R&S®CMW-KG4xx/-KM4xx/-KS4xx WCDMA Firmware Applications
User Manual

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Test & Measurement

User Manual

ROHDE&SCHWARZ

This user manual describes the following R&S®CMW options:

- R&S®CMW-KG400 (WCDMA R99, generator, downlink)
- R&S®CMW-KG401 (WCDMA R5/6 HSPA, generator, downlink)
- R&S®CMW-KM400 (WCDMA R99, TX measurement, uplink)
- R&S®CMW-KM401 (WCDMA R5/6 HSPA, TX measurement, uplink)
- R&S®CMW-KM403 (WCDMA R7 HSPA+, TX measurement, uplink)
- R&S®CMW-KM012 (TX measurement, multi evaluation list mode)
- R&S®CMW-KS400 (WCDMA R99, basic signaling)
- R&S®CMW-KS401 (WCDMA R5/6 HSPA, basic signaling)
- R&S®CMW-KS403 (WCDMA R7 HSPA+, basic signaling)
- R&S®CMW-KS404 (WCDMA R8, basic signaling)
- R&S®CMW-KS410 (WCDMA R99, advanced signaling)
- R&S®CMW-KS411 (WCDMA R5/6 HSPA, advanced signaling)
- R&S®CMW-KS413 (WCDMA R7 HSPA+, advanced signaling)
- R&S®CMW-KS425 (WCDMA, user defined bands, generic signaling)
- R&S®CMW-KE100 (Basic Fading support: AWGN generator)
- R&S®CMW-KE400 (WCDMA fading profiles TS 25.101, excerpts)

Muehldorfstr. 15, 81671 Munich, Germany
Phone: +49 89 41 29 - 0
Fax: +49 89 41 29 12 164
E-mail: info@rohde-schwarz.com
Internet: http://www.rohde-schwarz.com

The following abbreviations are used throughout this manual: R&S®CMW is abbreviated as R&S CMW.

Contents

1 Preface

The operation of the R&S CMW is described in several user manuals:

- The R&S CMW user manual describes the base software, common features of the firmware applications and basic principles for manual operation and remote control.
- Additional user manuals, like this document, describe the firmware applications.

Rohde & Schwarz provides registered users a "CMW Customer Web" section on GLORIS, the Global Rohde & Schwarz Information System: https://extranet.rohde-schwarz.com. From this resource you can download software updates, waveform library updates and documentation updates, e.g. updates of this document.

1.1 How to Read Firmware Application Chapters

Each firmware application is described in a separate chapter. These chapters can be read independently of each other. However, they are all organized as follows:

1. General Description
2. Application Sheets (optional)
3. GUI Reference
4. Programming Examples
5. Command Reference

The chapters "System Overview" and "Remote Control" in the R&S CMW user manual provide additional important information independent of the individual firmware applications. The most important parts are referenced by the firmware application descriptions.

1.1.1 General Description

This section provides a general description of the firmware application, independent of a specific operation mode (manual or remote control). It gives a high-level introduction to the capabilities of the firmware application. Background information related to the network standard is given as far as it is directly related to administrable parameters. For measurement applications a detailed description of measurement results and a description of configurable limits is given, including the relation to conformance requirements defined in network standard specifications.

1.1.2 Application Sheets

This optional section provides short application examples for select issues and related background information.

1.1.3 GUI Reference

The GUI reference describes the manual operation of the firmware application via the Graphical User Interface (GUI).

The description of a configuration dialog usually starts with a screenshot presenting the preset values of the parameters (sometimes preset values are modified to enable hidden parts of a dialog). Below the screenshot all shown parameters are described. For each single parameter a link to the corresponding command description in the "Command Reference" is provided. Ranges for numeric parameters and reset values are given there.

For measurement results links to the corresponding command descriptions are provided (commands to retrieve the results). The measurement results are described in detail in the "General Description".

1.1.4 Programming Examples

The programming examples show how to control and configure the firmware application via a remote-control program and how to retrieve measurement results. The examples consist of comprehensive command sequences. You can check just a single command of a sequence to get an example for the syntax of this single command. But you can also consider an entire sequence showing the commands in the context of a command script, under consideration of dependencies and required orders of the commands.

The command sequences are written with the intention to list most commands of the firmware application. They do not show the fastest way for a given configuration task. The fastest way would use many reset values and omit the corresponding commands.

The examples are referenced by the command descriptions of the "Command Reference".

1.1.5 Command Reference

The command reference provides information on the remote commands of the firmware application. The commands are grouped according to their function.

Each command description indicates the syntax of the command header and of the parameters. For input parameters the allowed ranges, reset values and default units are listed, for returned values the expected ranges and default units. Most commands have a command form and a query form. Exceptions are marked by "Setting only", "Query only" or "Event". Furthermore a link to the "Programming Examples" is provided and the first software version supporting the command is indicated.

2 WCDMA Generator

The WCDMA generator (option R&S CMW-KG400) provides a flexible WCDMA downlink test signal at arbitrary RF carrier frequency (inband as well as out of band) and selectable level.

2.1 What's New in this Revision

This revision describes version 2.1.20 and later of the "WCDMA Generator" firmware application. Compared to version 2.0.10 it provides the following new features:

- Support of operating band L
- TPC test steps EF and GH, see TPC Test Steps for Inner Loop Power Control
- Segmentation for test steps E, F, G and H, see Segmented TPC Test Patterns

Software Version

To check your R&S CMW software version, open the "Setup" dialog and click "HW/SW Equipment". The initial software version for each remote control command is quoted in the reference description.

2.2 General Description

The downlink test signal provided by the WCDMA generator (option R&S CMW-KG400) includes physical channels (pilot channels, synchronization channels, ...) suitable to test whether a UE can perform synchronization and scrambling code identification.

The generator provides trigger signals that can be used by other firmware applications to synchronize to the generated WCDMA downlink signal. Example: Use the generator to send Transmit Power Control (TPC) patterns to the UE and measure the resulting UE power with the "WCDMA measurement" firmware application (option R&S CMW-KM400). Use the TPC trigger provided by the generator to synchronize the measurement to the transmitted TPC pattern.

High speed channels can be generated if option R&S CMW-KG401 is available. It allows to generate High Speed Downlink Packet Access (HSDPA) channels as well as downlink channels related to High Speed Uplink Packet Access (HSUPA).

The WCDMA generator is a real-time generator. In contrast to ARB files created with the GPRF generator, the real-time generator allows to:

- quickly re-configure signals and test the effects without loading a new waveform file
- generate signals with arbitrary length (e.g. for the transmission of long PRBS sequences)
- use dynamic features such as TPC sequences for WCDMA tests

The following sections provide detailed background information about the properties of the WCDMA downlink signal. The GUI Reference provides links to this background information where required.

2.2.1 Physical Channel Overview

The radio resources in a WCDMA system are divided into physical channels characterized by a specific carrier frequency, scrambling code, channelization code and duration. The time duration is defined in integer multiples of chips, slots and radio frames. With a chip rate of 3.84 Mcps, a slot corresponds to 2560 chips. A frame consists of 15 slots, i.e. 38400 chips or 10 ms.

The generator provides a set of downlink physical channels sufficient for synchronization of the UE and data transfer. In addition, it generates the PICH which is to be used in many of the conformance tests described in 3GPP TS 34.121.

3GPP specifies different physical channel types. The channels are generated by mapping transport channel information into a physical channel and differ in their physical parameters.

- Common channels carry messages that are not directed at a particular UE; they are point-to-multipoint channels.
- Dedicated channels carry information related to a particular connection; they are point-to-point channels.
- Shared channels are dedicated channels shared by several UEs. At a given time, a shared channel is assigned to one UE only, but the assignment may change within a few timeslots.

An overview of the physical channels of the downlink generator signal is given in the following table. The links in the first column point to additional channel-related information. The third column lists some channel properties. If not mentioned otherwise both primary and secondary scrambling code are allowed and the channelization code can be set. The Spreading Factor (SF) and the symbol rate are indicated.

Table 2-1: DL Channel Overview

Channel type	Purpose	Properties
Primary Common Pilot Channel (P-CPICH)	Determination of the scrambling code out of a scrambling code group Phase reference for SCH and other downlink physical channels	SF = 256, 15 ksps Fixed channelization code $c_{256, 0}$ Primary scrambling code Predefined symbol sequence
Secondary Common Pilot Channel (S-CPICH)	Alternative phase reference for the cell; also used as a phase reference for some conformance tests	SF = 256, 15 ksps Predefined symbol sequence Zero, one or several S-CPICH channels per cell (the R&S CMW generates zero or one S-CPICHs)
Primary Synchronization Channel (P-SCH)	Slot synchronization between the instrument and the UE	Fixed 256-chip code (primary synchronization code) Time-multiplexed with P-CCPCH No channelization, no scrambling
Secondary Synchronization Channel (S-SCH)	Frame synchronization between the instrument and the UE Provides the scrambling code group	256-chip code depending on the slot number and the scrambling code group Time-multiplexed with P-CCPCH No channelization, no scrambling
Primary Common Control Physical Channel (P-CCPCH)	Transmits the System Frame Number (SFN) and is used as a timing reference for all physical channels Carries the BCH transport channel	SF = 256, 15 ksps Fixed channelization code $c_{256, 1}$ Primary scrambling code Time-multiplexed with SCH
Secondary Common Control Physical Channel (S-CCPCH)	Carries the Forward Access Channel (FACH) and the Paging Channel (PCH)	Variable spreading factor Primary scrambling code
Paging Indicator Channel (PICH)	Transfer of paging indicators to the UE Required to be present in many conformance tests	SF = 256, 15 ksps Primary scrambling code
Dedicated Physical Channel (DPCH)	Transfer of control information and user data to the UE	Variable spreading factor DPDCH and DPCCH time-multiplexed
Fractional Dedicated Physical Channel (F-DPCH)	Transfer of TPC information to the UE for HSDPA	SF = 256, 15 ksps
High Speed Shared Control Channel (HS-SCCH)	Transfer of downlink signaling information related to HS-DSCH transmission	SF = 128, 30 ksps
High Speed Physical Downlink Shared Channel (HS-PDSCH)	Carries the High Speed Downlink Shared Channel (HS-DSCH)	SF = 16 (multiple codes can be assigned to one UE), 240 ksps
E–DCH Absolute Grant Channel (E-AGCH)	Transfer of uplink E-DCH absolute grant to the UE	SF = 256, 15 ksps

Channel type	Purpose	Properties
E-DCH Relative Grant Channel (E-RGCH)	Transfer of uplink E-DCH relative grants to the UE	SF = 128, 30 ksps Same channelization code as E-HICH
E-DCH HARQ Indicator Channel (E-HICH)	Transfer of uplink E-DCH HARQ acknowledgement indicator to the UE	SF = 128, 30 ksps Same channelization code as E-RGCH

The R&S CMW uses the scheme defined in 3GPP TS 25.213 to spread and combine the downlink channels (see figure below). For all physical channels except P-SCH and S-SCH, the real-valued symbols are mapped to an I and Q branch. The I and Q branches of each channel are spread to the chip rate using the same channelization code $c_{SF,m}$ for both branches.

The complex-valued chip sequences are scrambled with primary or secondary scrambling codes S^p or S^s, weighted with individual factors G and then combined using complex addition. The G factors are directly related to the individual channel levels set at the instrument. See also chapter 2.2.1.2, "Scrambling Codes", on page 17.

The complex-valued synchronization channels P-SCH and S-SCH are not spread but weighted separately and then added to the already combined signal.

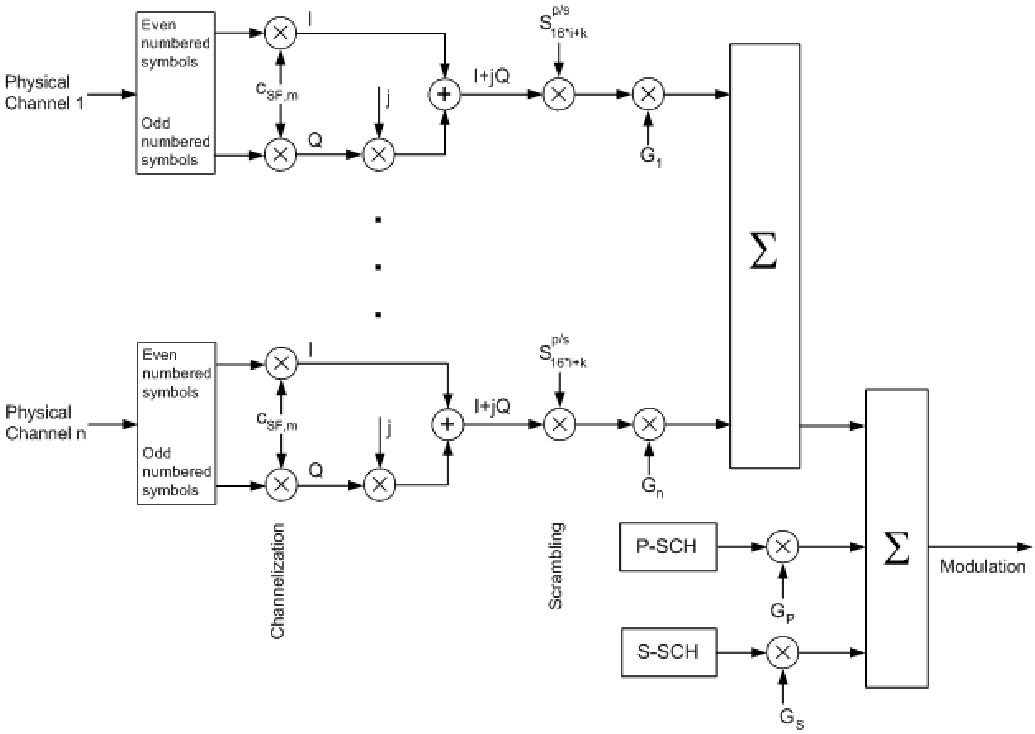


Fig. 2-1: Channelization, scrambling, weighting and combining of downlink channels

2.2.1.1 UE Synchronization and Scrambling Code Identification

With the channels of the generator signal, synchronization of the UE and scrambling code identification is a three-step process:

1. Slot synchronization
   The UE searches for the P-SCH and detects the primary synchronization code using correlation methods. The start of the P-SCH marks the beginning of a slot.
2. Frame synchronization and scrambling code group identification
   The UE detects the secondary synchronization code transmitted on the S-SCH to obtain the frame time and the scrambling code group. If needed, it also determines the System Frame Number (SFN) transmitted on the P-CCPCH.
3. Scrambling code identification and data evaluation
   The UE detects the P-CPICH to determine the primary scrambling code within the scrambling code group obtained in step 2. Using this information, it is possible to detect the scrambling code of the DPCH and to decode the data.

2.2.1.2 Scrambling Codes

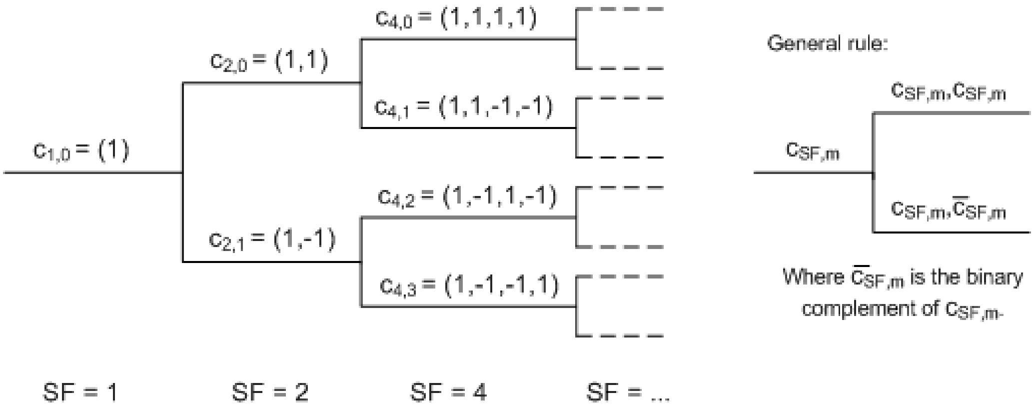
Scrambling codes are used to separate different cells and users. According to 3GPP TS 25.213, the complex downlink scrambling codes are constructed by combining two real sequences generated by means of two generator polynomials of degree 18. Of these $2^{18} – 1$ scrambling codes, only a subset of 512 primary scrambling codes (numbered n = 16*i where i = 0 to 511) and 15*512 secondary codes (numbered n = 16*i + k where i = 0 to 511 and k = 1 to 15) are used. Hence the total number of primary and secondary codes is 8192.

The 512 primary scrambling codes are further divided into 64 groups, each consisting of 8 codes. The scrambling code group information is transmitted on the S-SCH.

Each cell is allocated one and only one primary scrambling code. Most channels are always transmitted using the primary scrambling code. Some channels can be transmitted with either the primary scrambling code or one of the secondary scrambling codes associated with the primary scrambling code of a cell (see table 2-1). You can define one primary and one secondary scrambling code.

2.2.1.3 Channelization Codes

Channelization codes are used to separate different physical channels of the same carrier frequency, cell and user. They are defined in terms of the spreading factor (SF) and a code number m ranging from 0 to SF – 1. The codes $c_{SF,m}$ are called Orthogonal Variable Spreading Factor (OVSF) codes and are derived from a hierarchical tree:

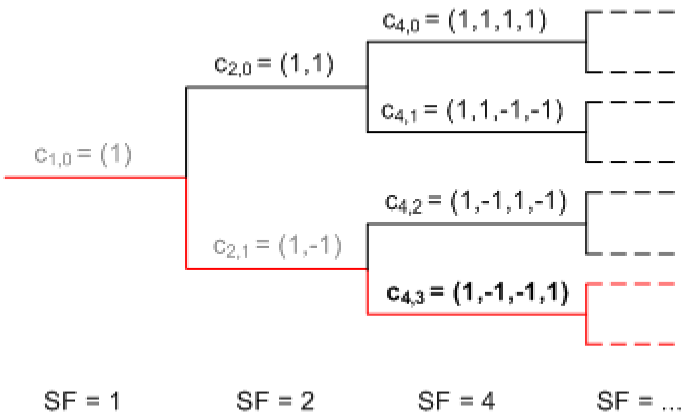


The following rule has to be observed for assignment of channelization codes in order to avoid code conflicts: Within each branch only one code can be used at the same time.

This means:

- Other codes on the path between the code and the root of the tree must not be used.
- Codes in sub-branches of the code (to the right of the code) must not be used.

For an example see the figure below. The red parts are blocked when $c_{4,3}$ is used.



2.2.2 Channel Structure

The following sections describe the structure of most physical channels. For an overview of the channels refer to chapter 2.2.1, "Physical Channel Overview", on page 14.

2.2.2.1 SCH and P-CCPCH

The Primary Synchronization Channel (P-SCH) carries a complex-valued 256-chip code c_p depending on the Space Time Transmit Diversity (STTD) encoding on the P-CCPCH and is used for slot synchronization between the R&S CMW and the UE.

The Secondary Synchronization Channel (S-SCH) carries a complex-valued 256-chip code $c^{g,i}_s$ depending on the slot number i, the scrambling code group g, and the STTD encoding on the P-CCPCH. It is used for frame synchronization between the instrument and the UE.

Both P-SCH and S-SCH are time-multiplexed with the P-CCPCH as shown below.

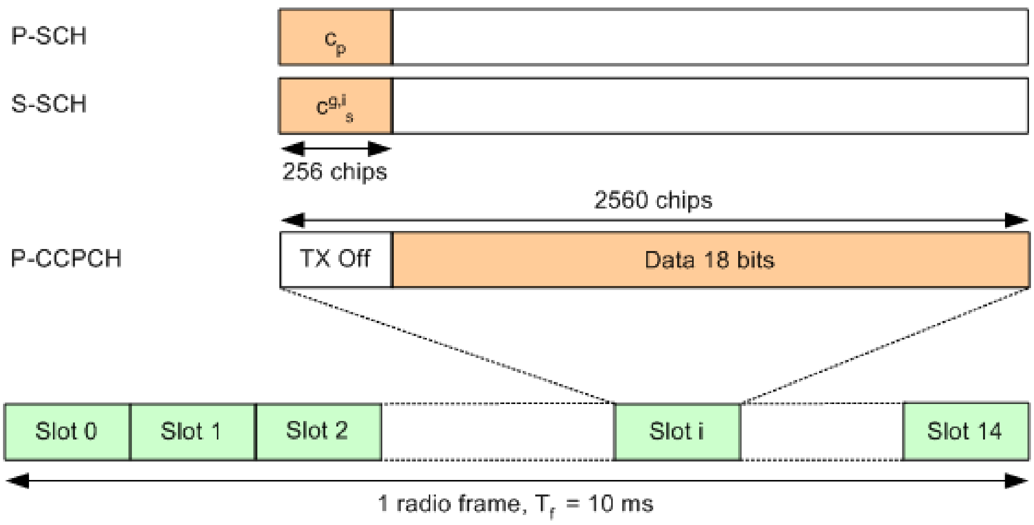


Fig. 2-2: Structure of SCH and P-CCPCH

The Primary Common Control Physical Channel (P-CCPCH) carries the BCH transport channel. It is not transmitted during the first 256 chips of each slot. In contrast to the S-CCPCH it has a fixed predefined transport format combination and contains no TFCI field.

2.2.2.2 Secondary Common Control Physical Channel (S-CCPCH)

The S-CCPCH contains a TFCI field, a data field and a pilot field. The detailed structure in the time domain is shown below:

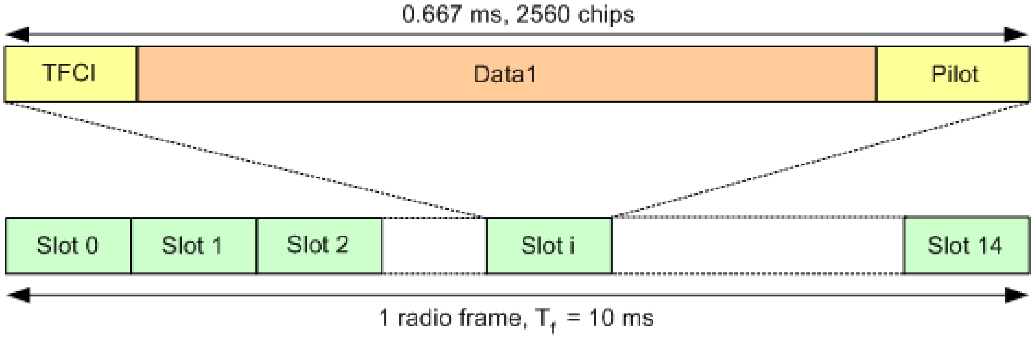


Fig. 2-3: Structure of S-CCPCH

The total number of bits per slot, the relative length of the fields and other parameters depend on the selected slot format. The slot formats are defined in 3GPP TS 25.211 and listed in the following table.

Slot Format	Symbol Rate (ksps)	SF	Bits/Slot	N_{Data1}	N_{Pilot}	N_{TFCI}
0	15	256	20	20	0	0
1	15	256	20	12	8	0
2	15	256	20	18	0	2
3	15	256	20	10	8	2
4	30	128	40	40	0	0
5	30	128	40	32	8	0
6	30	128	40	38	0	2
7	30	128	40	30	8	2
8	60	64	80	72	0	8*
9	60	64	80	64	8	8*
10	120	32	160	152	0	8*
11	120	32	160	144	8	8*
12	240	16	320	312	0	8*
13	240	16	320	296	16	8*
14	480	8	640	632	0	8*
15	480	8	640	616	16	8*
16	960	4	1280	1272	0	8*
17	960	4	1280	1256	16	8*

*If TFCI bits are not used, then DTX bits (discontinuous transmission) shall be filled into the TFCI field.

2.2.2.3 Paging Indicator Channel (PICH)

The PICH is used to carry the paging indicators. One PICH radio frame of length 10 ms consists of 300 bits (38400 chips). Of these the first 288 bits (36864 chips) are used to carry paging indicators. The remaining 12 bits (1536 chips) are not formally part of the PICH and shall not be transmitted (DTX). The part of the frame with no transmission is reserved for possible future use.

2.2.2.4 Dedicated Physical Channel (DPCH)

The DPCH contains the time-multiplexed Dedicated Physical Control Channel (DPCCH) and the Dedicated Physical Data Channel (DPDCH). The detailed structure in the time domain is shown below:

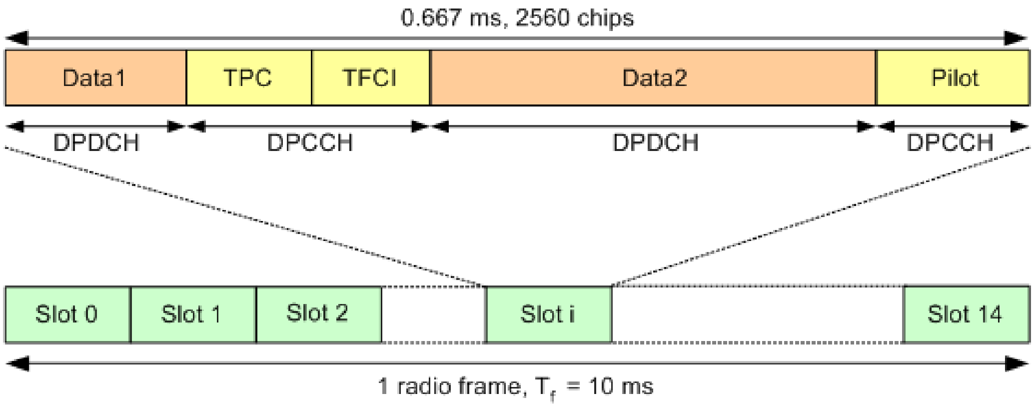


Fig. 2-4: Structure of DPCH

The DPDCH contains two data fields. The DPCCH contains the following fields:

- Transmit Power Control (TPC): contains power control bits requesting the UE to increase (bit 1) or decrease (bit 0) its transmit power. See also chapter 2.2.8, "Transmit Power Control (TPC)", on page 31.
- Transport Format Combination Indicator (TFCI): informs the receiver of the current structure of the transmitted transport channels
- Pilot field: fixed bit sequence used for synchronization purposes in the receiver

The total number of bits per slot, the relative length of the fields and other parameters depend on the selected slot format. The slot formats are defined in 3GPP TS 25.211 and listed in the following table.

Slot Format	Symbol Rate (ksps)	SF	Bits/Slot	N_{Data1}	N_{Data2}	N_{TPC}	N_{TFCI}	N_{Pilot}
0	7.5	512	10	0	4	2	0	4
1	7.5	512	10	0	2	2	2	4
2	15	256	20	2	14	2	0	2
3	15	256	20	2	12	2	2	2

Slot Format	Symbol Rate (ksps)	SF	Bits/Slot	N_{Data1}	N_{Data2}	N_{TPC}	N_{TFCI}	N_{Pilot}
4	15	256	20	2	12	2	0	4
5	15	256	20	2	10	2	2	4
6	15	256	20	2	8	2	0	8
7	15	256	20	2	6	2	2	8
8	30	128	40	6	28	2	0	4
9	30	128	40	6	26	2	2	4
10	30	128	40	6	24	2	0	8
11	30	128	40	6	22	2	2	8
12	60	64	80	12	48	4	8*	8
13	120	32	160	28	112	4	8*	8
14	240	16	320	56	232	8	8*	16
15	480	8	640	120	488	8	8*	16
16	960	4	1280	248	1000	8	8*	16

*If TFCI bits are not used, then DTX bits (discontinuous transmision) shall be filled into the TFCI field.

2.2.2.5 Fractional Dedicated Physical Channel (F-DPCH)

The F-DPCH is a special case of a downlink DPCCH carrying TPC information (see 3GPP TS 25.211). It is required to transport TPC information when no normal DPCCH is available, e.g. for HSDPA. Each F-DPCH slot is subdivided into 10 256-chip periods. The second 256-chip period is used to transmit 2 TPC bits. During the remainder of the slot, the TX power is switched off.

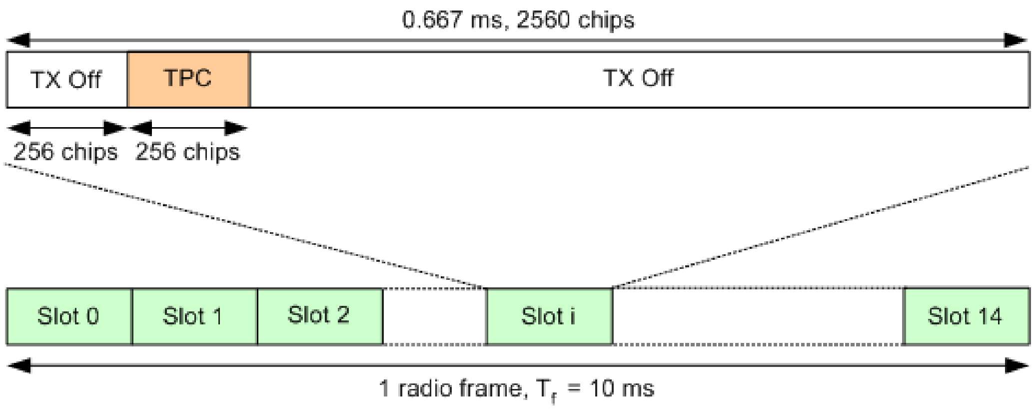


Fig. 2-5: Structure of F-DPCH

The time offset of the F-DPCH relative to the P-CCPCH is UE-specific, which allows to superimpose several F-DPCHs in order to allocate TPC information to up to 10 different

UEs using a single, time-multiplexed code channel. All other data (including higher-layer signaling) is transmitted on the HSDPA channels.

The slot format of the F-DPCH equals 0 and the symbol rate equals 15 ksps.

2.2.2.6 HS-PDSCH and HS-SCCH

The High Speed Physical Downlink Shared Channel (HS-PDSCH) carries the transport channel High Speed Downlink Shared Channel (HS-DSCH). Multiple users share the air interface resources available on this channel. An intelligent algorithm in the Node B decides which UE will receive a data packet at which time. This decision is reported to the UEs via a parallel signaling channel, the High Speed Shared Control Channel (HS-SCCH). The HS-SCCH transports also information on the used channelization code set, the modulation scheme, the transport block size and Hybrid Automatic Repeat Request (HARQ) related information (see 3GPP TS 25.212).

For HSDPA a radio frame is divided into five subframes of three slots each. A slot contains one data field of 2560 chips. This subframe structure applies to HS-PDSCH and HS-SCCH. The HS-PDSCH subframe starts 2 timeslots after the start of the corresponding HS-SCCH subframe.

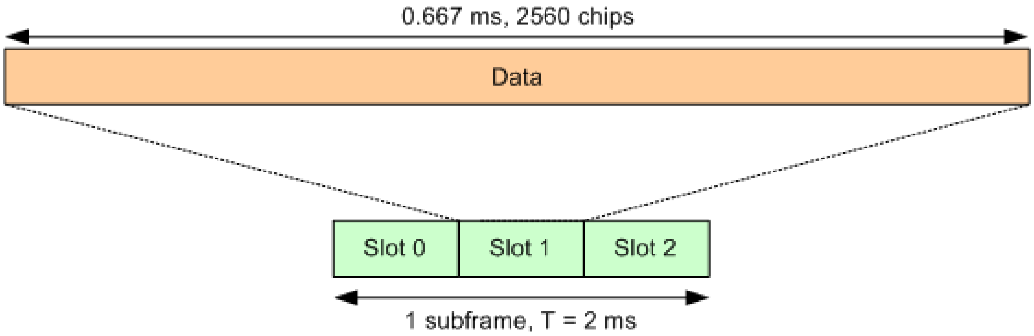


Fig. 2-6: Structure of HS-PDSCH and HS-SCCH

The HS-DSCH is always configured as reference channel according to 3GPP TS 25.101, Annex A7. Reference channels for HSDPA conformance tests are described in terms of the H-Sets 1 to 5. For the H-Sets 1, 2 and 3, a QPSK and a 16 QAM version is available. H-Sets 4 and 5 use QPSK modulation only.

All reference channel configurations assign multiple channelization codes (SF=16) to the same UE:

- H-Set 1, 2, 3, 4, 5 (QPSK): 5 codes
- H-Set 1, 2, 3 (16QAM): 4 codes

2.2.2.7 E-AGCH, E-RGCH and E-HICH

These downlink channels transport information related to the high speed uplink transport channel E-DCH:

- The Enhanced DCH Absolute Grant Channel (E-AGCH) carries the uplink E-DCH absolute grants. An absolute grant defines the maximum amount of uplink (E-DCH) resources the UE may use (see 3GPP TS 25.321). It is signaled to the UE by the serving cell.An E-DCH absolute grant is transmitted using 3 or 15 consecutive slots depending on the Transmission Time Interval (TTI) of the E-DCH (2 ms or 10 ms). In each slot a sequence of 20 bits is transmitted.

- The Enhanced DCH Relative Grant Channel (E-RGCH) carries the uplink E-DCH relative grants. A relative grant updates the uplink (E-DCH) resource allocation to a UE. It is transmitted using 3 or 12 consecutive slots depending on the TTI of the E-DCH (2 ms or 10 ms). In each slot a sequence of 40 ternary values (corresponding to Up / Hold / Down) is transmitted.
- The Enhanced DCH HARQ Indicator Channel (E-HICH) carries the uplink E-DCH Hybrid Automatic Repeat Request (HARQ) acknowledgement indicator. When the Node B receives a data packet correctly from the UE it uses this indicator to return an acknowledgement (ACK). When it receives a data packet with errors the Node B returns a negative acknowledgement (NACK) requesting retransmission of the data packet.A HARQ acknowledgement indicator is transmitted using 3 or 12 consecutive slots depending on the TTI of the E-DCH. In each slot a sequence of 40 binary values (corresponding to ACK / NACK) is transmitted.

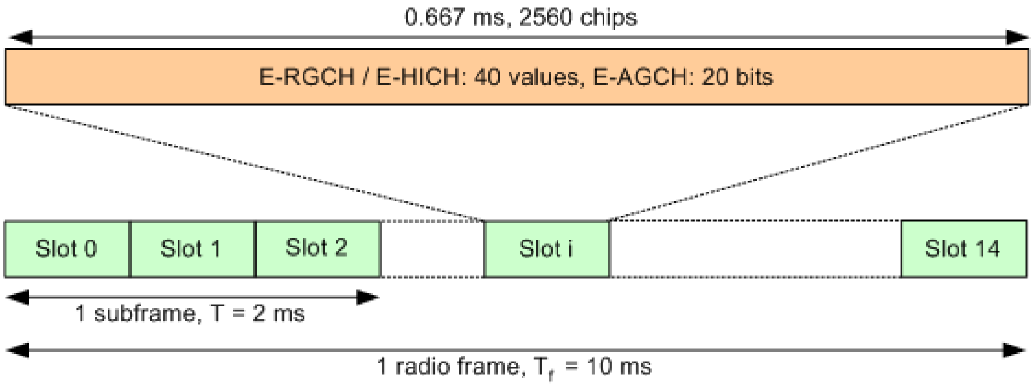


Fig. 2-7: Structure of E-AGCH, E-RGCH and E-HICH

E-RGCH and E-HICH use the same channelization code. They are separated by specific orthogonal signature sequences defined in 3GPP TS 25.211.

2.2.3 Dedicated Channel Models

The generator provides three basic DCH models specified by 3GPP. All models are available with several data rates and are described in this section.

Alternatively the dedicated channel can also be configured as fractional DPCH, see chapter 2.2.2.5, "Fractional Dedicated Physical Channel (F-DPCH)", on page 22.

2.2.3.1 Reference Measurement Channel (RMC)

The data content of the 3GPP downlink RMC is defined on transport channel level according to 3GPP TS 25.101. The data sequence to be transferred is directly fed into the Dedicated Traffic Channel (DTCH) and the Dedicated Control Channel (DCCH). The transport channels are channel coded, multiplexed and mapped onto a Dedicated Physical Channel (DPCH) with variable data rate (see figure below).

The downlink reference measurement channel generated in this way is to be used for various transmitter and receiver tests specified e.g. in 3GPP TS 25.101 and 34.121.

The following example illustrates the generation of a 3GPP reference measurement channel from the DTCH and DCCH transport channels and lists the physical and transport channel parameters for an information bit rate of 12.2 kbps. For other bit rates refer to specification 3GPP TS 25.101.

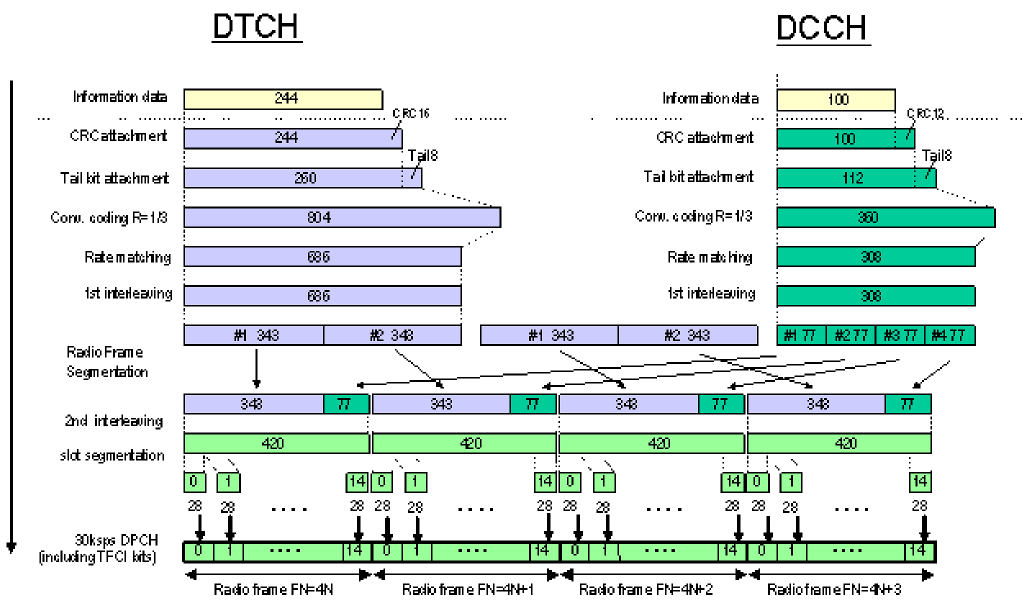


Fig. 2-8: Generation of RMC from DTCH and DCCH

Table 2-2: RMC physical parameters (12.2 kbps)

Physical Parameter	Value
Information bit rate	12.2 kbps
DPCH	30 ksps
Slot Format number	11
TFCI	On
Power offsets PO1, PO2 and PO3	0 dB
Puncturing	14.7 %

Table 2-3: RMC transport channel parameters (12.2 kbps)

Transport Channel Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	244	100
Transport Block Set Size	244	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	fixed

2.2.3.2 Signaling Radio Bearer (SRB)

The data content of the SRB is defined on transport channel level in 3GPP TS 34.108. The most important layer 1 parameters are shown in the following table.

The listed slot format determines additional parameters, see chapter 2.2.2.4, "Dedicated Physical Channel (DPCH)", on page 21.

	SRB 1.7	SRB 2.5	SRB 3.4	SRB 13.6
DPCH Slot Format	0	6	4	8
Transmission Time Interval	80 ms	40 ms	40 ms	10 ms
Coding Type	Convolution Cod- ing	Convolution Cod- ing	Convolution Cod- ing	Convolution Cod- ing
Coding Rate	1/3	1/3	1/3	1/3
Rate Matching attribute	155	256	155	155
Size of CRC	16 bits	12 bits	16 bits	16 bits
TFS (TF0, TF1)	0 x 148 bits, 1 x 148 bits	0 x 100 bits, 1 x 100 bits	0 x 148 bits, 1 x 148 bits	0 x 148 bits, 1 x 148 bits

2.2.3.3 Blind Transport Format Detection (BTFD)

BTFD means that the UE receives transport blocks that contain no Transport Format Combination Index (TFCI) and recognizes the transport format autonomously.

According to the conformance specification, BTFD tests are performed on a special set of Reference Measurement Channels (RMCs) with variable DL DTCH transport format, corresponding to data rates between 1.95 kbps and 12.2 kbps. The BTFD RMCs are specified in 3GPP TS 25.101 and 34.121. The physical and transport channel parameters of the RMCs used for BTFD are listed below.

Table 2-4: RMC for BTFD, physical parameters

Physical Parameter	Value
Information bit rate	Rate 1: 12.2 kbps, Rate 2: 7.95 kbps, Rate 3: 1.95 kbps
DPCH	30 ksps
Slot Format number	8
TFCI	Off
Power offsets PO1, PO2 and PO3	0 dB
Repetition	5 %

Table 2-5: RMC for BTFD, transport channel parameters

Transport Channel Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	for Rate 1: 244 for Rate 2: 159 for Rate 3: 39	100
Transport Block Set Size	for Rate 1: 244 for Rate 2: 159 for Rate 3: 39	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	12	12
Position of TrCH in radio frame	fixed	fixed

2.2.4 Orthogonal Channel Noise Simulator (OCNS)

The OCNS is used to simulate the users or control signals on the other orthogonal channels of a downlink. The channelization code and relative level settings for OCNS signals are specified in the terminal conformance specification 3GPP TS 34.121; see tables below. The spreading factor of the OCNS signal is 128. The DPCH data for each channelization code are uncorrelated with each other and with any wanted signal over the period of any measurement. The parameters are chosen to simulate a signal with realistic Peak to Average Ratio.

The following tables list the channelization codes and relative level settings for non-HSDPA tests (R99) and HSDPA tests (R5).

Table 2-6: OCNS channels for non-HSDPA tests (R99)

Channelization Code (SF = 128)	Relative Level Setting (dB)	Channelization Code (SF = 128)	Relative Level Setting (dB)
2	-1	62	-4
11	-3	69	-6
17	-3	78	-5
23	-5	85	-9
31	-2	94	-10
38	-4	113	-6
47	-8	119	0
55	-7	125	-8

Table 2-7: OCNS channels for HSDPA tests (R5)

Channelization Code (SF = 128)	Relative Level Setting (dB)
122	0
123	-2
124	-2
125	-4
126	-1
127	-3

The relative level setting specified in dB describes the relationship between the OCNS channels. The total power level of all OCNS channels depends on the power level of the other channels, see chapter 2.2.5, "Power Levels", on page 28.

2.2.5 Power Levels

The individual channel power levels and the OCNS power level are expressed relative to the RMS output power of the generator. The total power of all active channels (excluding OCNS channels) is called "accumulated power". It is calculated under consideration of the transmission duration of each channel within a timeslot or frame (see chapter 2.2.2, "Channel Structure", on page 18):

- SCH: first 256 chips of a slot (2560 chips)
- P-CCPCH: last 2304 chips of a slot (2560 chips)
- PICH: 288 bits of a frame (300 bits)
- F-DPCH: 256 chips of a slot (2560 chips)
- all other channels: transmitted during entire timeslot / frame

Example: For a configuration with active P-CPICH, DPCH, PICH, P-SCH and P-CCPCH the accumulated power is calculated according to the following formula:

$$P_{acc} = P_{P-CPICH} + P_{DPCH} + P_{PICH} \cdot \frac{288}{300} + P_{P-SCH} \cdot \frac{256}{2560} + P_{P-CCPCH} \cdot \frac{2304}{2560}$$

If the accumulated power is smaller than the RMS output power of the generator, this gap is filled by OCNS channels, see chapter 2.2.4, "Orthogonal Channel Noise Simulator (OCNS)", on page 27.

2.2.6 Operating Bands

The carrier frequencies for WCDMA downlink signals are defined in 3GPP specification TS 25.141 (except the S and L operating bands which are not standardized). Each operating band contains a number of downlink carrier frequencies and corresponding channel numbers (UARFCN, UTRA Absolute Radio Frequency Channel Number). The assignment between channel numbers N and carrier center frequencies F is defined as:

$N = 5 * (F - F_{Offset}) / MHz$

The table below provides an overview of all bands. For each band it lists the offset frequencies F_{Offset}, channel numbers N and carrier center frequencies F. For some operating bands a second row indicates additional center frequencies, which are shifted by 100 kHz relative to the normal 200 kHz raster. The channel numbers for these additional frequencies are either explicitly listed or indicated as discontinuous range with a step width of 25. The related center frequencies are listed as discontinuous ranges.

Table 2-8: Operating bands for downlink signals

Band	F_{Offset} [MHz]	Channel No N	F [MHz]
1	0	10562 to 10838	2112.4 to 2167.6
2	0 1850.1	9662 to 9938 412 to 687 (step 25)	1932.4 to 1987.6 1932.5 to 1987.5
3	1575	1162 to 1513	1807.4 to 1877.6
4	1805 1735.1	1537 to 1738 1887 to 2087 (step 25)	2112.4 to 2152.6 2112.5 to 2152.5
5	0 670.1	4357 to 4458 1007, 1012, 1032, 1037, 1062, 1087	871.4 to 891.6 871.5 to 887.5
6	0 670.1	4387 to 4413 1037, 1062	877.4 to 882.6 877.5, 882.5
7	2175 2105.1	2237 to 2563 2587 to 2912 (step 25)	2622.4 to 2687.6 2622.5 to 2687.5
8	340	2937 to 3088	927.4 to 957.6
9	0	9237 to 9387	1847.4 to 1877.4
10	1490 1430.1	3112 to 3388 3412 to 3687 (step 25)	2112.4 to 2167.6 2112.5 to 2167.5
11	736	3712 to 3812	1478.4 to 1498.4

Band	F_{Offset} [MHz]	Channel No N	F [MHz]
12	-37 -54.9	3837 to 3903 3927, 3932, 3957, 3962, 3987, 3992	730.4 to 743.6 730.5 to 743.5
13	-55 -64.9	4017 to 4043 4067, 4092	748.4 to 753.6 748.5, 753.5
14	-63 -72.9	4117 to 4143 4167, 4192	760.4 to 765.6 760.5, 765.5
19	735 720.1	712 to 763 787, 812, 837	877.4 to 887.6 877.5, 882.5, 887.5
20	-109	4512 to 4638	793.4 to 818.6
21	1326	862 to 912	1498.4 to 1508.4
S	0 1000.1	10912 to 10988 5912 to 5987 (step 25)	2182.4 to 2197.6 2182.5 to 2197.5
S 170 MHz	0	10900 to 10950	2180.0 to 2190.0
S 190 MHz	0 1000.1	10950 to 11000 5962, 5987	2190.0 to 2200.0 2192.5, 2197.5
L	0 -30.1	7637 to 7783 7788 to 7933	1527.4 to 1556.6 1527.5 to 1556.5

2.2.7 Trigger Signals

The WCDMA generator provides trigger signals that can be used by other R&S CMW applications to synchronize to the generated WCDMA downlink signal. This is especially useful to trigger WCDMA TX measurements (option R&S CMW-KM400).

The available trigger signals are described below.

To address the trigger signals in remote commands, use the following strings, with <i> replaced by the instance number of the generator:

- "WCDMA Gen<i>: TPC Trigger"
- "WCDMA Gen<i>: Slot Trigger"
- "WCDMA Gen<i>: Frame Trigger"
- "WCDMA Gen<i>: DCCH TTI Trigger"
- "WCDMA Gen<i>: HS-DPCCH Trigger"

TPC Trigger

Trigger event one slot before a TPC pattern is sent to the UE via the downlink DPCH. This trigger signal is only available when the downlink signal contains a DPCH. It is not generated if an F-DPCH is available instead.

For more details see chapter 2.2.8.5, "Generating TPC Trigger Signals", on page 36.

Slot Trigger

Trigger event at the beginning of each downlink DPCH slot. If no downlink DPCH is available the trigger is aligned to the CPICH instead.

Frame Trigger

Trigger event at the beginning of each downlink frame. The trigger is aligned to the downlink DPCH if available. Otherwise it is aligned to the CPICH.

DCCH TTI Trigger

Trigger event at the beginning of a Transmission Time Interval (TTI) of the Dedicated Control Channel (DCCH). This trigger signal is only available when the downlink signal contains a DPCH. It is not generated if an F-DPCH is available instead.

The TTI depends on the selected channel model, see chapter 2.2.3, "Dedicated Channel Models", on page 24.

HS-DPCCH Trigger

Trigger event indicating an expected ACK or NACK in the uplink signal, with a trigger period of 18 slots.

The first uplink HS-DPCH slot transmitting an ACK or NACK is expected 12.5 slots after the generator starts transmission of the CPICH. The first trigger pulse is generated at the previous downlink DPCH slot boundary, located in the range between 1024 chips and 3328 chips before the start of the uplink HS-DPCH slot. Thus the next uplink HS-DPCH slot received after the trigger event carries an ACK or NACK. After the first trigger event, a trigger pulse is generated every 18 slots (6 sub-frames or 12 ms).

The HS-DPCCH trigger signal is only available when the downlink signal contains an HS-SCCH. If no downlink DPCH is available, the first trigger pulse is aligned to a CPICH slot boundary instead of a DPCH slot boundary.

The HS-DPCCH trigger is suitable for conformance tests where the UE must transmit specific patterns of ACK/NACK and CQI via the HS-DPCCH with a period of 18 slots. Such conformance tests are defined in 3GPP TS 34.121, e.g. section 5.7A "HS-DPCCH power control" and section 5.13.1AA "Error Vector Magnitude (EVM) and phase discontinuity with HS-DPCCH".

An (N)ACK/CQI pattern period of 18 slots can be reached using a CQI feedback cycle of 4 ms (required for the conformance tests) or of 2 ms. The appropriate CQI cycle has to be administered at the UE. The CQI timing and the HARQ timing at the UE must be the same.

2.2.8 Transmit Power Control (TPC)

In CDMA networks, control of the UE transmit power is essential to ensure stable transmission and an efficient radio resource management within the system. Generally speaking, an output power of the UE transmitter that is too low decreases the coverage area while an excess output power may cause interference to other channels or systems. Both effects decrease the system capacity.

The Node B transmits a series of Transmit Power Control (TPC) commands on the DL DPCH. The UE receives the TPC commands and adjusts its transmit power according to one of the following algorithms for uplink power control (see 3GPP TS 25.214):

- **Algorithm 1:**
  One TPC command is received in each slot. If the received TPC command is equal to 1 (0), then the power control parameter TPC_cmd for that slot is +1 (–1). This implies that the UE transmitter output power changes after each slot.
- **Algorithm 2:**
  One TPC command is received in each slot. The slots are grouped into sets of 5 slots, aligned to the frame boundaries, so that there is no overlap between different sets of 5 slots.
  If the received TPC command is equal to 1 (0) in all 5 slots of a set, then the power control parameter TPC_cmd for the 5th slot is +1 (–1). Otherwise TPC_cmd for the 5th slot is 0. This implies that the UE transmitter output power only changes if the same TPC command is received in a complete set of 5 slots.

For both algorithms, the UE transmitter output power changes by TPC_cmd multiplied with the TPC step size of 1 dB or 2 dB. According to 3GPP, the TPC step size for Algorithm 2 is always 1 dB. The step size for Algorithm 1 can be 1 dB or 2 dB.

2.2.8.1 TPC Pattern Setups

The R&S CMW provides several predefined setups with different TPC patterns. Some of these setups are fixed, some can be modified according to the needs of a specific application. The UE power resulting from a TPC pattern sent to the UE can be measured using the "WCDMA measurement" firmware application (option R&S CMW-KM400).

The following table provides an overview of the predefined setups. <Pattern> refers to a user-definable bit sequence.

Pattern Setup Name	Transferred Pattern
Alternating	(1)010101010... The first bit of the pattern is different from the last bit transferred before the start of the pattern.
All 1	1111111111...
All 0	0000000000...
Single Pattern + Alternating	<Pattern>(0)101010101... The first bit after <Pattern> is different from the last bit in <Pattern>
Single Pattern + All 1	<Pattern>1111111111...
Single Pattern + All 0	<Pattern>0000000000...
Continuous Pattern	<Pattern><Pattern><Pattern><Pattern>...
TPC Test Step...	see TPC Test Steps for Inner Loop Power Control

Pattern Setup Name	Transferred Pattern
Phase Discontinuity Up	111110000 (repeated up to 13 times, then alternating pattern)
Phase Discontinuity Down	000001111 (repeated up to 13 times, then alternating pattern) See also TPC Patterns for Phase Discontinuity Measurements

2.2.8.2 TPC Test Steps for Inner Loop Power Control

The conformance test specification 3GPP TS 34.121, section 5.4.2 "Inner Loop Power Control" defines the TPC test steps A to H inducing a power ramp of the following shape:

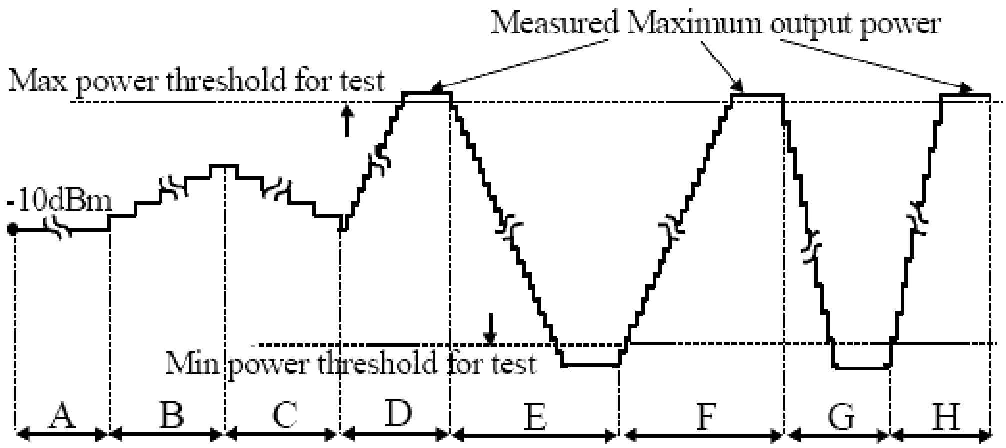


Fig. 2-9: TPC test steps A to H as defined by 3GPP

The R&S CMW offers some of these steps as fixed TPC pattern setups, see table below.

Pattern Setup Name	Transferred Pattern	Algorithm / Step Size
TPC Test Step E	all 0	1 / 1 dB
TPC Test Step F	all 1	1 / 1 dB
TPC Test Step EF	n x 0, followed by all 1	1 / 1 dB
TPC Test Step GH	m x 0, followed by all 1	1 / 2 dB
	n and m are configurable. 3GPP requests "at least 10 more than ... required to ensure that the UE reaches ... minimum power"	

Segmented TPC Test Patterns

To improve the accuracy of the power steps, it is possible to split the TPC patterns for test steps E, F, G, and H into segments.

Segmentation means that inverse TPC commands are inserted into each of the four test step patterns: A …1111…1111… pattern changes to …11011…11011…, a …0000…0000… pattern changes to …00100…00100…

The positions of the inverse TPC commands (segment borders) are fixed and known both by the generator and by the "TPC measurement" being available as part of R&S CMW-KM400. The measurement uses the inverse TPC periods to adjust the instrument hardware to the next input power range. The two UE power steps before and after each segment border are assumed to be equal. A difference in the measured UE power steps is attributed to the changed hardware settings and subtracted off:

- For the falling TPC patterns (E, G), the power steps after the segment borders are corrected.
- For the rising TPC patterns (F, H), the power steps before the segment borders are corrected.

As a consequence, the correction in the segment near the maximum UE output power is zero, and the segment near the minimum UE output power contains the sum of all corrections in the test step.

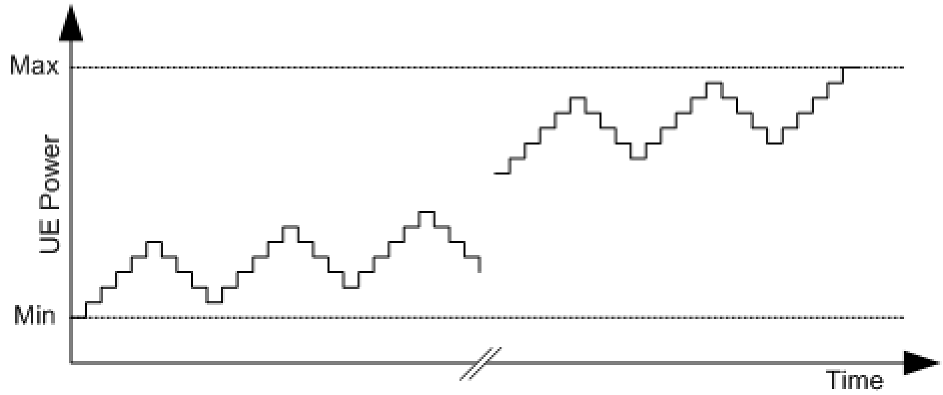
Unsegmented TPC test patterns correspond to the unmodified patterns described in 3GPP TS 34.121. However, segmented test patterns still comply with 3GPP specifications. Use segmented TPC test patterns to measure all power steps with maximum accuracy. Note that the corrections may add up to a systematic error of the measured absolute powers, especially in the segments near the minimum UE output power.

If the UE power steps are systematically above or below the specified values, the UE power towards the end of a test step may get outside the linear analyzer range, causing the TPC measurement to generate an "Overflow" or "Underflow" message. This can be due to the fixed segment borders and the correction method. It does not necessarily mean that any of the single UE power steps are out of their specified range.

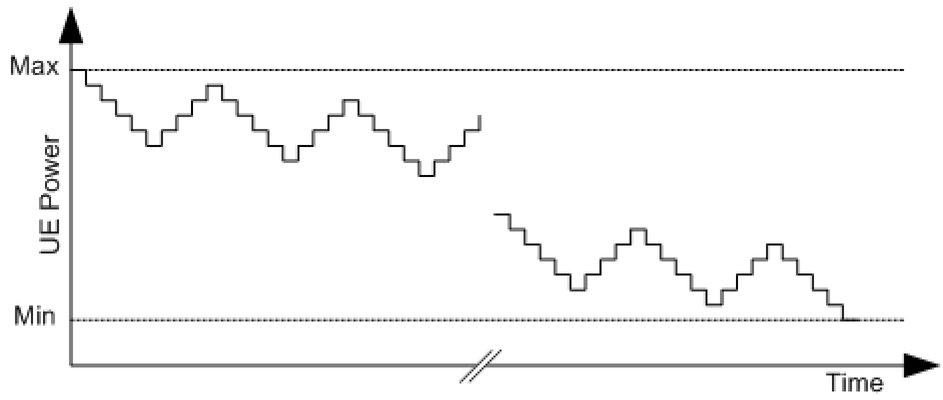
2.2.8.3 TPC Patterns for Phase Discontinuity Measurements

Phase discontinuity is the change in phase between any two adjacent timeslots. According to the conformance test specification 3GPP TS 34.121, a phase discontinuity measurement requires two special TPC patterns to be transmitted to the UE:

- **Phase Discontinuity Up:**
  Starting with minimum transmit power a sequence of five up and four down TPC commands has to be transmitted until the UE reaches maximum transmit power.



- **Phase Discontinuity Down:**
  Starting with maximum transmit power a sequence of five down and four up TPC commands has to be transmitted until the UE reaches minimum transmit power.



2.2.8.4 Rules for the Transfer of TPC Patterns

Administrable TPC patterns are transmitted via the downlink DPCH. They cannot be transmitted via an F-DPCH.

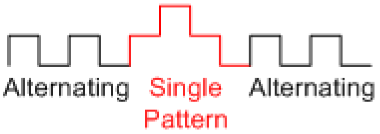
A pattern starts always at the beginning of a frame:

- A new pattern following an "All 0" or "All 1" pattern starts at the beginning of the first frame after the current frame.
- A new pattern following an "Alternating" pattern always starts at the next frame boundary where the last bit of the "Alternating" pattern is different from the first bit of the new pattern. This may be the first or second frame after the current frame.
- A running "Continuous Pattern" is immediately interrupted by a new pattern. The new pattern starts at the beginning of the first frame after the current frame.

Example:

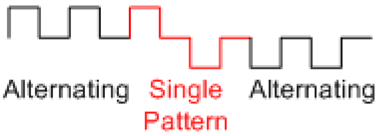
Single Pattern + Alternating can be used to first change the (average) UE power by a definite number of steps and then maintain the new (average) UE power. Due to the rules quoted above, the first and the last bit in <Pattern> cancel the effect of the preceding and the following bits. The rules tend to stabilize the net UE power and minimize the effect of <Pattern>.

It is easy to show this mechanism for power control algorithm 1 where the UE power changes after each slot by a definite step size. If the first and the last bits in <Pattern> are different, the net UE power change caused by these bits is zero. Example:



Single Pattern = 1100
Net UE power is unchanged

If both the first and the last bit in <Pattern> are 1 (0), then the net UE power change caused by these 2 bits equals the step size multiplied with 1 (–1); the effect of one bit is canceled. Example:



Single Pattern = 1001
Net UE power change: -1 x step size

In contrast, each of the central 0 and 1 bits in <Pattern> (i.e. all bits except the first and the last bit) causes a UE power change of the step size multiplied with –1 and 1, respectively.

2.2.8.5 Generating TPC Trigger Signals

The WCDMA generator provides TPC trigger signals. These signals allow a measurement (e.g. a WCDMA TX measurement, option R&S CMW-KM400) to synchronize to the transferred TPC patterns, e.g. for measuring the resulting UE power.

The trigger pulse related to a certain TPC pattern is generated one timeslot before the first TPC bit. Example: If the first TPC bit is transferred in the first timeslot (slot 0) of a frame, the trigger pulse is transmitted at the beginning of the last timeslot (slot 14) of the previous frame.

Depending on the pattern setup, a trigger pulse may be generated either once or it may be repeated periodically:

- Once: One trigger pulse is generated for the first TPC bit (slot 14 of previous frame)
- Periodic (10 Slot): The first trigger pulse is repeated every tenth bit/slot (slot 14, slot 9, slot 4, slot 14, ...)
- Periodic (Patt. Length), for Continuous Pattern only: Whenever the first bit of <Pattern> is transferred, a trigger pulse is generated in the previous timeslot. For a Continuous Pattern with length 1, a trigger pulse is generated in every second timeslot.

The assignment of one of these options to a pattern setup is fixed and displayed at the GUI, see chapter 2.3.6, "DPCCH Settings", on page 46.

Trigger pulses are generated for pattern execution, not for reaching a precondition.

Configuring measurements for single trigger pulses

In order to use a trigger signal providing only one single trigger pulse ("Once" trigger) to trigger a measurement, you must configure the measurement so that it measures only one measurement interval - which is then triggered by the single trigger pulse.

If you configure more than one measurement interval, the second interval results in a trigger timeout.

Configuring only one measurement interval means setting the statistic counts to 1 and performing a single shot measurement.

2.2.8.6 Preconditions and Pattern Execution

For some measurements it is useful to command the UE to a specific precondition, e.g. the UE must transmit at maximum power.

Possible preconditions are:

- Min. Power: The UE is commanded to reach its minimum power.
- Max. Power: The UE is commanded to reach its maximum power.
- Alternating: An alternating bit sequence is transmitted. The UE power is kept constant (for algorithm 1 alternating increase/decrease by one power step).

In order to reach the precondition of the active setup you can press the "Precond." button. But this is only required in exceptional situations. For maximum speed and convenience the precondition is reached automatically whenever possible. For buttons and configuration see chapter 2.3.6, "DPCCH Settings", on page 46.

The pattern execution (and trigger pulse generation) can be started by pressing the "Execute" button. If the precondition of the active TPC setup has not been reached when the "Execute" button is pressed, the precondition is reached first, then pattern execution is started. For TPC setups without precondition the pattern execution starts automatically whenever possible.

Events:

- When the generator is switched on (generator state changes from OFF to ON):
  If the active TPC setup has a precondition, the precondition is reached automatically.
  If the active TPC setup has no precondition, pattern execution is started automatically.
- When the precondition of the active TPC setup is changed (generator state = ON):
  The new precondition is reached automatically (if it is set to "None", pattern execution is started).
- When the active setup is changed (generator state = ON):
  If the new TPC setup has a precondition, the precondition is reached automatically.
  If the new TPC setup has no precondition, pattern execution is started automatically.

Changes of the TPC settings (including pressing the "Precond." or "Execute" button) may not be evaluated immediately while reaching a precondition or executing a pattern.

The following rules apply:

- If the UE is commanded to reach its minimum/maximum power, changes are evaluated when the generator assumes that the minimum/maximum power has been reached (reaching precondition "Min. Power" or "Max. Power", executing pattern setup "All 0", "All 1", "Single Pattern + All 0", "Single Pattern + All 1", "Test Step E", "Test Step F").

- If the following setups are executed, changes are only evaluated while the alternating pattern is transmitted: "Single Pattern + Alternating", "Phase Discontinuity Up", "Phase Discontinuity Down".
- While the following setups are executed, changes are evaluated at any time: "Alternating", "Continuous Pattern".

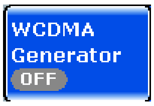
2.3 GUI Reference

The following sections provide detailed reference information on the Graphical User Interface (GUI) and the parameters of the WCDMA generator.

2.3.1 Generator Control

The generator is turned on or off using the ON | OFF key.

See also: "Generator Control" in the R&S CMW user manual, chapter "System Overview"



WCDMA Generator (Softkey)
The softkey shows the current generator state.

Remote command:
`SOURce:WCDMa:GEN<i>:STATe`

2.3.2 General Generator Settings

The following channel-independent parameters are available.

See also: "RF Path Settings (Generators)" in the R&S CMW user manual, chapter "System Overview"

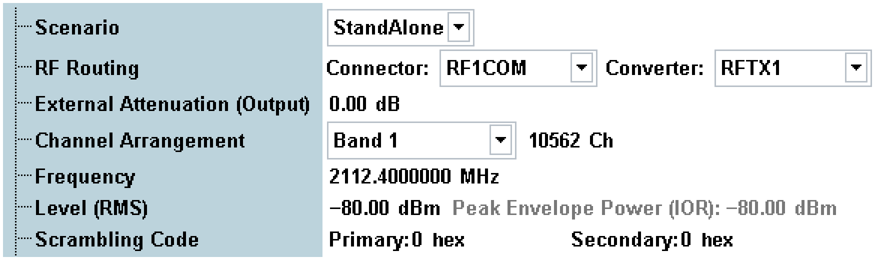


Fig. 2-10: General WCDMA generator settings

Scenario

This software version supports only a standalone scenario.

Remote command:

ROUTe:WCDMa:GEN<i>:SCENario:SALone

ROUTe:WCDMa:GEN<i>:SCENario?

ROUTe:WCDMa:GEN<i>?

RF Routing

Selects the output path for the generated RF signal, i.e. the output connector and the TX module to be used.

Depending on your hardware configuration there may be dependencies between both parameters. Select the RF connector first. The "Converter" parameter offers only values compatible with the selected RF connector.

Remote command:

ROUTe:WCDMa:GEN<i>:SCENario:SALone

External Attenuation (Output)

Defines the value of an external attenuation (or gain, if the value is negative) in the output path. With an external attenuation of x dB, the power of the generated signal is increased by x dB. The actual generated levels are equal to the displayed values plus the external attenuation.

If a correction table for frequency-dependent attenuation is active for the chosen connector, then the table's name and a button are displayed. Press the button to display the table entries.

Remote command:

SOURce:WCDMa:GEN<i>:RFSettings:EATTenuation

Channel Arrangement / Frequency

Sets the RF carrier frequency of the generator. The relation between operating band, frequency and channel number is defined by 3GPP, see chapter 2.2.6, "Operating Bands", on page 29.

You can specify the RF frequency in two ways:

- Enter the frequency directly. The band and channel settings can be ignored or used for validation of the entered frequency. For validation select the designated band. The channel number resulting from the selected band and frequency is displayed. For an invalid combination no channel number is displayed.

- Select a band and enter a channel number valid for this band. The R&S CMW calculates the resulting frequency.

Remote command:
SOURce:WCDMa:GEN<i>:BAND
SOURce:WCDMa:GEN<i>:RFSettings:FREQuency

Level (RMS)
Sets the base level of the generator. The individual physical channel levels are defined relative to this base level, see parameter "Level" on page 41.

The resulting actual Peak Envelope Power (PEP) is measured and displayed for information when the generator is turned on. The indicated PEP corresponds to the actual peak output level at the output connector, assuming the External Attenuation (Output) is zero.

The signal at the output connector is limited to the maximum level stated in the data sheet. When the settings result in a signal exceeding this limit, the Level (RMS) is decreased automatically.

Remote command:
SOURce:WCDMa:GEN<i>:RFSettings:LEVel
SOURce:WCDMa:GEN<i>:RFSettings:PEAK?

Scrambling Code
Set index i (Primary) and index k (Secondary) for calculation of the primary and secondary scrambling code numbers.

Primary scrambling code number: n = 16*i, where i = 0 to 1FF (hex), corresponding to 0 to 511 decimal.

Secondary scrambling code number: m = 16*i + k, where k = 0 to F (hex), corresponding to 0 to 15 decimal.

Some channels can be scrambled using the primary or the secondary scrambling code. If k=0 is entered, the primary scrambling code is used for these channels. If k≠0 is entered, the corresponding secondary scrambling code is used.

For background information see also table 2-1 and chapter 2.2.1.2, "Scrambling Codes", on page 17.

Remote command:
SOURce:WCDMa:GEN<i>:SCODe:PRIMary
SOURce:WCDMa:GEN<i>:SCODe:SECondary

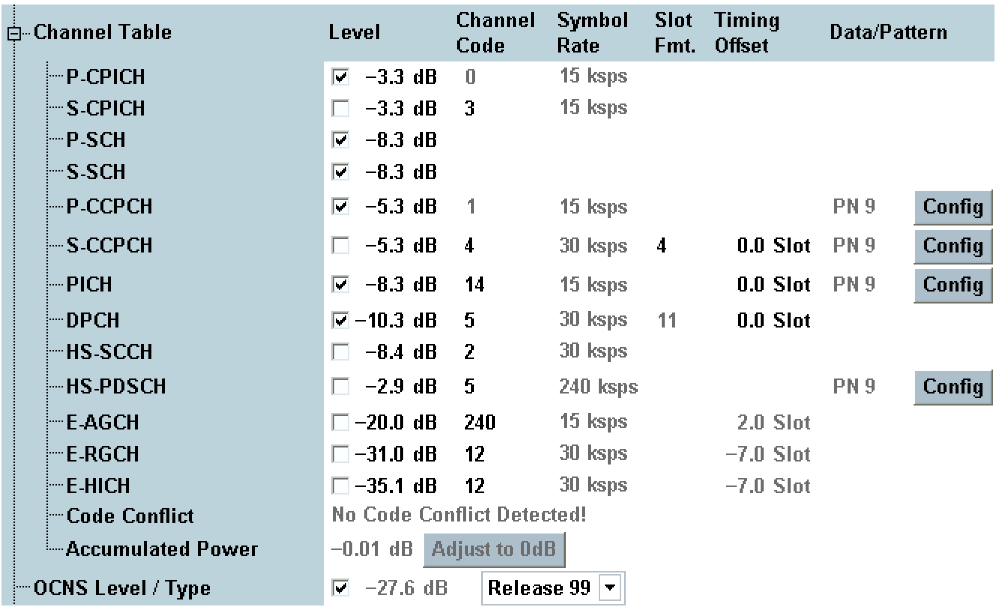
2.3.3 Physical Channel Settings

The physical channels are configured via the "Channel Table". The table and the OCNS section are explained in detail below.

For background information see chapter 2.2.1, "Physical Channel Overview", on page 14 and chapter 2.2.2, "Channel Structure", on page 18.

The CDP diagram displays the resulting channelization codes and power levels of the individual active physical and OCNS channels, see chapter 2.3.4, "CDP Diagram", on page 44.

The channels HS-x and E-x require option R&S CMW-KG401.



Channel Table	Level	Channel Code	Symbol Rate	Slot Fmt.	Timing Offset	Data/Pattern	
P-CPICH	☑ –3.3 dB	0	15 ksps				
S-CPICH	☐ –3.3 dB	3	15 ksps				
P-SCH	☑ –8.3 dB						
S-SCH	☑ –8.3 dB						
P-CCPCH	☑ –5.3 dB	1	15 ksps			PN 9	Config
S-CCPCH	☐ –5.3 dB	4	30 ksps	4	0.0 Slot	PN 9	Config
PICH	☑ –8.3 dB	14	15 ksps		0.0 Slot	PN 9	Config
DPCH	☑ –10.3 dB	5	30 ksps	11	0.0 Slot		
HS-SCCH	☐ –8.4 dB	2	30 ksps				
HS-PDSCH	☐ –2.9 dB	5	240 ksps			PN 9	Config
E-AGCH	☐ –20.0 dB	240	15 ksps		2.0 Slot		
E-RGCH	☐ –31.0 dB	12	30 ksps		–7.0 Slot		
E-HICH	☐ –35.1 dB	12	30 ksps		–7.0 Slot		
Code Conflict	No Code Conflict Detected!						
Accumulated Power	–0.01 dB Adjust to 0dB						
OCNS Level / Type	☑ –27.6 dB	Release 99					

Fig. 2-11: Table of physical WCDMA channels

Level

Defines the level of a channel relative to the base level of the generator (see "Level (RMS)" on page 40). Each channel can be activated and deactivated separately.

For the HS-PDSCH several code channels are assigned to one UE. The power level in the channel table refers to the total power of these code channels.

See also the related parameters "Accumulated Power" on page 43 and "OCNS Level / Type" on page 43.

Remote command:

`SOURce:WCDMa:GEN<i>:LEVel:WCDMa`

`SOURce:WCDMa:GEN<i>:LEVel:HSPA`

`SOURce:WCDMa:GEN<i>:LEVel:EHICh` etc.

Channel Code

Defines the channelization code number of a channel. Some channels are never channelized (e.g. S-SCH), so no channel code is displayed. Gray values indicate fixed standardized channelization codes. They cannot be modified but are relevant for display of code conflicts.

Conflicting channelization code settings are indicated by a red box next to the conflicting codes. Conflicts are not corrected automatically. It is even possible to generate a signal using conflicting codes. The parameter Code Conflict also indicates whether a code conflict is detected.

For S-CCPCH and DPCH the spreading factor and thus the allowed input range for the channelization codes depends on the slot format, see column Slot Fmt.. For HS-PDSCH several code channels are assigned to one UE. The channel table indicates the first code number only. Example: code number = 5 and assigned codes = 4 means code numbers 5 to 8 are used. The number of assigned codes depends on the selected H-Set, see "Fixed Reference Channel" on page 50.

According to 3GPP the E-RGCH and the E-HICH use the same code number and are separated by orthogonal signature sequences.

For background information see also chapter 2.2.1.3, "Channelization Codes", on page 17.

Remote command:
`SOURce:WCDMa:GEN<i>:CCODe:WCDMa`
`SOURce:WCDMa:GEN<i>:CCODe:HSPA`
`SOURce:WCDMa:GEN<i>:CCODe:EHICh` etc.
`SOURce:WCDMa:GEN<i>:CCODe:PCPich?`
`SOURce:WCDMa:GEN<i>:CCODe:PCCPch?`

Symbol Rate
Displays the symbol rate of a channel. For most channels this value is standardized. For the DPCH and the S-CCPCH the symbol rate depends on the slot format, see column Slot Fmt..

Remote command:
`SOURce:WCDMa:GEN<i>:SRATe:PCPich?`
`SOURce:WCDMa:GEN<i>:SRATe:SCPich?`
`SOURce:WCDMa:GEN<i>:SRATe:PCCPch?`
`SOURce:WCDMa:GEN<i>:SRATe:SCCPch?`
`SOURce:WCDMa:GEN<i>:SRATe:PICH?`
`SOURce:WCDMa:GEN<i>:SRATe:DPCH?`
`SOURce:WCDMa:GEN<i>:SRATe:HSSCch?`
`SOURce:WCDMa:GEN<i>:SRATe:HSPDsch?`
`SOURce:WCDMa:GEN<i>:SRATe:EAGCh?`
`SOURce:WCDMa:GEN<i>:SRATe:ERGCh?`
`SOURce:WCDMa:GEN<i>:SRATe:EHICh?`

Slot Fmt.
Sets the slot format of a channel. For the DPCH the slot format depends on the selected DCH model, see "DCH Model" on page 45.

Remote command:
`SOURce:WCDMa:GEN<i>:SFORmat:SCCPch`
`SOURce:WCDMa:GEN<i>:SFORmat:DPCH?`

Timing Offset
Sets or displays an offset relative to the P-CCPCH timing. The timing offset is a multiple of 256 chips (1/10 slot). For the E-RGCH and the E-HICH the timing offset depends on the timing offset of the DPCH and on the transmission time interval, see parameter "TTI" on page 51.

Remote command:
`SOURce:WCDMa:GEN<i>:TOFFset:DPCH` etc.
`SOURce:WCDMa:GEN<i>:TOFFset:EHICh?` etc.

Data / Pattern
Define a bit sequence transmitted as user information. The bit sequence consists of zeros (ALL 0), ones (ALL 1), a definable pattern (Pattern) or pseudo-random bit sequences of variable length (PN9, PN11, ...).

The parameter Pattern defines an arbitrary bit sequence that is applied if Data = Pattern is selected.

Press the "Config" button to modify the parameters "Data" and "Pattern."

Remote command:
`SOURce:WCDMa:GEN<i>:DATA:HSPDsch` etc.
`SOURce:WCDMa:GEN<i>:PATTern:HSPDsch` etc.

Code Conflict
Displays whether a code conflict is detected or not. Additionally a red box is displayed next to the conflicting channels.

For background information see chapter 2.2.1.3, "Channelization Codes", on page 17.

Remote command:
`SOURce:WCDMa:GEN<i>:CCODe:CONFlict?`

Accumulated Power
Displays the total power of all active channels relative to the base level of the generator (see "Level (RMS)" on page 40).

The button "Adjust to 0 dB" corrects the power levels of the active channels to minimize the difference between the total power level of all active channels and the base power level. For this purpose the level of all active channels is increased or decreased by the same amount. As the levels are modified in steps of 0.1 dB this procedure may yield a small remaining accumulated power instead of 0 dB.

Remote command:
`SOURce:WCDMa:GEN<i>:LEVel:APOWer?`
`SOURce:WCDMa:GEN<i>:LEVel:ADJust`

OCNS Level / Type
Activates or deactivates the Orthogonal Channel Noise Simulator (OCNS) channels and displays the total OCNS channel power relative to the base level of the generator (see "Level (RMS)" on page 40).

The OCNS channels are available if the total power of all active channels is smaller than the Level (RMS). The remaining power is then assigned to the OCNS channels so that the Level(RMS) is reached.

Two sets of OCNS channels are available: Release 99 for non-HSDPA tests and Release 5 for HSDPA tests (option R&S CMW-KG401).

For background information see chapter 2.2.4, "Orthogonal Channel Noise Simulator (OCNS)", on page 27.

Remote command:
`SOURce:WCDMa:GEN<i>:OCNS:USE`
`SOURce:WCDMa:GEN<i>:OCNS:LEVel?`
`SOURce:WCDMa:GEN<i>:OCNS:TYPE`

2.3.4 CDP Diagram

The Code Domain Power (CDP) diagram provides a graphical overview of all active physical channels configured via the channel table (except P-SCH and S-SCH which are not channel coded and including active OCNS channels).

For configuration of the channel table see chapter 2.3.3, "Physical Channel Settings", on page 40.

To show or hide the CDP diagram press the softkey "CDP Display" and the hotkey "Hide/Show".

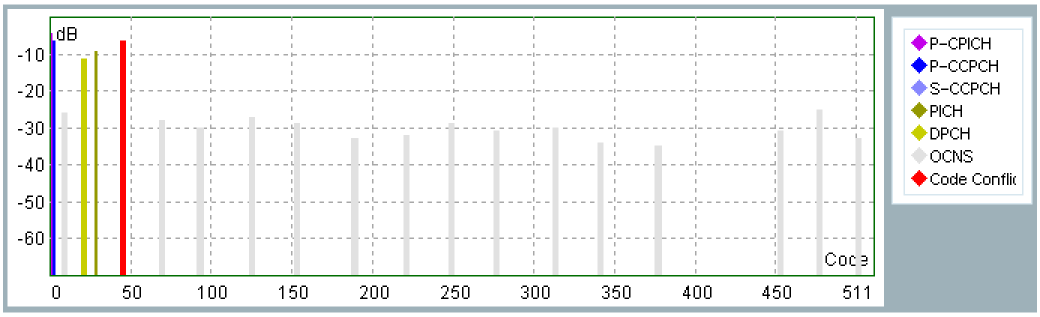


Fig. 2-12: CDP diagram

The CDP diagram displays one bar per channel. The X-axis displays the code numbers occupied for spreading factor 512. Channels with smaller spreading factor occupy several code numbers in this representation. Example: A channel with spreading factor 128 and code number 5 occupies channel numbers 20 to 23 of spreading factor 512. This is a direct result of the code tree structure, see chapter 2.2.1.3, "Channelization Codes", on page 17.

The example diagram above is based on the channel configuration listed in the following table. The column "Code Number Range" lists the code numbers occupied for spreading factor 512. They are calculated from the columns "Spreading Factor" and "Code Number" to facilitate the identification of the individual channels in the example diagram.

Channel	Spreading Factor	Code Number	Code Number Range (SF=512)	Level [dB]
P-CPICH	256	0	0 to 1	-4.4
P-CCPCH	256	1	2 to 3	-6.4

Channel	**Spreading Factor**	**Code Number**	**Code Number Range (SF=512)**	**Level [dB]**
DPCH	128	5	20 to 23	-11.4
PICH	256	14	28 to 29	-9.4
S-CCPCH	128	11	44 to 47	-6.4
OCNS (R99), 16 channels1)	128	2, 11, 17, ...	8 to 11, 44 to 47, 68 to 71, ...	-26.1, -28.1, -28.1, ...

Note 1) For details see chapter 2.2.4, "Orthogonal Channel Noise Simulator (OCNS)", on page 27

When several channels occupy the same code numbers (code conflict), this is indicated in the diagram as follows: the overlapping parts of the conflicting bars are marked red. The displayed power level in this area represents the sum of the power levels of the conflicting channels. In the example above the S-CCPCH conflicts with the second OCNS channel.

Related hotkeys

To display the hotkeys press the "CDP Display" softkey.The following hotkeys are then available at the bottom of the GUI:

Hotkey	**Description**
"Hide/Show"	Hides or shows the CDP diagram.
"Channel/Symbol Rate"	Switches between two color modes: The colors of the bars and the legend indicate either physical channels or symbol rates.
"Scale Y"	Modify the ranges of the Y-axis.

2.3.5 Transport Channel Settings

The following transport channel settings are available.

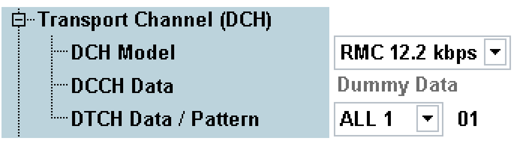


Fig. 2-13: DCH settings

DCH Model

Defines the type of the transport channel (DCH). The following three DCH Models are available with several data rates: Reference Measurement Channel (RMC), Signaling Radio Bearer (SRB) and Blind Transport Format Detection (BTFD).

The DCH Model determines various parameters of the transport channel. It also influences the parameter "TFCI" on page 47 and the DPCH slot format, see chapter 2.3.3, "Physical Channel Settings", on page 40.

For background information see chapter 2.2.3, "Dedicated Channel Models", on page 24.

Remote command:
SOURce:WCDMa:GEN<i>:DCH

DCCH Data
Displays the data type transmitted via the DCCH. The WCDMA generator transmits always Dummy Data as specified in 3GPP TS 34.121.

DTCH Data / Pattern
Define a bit sequence transmitted as user information on the DTCH. The parameter to the left selects the type of the bit sequence: zeros only (ALL 0), ones only (ALL 1), definable pattern (Pattern) or one of several pseudo-random bit sequences of variable length (PN9, PN11, ...).

The parameter to the right allows to define an arbitrary bit sequence that is used if "Pattern" is selected.

Remote command:
SOURce:WCDMa:GEN<i>:DTCH:DATA
SOURce:WCDMa:GEN<i>:DTCH:PATTern

2.3.6 DPCCH Settings

The following Dedicated Physical Control Channel (DPCCH) settings are available.

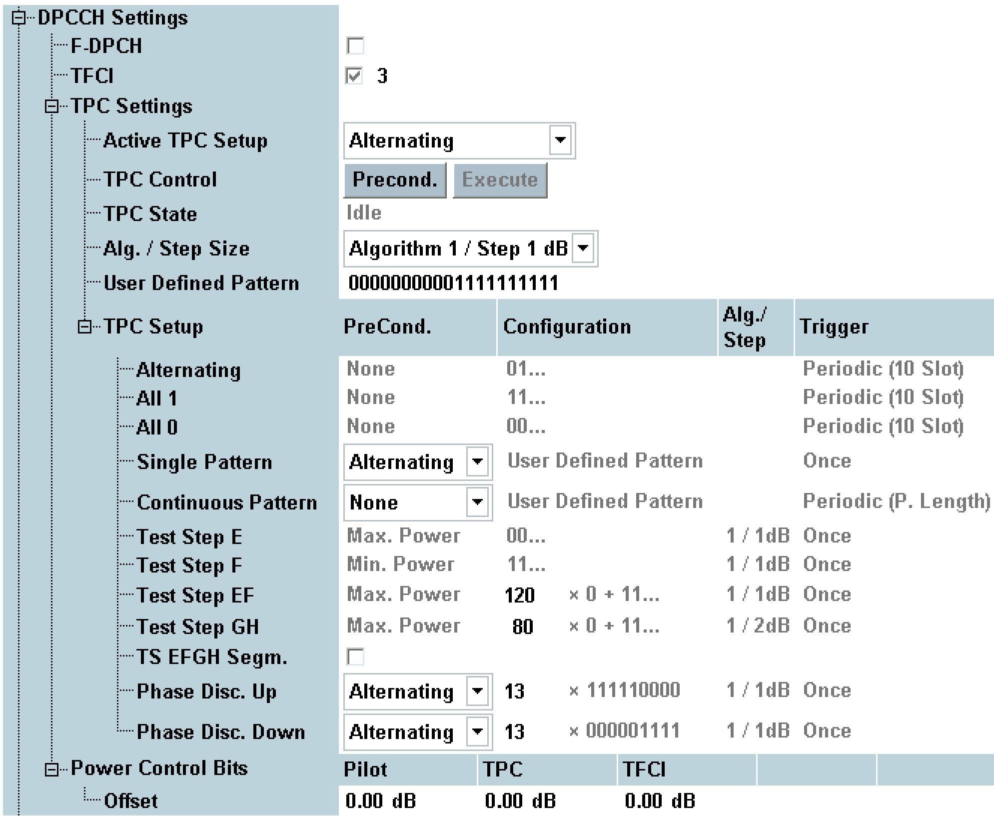


Fig. 2-14: DPCCH settings

F-DPCH (Option R&S CMW-KG401)

Activates or deactivates the F-DPCH.

If the F-DPCH is activated, the dedicated channel is configured as fractional DPCH and the selected DCH model is ignored (parameter "DCH Model" on page 45).

In that case the DPCH settings displayed in the channel table are related to the F-DPCH: activation status, power level (plus TPC Offset), channelization code, symbol rate (fixed), slot format (fixed) and timing offset.

For the channel table see chapter 2.3.3, "Physical Channel Settings", on page 40.

For background information see chapter 2.2.2.5, "Fractional Dedicated Physical Channel (F-DPCH)", on page 22

Remote command:

`SOURce:WCDMa:GEN<i>:FDPCh`

TFCI

The checkbox displays the presence of a Transport Format Combination Indicator (TFCI) in the DPCCH. The status depends on the used DCH Model (parameter "DCH Model" on page 45).

If the TFCI is present, the entered value is transmitted in the TFCI field. If the TFCI is not present, the TFCI field is filled by DTX bits (discontinuous transmission).

Remote command:
`SOURce:WCDMa:GEN<i>:TFCI`

TPC Settings > Active TPC Setup
Selects the active TPC setup. Attributes of the setups are listed in the TPC setup table, see "TPC Settings > TPC Setup" on page 49.

Remote command:
`SOURce:WCDMa:GEN<i>:TPC:SET`

TPC Settings > TPC Control
When the button "Precond." is pressed while the generator is in state "ON", the instrument sends a TPC pattern to the UE to reach the precondition defined for the active TPC setup in the TPC setup table. In most situations this action is performed automatically. After the precondition has been reached, the button "Execute" allows to start the execution of the active TPC setup.

See also parameter "TPC Settings > TPC Setup" on page 49.

For background information see chapter 2.2.8.6, "Preconditions and Pattern Execution", on page 37.

Remote command:
`SOURce:WCDMa:GEN<i>:TPC:PRECondition`
`SOURce:WCDMa:GEN<i>:TPC:PEXecute`

TPC Settings > TPC State
Displays the current TPC state. Transition states that would be displayed for a very short time only are indicated via remote command, but not displayed at the GUI (e.g. transmission of single pattern).

Possible values are:
- **Idle**: generator switched off
- **Continuous Pattern**: transmitting continuous pattern
- **Alternating**: transmitting alternating pattern
- **Prec. <Precondition> (press Execute)**: The indicated <Precondition> has been reached.
- **<State> (press Precond. or Execute)**: The current <State> results from a previously executed TPC setup and does not match the precondition of the active TPC setup.
- **Max Power**: maximum power reached
- **Min Power**: minimum power reached

Remote command:
`SOURce:WCDMa:GEN<i>:TPC:STATe?`

TPC Settings > Alg. / Step Size
Define the power control algorithm (1 or 2) and the TPC step size (1 dB or 2 dB) configured at the UE.

Some setups use a fixed algorithm and step size, so that this setting is ignored, see table column "Alg./Step".

The duration of a TPC pattern required to command a UE to reach a precondition depends on the algorithm and TPC step size of the UE. For that reason correct settings are especially important when using a TPC setup with a precondition.

For background information see chapter 2.2.8, "Transmit Power Control (TPC)", on page 31.

Remote command:

`SOURce:WCDMa:GEN<i>:TPC:MODE`

TPC Settings > User Defined Pattern

Define a pattern for the TPC Setup entries "Single Pattern" and "Continuous Pattern".

Remote command:

`SOURce:WCDMa:GEN<i>:TPC:PATTern`

TPC Settings > TPC Setup

This table lists all defined TPC pattern configurations. One of these configurations is active (see "TPC Settings > Active TPC Setup" on page 48). Most settings are predefined and cannot be modified (grayed out).

Table columns:

- **"PreCond."** defines or displays a precondition that the UE is commanded to before the pattern can be executed. For test steps E, F, G and H segmentation can be enabled.
- **"Configuration"** defines or displays the TPC pattern.
- **"Alg./Step"** displays the power control algorithm and the TPC step size if they are fixed for the TPC pattern.
- **"Trigger"** displays the trigger event for generation of a trigger pulse that can be evaluated by a WCDMA measurement application of the R&S CMW.

For background information refer to:

- chapter 2.2.8.1, "TPC Pattern Setups", on page 32
- chapter 2.2.8.6, "Preconditions and Pattern Execution", on page 37
- chapter 2.2.8.5, "Generating TPC Trigger Signals", on page 36

Remote command:

`SOURce:WCDMa:GEN<i>:TPCSet:PRECondition:PHDown` etc.

`SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:TSEF`

`SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:TSGH`

`SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:TSSegment`

`SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:PHDown` etc.

Power Control Bits

Selects the relative power of the control parts of the DPCH compared to the power in the data part (level of the DPCH as defined in the channel table, see chapter 2.3.3, "Physical Channel Settings", on page 40).

Remote command:

`SOURce:WCDMa:GEN<i>:POFFset:TFCI` etc.

2.3.7 HSDPA Settings (Option R&S CMW-KG401)

The following High Speed Downlink Packet Access (HSDPA) settings are available.

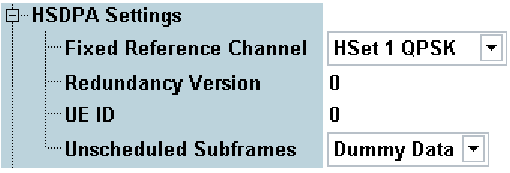


Fig. 2-15: HSDPA settings

Fixed Reference Channel
Selects the H-Set defining the properties of the fixed reference channel. All H-Sets are specified in 3GPP TS 25.101, Annex A. The HS-DSCH carried by the HS-PDSCH is always configured as fixed reference channel.

Remote command:
SOURce:WCDMa:GEN<i>:HSDPa:FRCHannel

Redundancy Version
Selects the redundancy version controlling the HARQ functionality when coding the HS-DSCH, see 3GPP TS 25.212.

Remote command:
SOURce:WCDMa:GEN<i>:HSDPa:RVERsion

UE ID
Defines the UE identity to be transmitted via the HS-SCCH. The UE ID identifies the UE for which the HS-SCCH is carrying the information necessary for decoding the HS-PDSCH. If a UE detects that a monitored HS-SCCHs carries consistent control information, it starts receiving the HS-PDSCHs indicated by this control information.

Remote command:
SOURce:WCDMa:GEN<i>:HSDPa:UEID

Unscheduled Subframes
Defines the transmission in the gaps between consecutive HS-SCCH and HS-PDSCH subframes allocated to the UE:
- **Dummy Data**: the power is maintained and the unscheduled subframes contain dummy data
- **DTX**: discontinuous transmission (the output power is switched off)

Remote command:
SOURce:WCDMa:GEN<i>:HSDPa:USFRames

2.3.8 HSUPA Settings (Option R&S CMW-KG401)

The following settings configure downlink channels that are related to High Speed Uplink Packet Access (HSUPA).

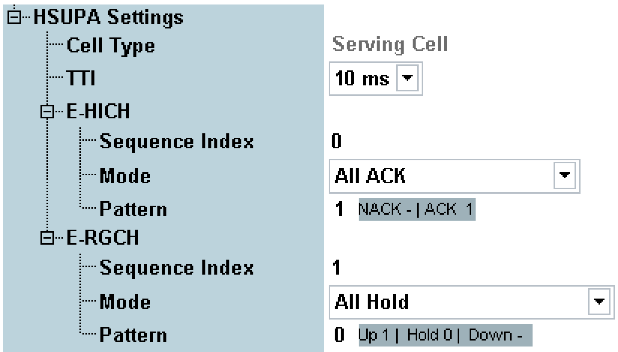


Fig. 2-16: HSUPA settings

Cell Type

Defines whether the transmitting cell is the serving cell for the UE or a non-serving cell. In the current firmware version the transmitting cell is always a serving cell.

The configuration of the downlink HSUPA channels transmitted to a UE depends on this setting (see 3GPP TS 25.211).

Remote command:
SOURce:WCDMa:GEN<i>:HSUPa:CTYPe?

TTI

Defines the Transmission Time Interval (TTI) of the E-DCH. According to 3GPP TS 25.321 a TTI can comprise 2 ms (1 HSUPA subframe comprising 3 slots) or 10 ms (1 WCDMA frame comprising 15 slots).

The TTI of the E-DCH determines also the transmission time interval of E-HICH, E-RGCH and E-AGCH.

Remote command:
SOURce:WCDMa:GEN<i>:HSUPa:TTI

E-HICH – Sequence Index

Defines the index of the E-HICH signature sequence used to separate the E-HICH channel from the E-RGCH. The value corresponds to the sequence index l defined in 3GPP TS 25.211.

To generate a signal conform to 3GPP select identical channelization codes but different sequence indices for E-HICH and E-RGCH. For configuration of channelization codes see chapter 2.3.3, "Physical Channel Settings", on page 40.

Remote command:
SOURce:WCDMa:GEN<i>:HSUPa:EHICh:SINDex

E-HICH – Mode / Pattern

Define a HARQ acknowledgement indicator sequence (ACK/NACK pattern) to be transmitted via the E-HICH to the UE.

The parameter Mode selects the type of the sequence: ACK only (All ACK), NACK only (All NACK), alternating sequence (Alternating ACK NACK and Alternating NACK ACK) or freely selectable pattern (Pattern).

The parameter Pattern allows to define an arbitrary sequence that is used if "Pattern" is selected. The following characters are supported: – (= NACK), 1 (= ACK). To enter an NACK via the front panel keys press the colon button.

Remote command:

`SOURce:WCDMa:GEN<i>:HSUPa:EHICh:MODE`

`SOURce:WCDMa:GEN<i>:HSUPa:EHICh:PATTern`

E-RGCH – Sequence Index

Defines the index of the E-RGCH signature sequence used to separate the E-RGCH channel from the E-HICH. The value corresponds to the sequence index l defined in 3GPP TS 25.211.

To generate a signal conform to 3GPP select identical channelization codes but different sequence indices for E-HICH and E-RGCH. For configuration of channelization codes see chapter 2.3.3, "Physical Channel Settings", on page 40.

Remote command:

`SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:SINDex`

E-RGCH – Mode / Pattern

Define a relative grant sequence to be transmitted via the E-RGCH to the UE.

The parameter Mode selects the type of the sequence: sequence filled with one bit (All Up, All Down, All Hold), alternating sequence or freely selectable pattern (User Pattern).

The parameter Pattern allows to define an arbitrary sequence that is used if "User Pattern" is selected. The following characters are supported: 1 (= Up), 0 (= Hold), – (= Down). To enter a Down via the front panel keys press the colon button.

Remote command:

`SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:MODE`

`SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:PATTern`

2.4 Programming

The following sections provide programming examples for the WCDMA generator.

See also: "Remote Control" in the R&S CMW user manual

2.4.1 Key Features

The WCDMA generator is programmed as follows:

- The generator is controlled by SCPI commands with the following syntax: `...:WCDMa:GEN:...`
- After a `*RST`, the generator must be switched on: `SOURce:WCDMa:GEN:STATe ON`. `*OPC?` ensures that the RF generator signal is actually available at the selected RF output before the next command line is executed.

An RF signal is available at the selected RF output as soon as the RF generator has reached the ON state. Use `SOURce:WCDMa:GEN:STATe?` to query the generator state.

2.4.2 Specifying General Generator Settings

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Route output signal, define external attenuation.
// *****************************************************************************
ROUTe:WCDMa:GEN:SCENario:SALone RF1C, TX1
SOURce:WCDMa:GEN:RFSettings:EATTenuation 2

// *****************************************************************************
// Set carrier frequency, power level and scrambling codes.
// *****************************************************************************
SOURce:WCDMa:GEN:RFSettings:FREQuency 1.80741E+009
SOURce:WCDMa:GEN:RFSettings:LEVel -70
SOURce:WCDMa:GEN:SCODe:PRIMary #H1A0
SOURce:WCDMa:GEN:SCODe:SECondary #H5

// *****************************************************************************
// Alternatively set the frequency indirectly via band and channel.
// *****************************************************************************
SOURce:WCDMa:GEN:BAND OB3
SOURce:WCDMa:GEN:RFSettings:FREQuency 1162 CH
```

2.4.3 Specifying Channel Table Entries

```
// *****************************************************************************
// Configure S-CCPCH: Set level, channelization code, slot format,
// timing offset, data type and bit pattern.
// *****************************************************************************
SOURce:WCDMa:GEN:LEVel:SCCPch -5
SOURce:WCDMa:GEN:CCODe:SCCPch 6
```

```
SOURce:WCDMa:GEN:SFORmat:SCCPch 10
SOURce:WCDMa:GEN:TOFFset:SCCPch 1
SOURce:WCDMa:GEN:DATA:SCCPch PAT
SOURce:WCDMa:GEN:PATTern:SCCPch '01001'

// *****************************************************************************
// Query resulting symbol rate and code conflicts.
// *****************************************************************************
SOURce:WCDMa:GEN:SRATe:SCCPch?
SOURce:WCDMa:GEN:CCODe:CONFlict?

// *****************************************************************************
// Query and adjust accumulated power.
// *****************************************************************************
SOURce:WCDMa:GEN:LEVel:APOWer?
SOURce:WCDMa:GEN:LEVel:ADJust
```

2.4.4 Specifying OCNS Settings

```
// *****************************************************************************
// Set OCNS channel type. Activate the OCNS and query the power level.
// *****************************************************************************
SOURce:WCDMa:GEN:OCNS:TYPE R99
SOURce:WCDMa:GEN:OCNS:USE ON
SOURce:WCDMa:GEN:OCNS:LEVel?
```

2.4.5 Specifying DCH and DPCCH Settings

```
// *****************************************************************************
// Set DCH model, data type and bit pattern.
// *****************************************************************************
SOURce:WCDMa:GEN:DCH BD1
SOURce:WCDMa:GEN:DTCH:DATA PAT
SOURce:WCDMa:GEN:DTCH:PATTern '010001'

// *****************************************************************************
// Set TPC parameters: active TPC setup (phase discontinuity up),
// algorithm and step size, precondition and number of repetitions.
// Reach the precondition, execute the pattern and query the state.
// *****************************************************************************
SOURce:WCDMa:GEN:TPC:SET PUP
SOURce:WCDMa:GEN:TPC:MODE A1S2
SOURce:WCDMa:GEN:TPCSet:PRECondition:PHUP MINP
SOURce:WCDMa:GEN:TPCSet:PCONfig:PHUP 4
SOURce:WCDMa:GEN:TPC:PRECondition
SOURce:WCDMa:GEN:TPC:PEXecute
SOURce:WCDMa:GEN:TPC:STATe?
```

```
// ****************************************************************************
// Configure other TPC setups:
// user defined pattern for single and continuous execution,
// precondition and number of repetitions for phase discontinuity down,
// preconditions for continuous and single user defined pattern execution,
// number of 0 bits for test step EF and GH, segmentation for test steps.
// ****************************************************************************
SOURce:WCDMa:GEN:TPC:PATTern '000111'
SOURce:WCDMa:GEN:TPCSet:PCONfig:PHDown 4
SOURce:WCDMa:GEN:TPCSet:PRECondition:PHDown MINP
SOURce:WCDMa:GEN:TPCSet:PRECondition:CONTinuous MINP
SOURce:WCDMa:GEN:TPCSet:PRECondition:SINGle MINP
SOURce:WCDMa:GEN:TPCSet:PCONfig:TSEF 110
SOURce:WCDMa:GEN:TPCSet:PCONfig:TSGH 70
SOURce:WCDMa:GEN:TPCSet:PCONfig:TSSegment ON

// ****************************************************************************
// Query presence of TFCI and set power offset for pilot.
// ****************************************************************************
SOURce:WCDMa:GEN:TFCI?
SOURce:WCDMa:GEN:POFFset:PILot 1
```

2.4.6 Specifying HSDPA Settings

```
// ****************************************************************************
// Set H-Set of fixed reference channel, redundancy version,
// UE ID and transmission of unscheduled subframes.
// ****************************************************************************
SOURce:WCDMa:GEN:HSDPa:FRCHannel H1Q
SOURce:WCDMa:GEN:HSDPa:RVERsion 3
SOURce:WCDMa:GEN:HSDPa:UEID 500
SOURce:WCDMa:GEN:HSDPa:USFRames DTX

// ****************************************************************************
// Activate F-DPCH and query resulting DPCH slot format.
// ****************************************************************************
SOURce:WCDMa:GEN:FDPCh ON
SOURce:WCDMa:GEN:SFORmat:DPCH?
```

2.4.7 Specifying HSUPA Settings

```
// ****************************************************************************
// Query the type of the transmitting cell.
// Set the transmission time interval.
// Query the timing offset of E-RGCH and E-AGCH.
// ****************************************************************************
SOURce:WCDMa:GEN:HSUPa:CTYPe?
SOURce:WCDMa:GEN:HSUPa:TTI T10
```

```
SOURce:WCDMa:GEN:TOFFset:ERGCh?
SOURce:WCDMa:GEN:TOFFset:EAGCh?

// *****************************************************************************
// Set E-HICH attributes: signature sequence index,
// acknowledgement indicator sequence mode and pattern.
// *****************************************************************************
SOURce:WCDMa:GEN:HSUPa:EHICh:SINDex 5
SOURce:WCDMa:GEN:HSUPa:EHICh:MODE PATT
SOURce:WCDMa:GEN:HSUPa:EHICh:PATTern '01111001'

// *****************************************************************************
// Set E-RGCH attributes: signature sequence index,
// relative grant sequence mode and pattern.
// *****************************************************************************
SOURce:WCDMa:GEN:HSUPa:ERGCh:SINDex 2
SOURce:WCDMa:GEN:HSUPa:ERGCh:MODE PATT
SOURce:WCDMa:GEN:HSUPa:ERGCh:PATTern '00110--011'
```

2.4.8 Switching on the Generator

```
// *****************************************************************************
// Switch on the generator. With command synchronization, the queried
// generator state is "ON".
// *****************************************************************************
SOURce:WCDMa:GEN:STATe ON; *OPC?
SOURce:WCDMa:GEN:STATe?

// *****************************************************************************
// Query the peak envelope power
// *****************************************************************************
SOURce:WCDMa:GEN:RFSettings:PEAK?
```

2.5 Command Reference

The following sections provide detailed reference information on the remote control commands of the WCDMA generator.

Issues of special interest for all commands

GEN<i> is used as abbreviation of "GENerator<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW user manual, chapter "Remote Control"

Command groups

The commands of the WCDMA generator are divided into the groups listed below.

2.5.1 Generator Control and States

The following command controls the generator and retrieves its state.

SOURce:WCDMa:GEN<i>:STATe <Control>

Turns the generator on or off.

See also: "Generator Control" in the R&S CMW user manual, chapter "Remote Control"

Setting parameters:

<Control> ON | OFF

Switch generator **ON** or **OFF**

Return values:

<State> OFF | PENDing | ON

OFF: generator switched off
PEND: generator switched on but no signal available yet
ON: generator switched on, signal available

*RST: OFF

Example: See Switching on the Generator

Firmware/Software: V1.0.4.11

Manual operation: See "WCDMA Generator (Softkey)" on page 38

2.5.2 Signal Routing

The following commands configure the scenario, select the path for the generated downlink signal and define an external attenuation value.

ROUTe:WCDMa:GEN<i>:SCENario:SALone <TXConnector>, <RFConverter>

Activates the standalone scenario and selects the output path for the generated RF signal, i.e. the RF connector and the TX module.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<TXConnector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC

RF1C, RF2C, RF3C, RF4C, RF1O, RF3O:
RF 1 COM to RF 4 COM and RF 1/3 OUT front panel connectors

RFAC, RFBC, RFAO:
Virtual names for the RF COM and RF OUT connectors

<RFConverter> TX1 | TX2 | TX3 | TX4

TX module for the output path

Example: See Specifying General Generator Settings

Firmware/Software: V2.0.10

Manual operation: See "Scenario" on page 39

ROUTe:WCDMa:GEN<i>:SCENario?

Returns the active scenario.

Return values:

<Scenario> SALone

SALone: Standalone

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Scenario" on page 39

ROUTe:WCDMa:GEN<i>?

Returns the configured routing settings.

Return values:

<Scenario> SALone

SALone: Standalone

<Controller> For future use, not relevant for standalone scenario

<TXConnector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C

RF 1 COM to RF 4 COM and RF 1/3 OUT front panel connectors

<TXConverter> TX1 | TX2 | TX3 | TX4

TX module for the output path

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Scenario" on page 39

SOURce:WCDMa:GEN<i>:RFSettings:EATTenuation <ExternalAtt>

Defines an external attenuation (or gain, if the value is negative), to be applied to the RF output connector.

Parameters:

<ExternalAtt> Range: -50 dB to 90 dB
*RST: 0 dB
Default unit: dB

Example: See Specifying General Generator Settings

Firmware/Software: V1.0.4.11

Manual operation: See "External Attenuation (Output)" on page 39

2.5.3 General Generator Settings

The following commands configure RF settings and scrambling codes.

SOURce:WCDMa:GEN<i>:RFSettings:FREQuency <Frequency>

Selects the RF carrier frequency of the WCDMA generator (Generator Frequency).

Parameters:

<Frequency>
Range: 100 MHz to 3300 MHz
*RST: 2112.4 MHz
Default unit: Hz
Using the unit CH the frequency can be set via the channel number. The allowed channel number range depends on the operating band, see chapter 2.2.6, "Operating Bands", on page 29.

Example: See Specifying General Generator Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Channel Arrangement / Frequency" on page 39

SOURce:WCDMa:GEN<i>:BAND <Number>

Selects the Operating Band (OB).

Parameters:

<Number>
OB1 | ... | OB14 | OB19 | ... | OB21 | OBS1 | ... | OBS3 | OBL1

OB1, ... ,**OB21**: Operating Band I, ..., XXI
OBS1: Operating Band S
OBS2: Operating Band S 170 MHz
OBS3: Operating Band S 190 MHz
OBL1: Operating Band L

*RST: OB1

Example: See Specifying General Generator Settings

Firmware/Software: V1.0.4.11
OBS1 to 3 V1.0.15.0
OB19 to 21 V2.0.10
OBL1: V2.1.20

Manual operation: See "Channel Arrangement / Frequency" on page 39

SOURce:WCDMa:GEN<i>:RFSettings:LEVel <Power>

Sets the base level "Level (RMS)" of the generator.

Parameters:

<Power>
The range of the base level can be calculated as follows:
Range (Base Level) = Range (Output Power) - External Attenuation

Range: -130 dBm to -5 dBm for the output power at RF COM, -120 dBm to 8 dBm at RF OUT; please also notice the ranges quoted in the data sheet
*RST: -80 dBm
Default unit: dBm

Example: See Specifying General Generator Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Level (RMS)" on page 40

SOURce:WCDMa:GEN<i>:RFSettings:PEAK?

Queries the Peak Envelope Power (PEP) of the RF generator.

Return values:

<AbsPower> Range: -130 dBm to -5 dBm at RF COM, -120 dBm to 8 dBm at RF OUT; please also notice the ranges quoted in the data sheet
Default unit: dBm

Example: See Switching on the Generator

Usage: Query only

Firmware/Software: V1.0.10.1

Manual operation: See "Level (RMS)" on page 40

SOURce:WCDMa:GEN<i>:SCODe:PRIMary <ScramblingCode>

Sets the index i for calculation of the primary scrambling code number using the formula n = 16*i.

Parameters:

<ScramblingCode> Range: 0 to 511 (#H0 to #H1FF)
*RST: 0

Example: See Specifying General Generator Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Scrambling Code" on page 40

SOURce:WCDMa:GEN<i>:SCODe:SECondary <ScramblingCode>

Sets the index k for calculation of the secondary scrambling code number using the formula n = 16*i + k. For configuration of index i see `SOURce:WCDMa:GEN<i>:SCODe:PRIMary` on page 61.

Parameters:

<ScramblingCode> Range: 0 to 15 (#H0 to #HF)
*RST: 0

Example: See Specifying General Generator Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Scrambling Code" on page 40

2.5.4 Power Levels (Physical Channels)

The following commands configure the levels of the individual channels relative to the base level of the generator (see `SOURce:WCDMa:GEN<i>:RFSettings:LEVel` on page 60).

SOURce:WCDMa:GEN<i>:LEVel:HSPA <PCPICH>, <SCPICH>, <PSCH>, <SSCH>, <PCCPCH>, <SCCPCH>, <PICH>, <DPCH>, <HSSCCH>, <HSPDSCH>, <EAGCH>, <ERGCH>, <EHICH>

Set the level of all R99 and HSPA channels. Setting a power level also activates the channel.

Additional values for all parameters: OFF | ON (disables | enables the channel using the previous/default level)

Parameters:

<PCPICH>
Range: -80 dB to 0 dB
*RST: -3.3 dB, ON
Default unit: dB

<SCPICH>
Range: -80 dB to 0 dB
*RST: -3.3 dB, OFF
Default unit: dB

<PSCH>
Range: -80 dB to 0 dB
*RST: -8.3 dB, ON
Default unit: dB

<SSCH>
Range: -80 dB to 0 dB
*RST: -8.3 dB, ON
Default unit: dB

<PCCPCH>	Range:	-80 dB to 0 dB
	*RST:	-5.3 dB, ON
	Default unit:	dB
<SCCPCH>	Range:	-80 dB to 0 dB
	*RST:	-5.3 dB, OFF
	Default unit:	dB
<PICH>	Range:	-80 dB to 0 dB
	*RST:	-8.3 dB, ON
	Default unit:	dB
<DPCH>	Range:	-80 dB to 0 dB
	*RST:	-10.3 dB, ON
	Default unit:	dB
<HSSCCH>	Range:	-80 dB to 0 dB
	*RST:	-8.4 dB, OFF
	Default unit:	dB
<HSPDSCH>	Range:	-80 dB to 0 dB
	*RST:	-2.9 dB, OFF
	Default unit:	dB
<EAGCH>	Range:	-80 dB to 0 dB
	*RST:	-20 dB, OFF
	Default unit:	dB
<ERGCH>	Range:	-80 dB to 0 dB
	*RST:	-31 dB, OFF
	Default unit:	dB
<EHICH>	Range:	-80 dB to 0 dB
	*RST:	-35.1 dB, OFF
	Default unit:	dB

Firmware/Software: V1.0.10.1

Options: R&S CMW-KG401

Manual operation: See "Level" on page 41

SOURce:WCDMa:GEN<i>:LEVel:WCDMa <PCPICH>, <SCPICH>, <PSCH>, <SSCH>, <PCCPCH>, <SCCPCH>, <PICH>, <DPCH>

Sets the level of all R99 channels. Setting a power level also activates the channel.

Additional values for all parameters: OFF | ON (disables | enables the channel using the previous/default level)

Parameters:

<PCPICH>	Range:	-80 dB to 0 dB
	*RST:	-3.3 dB, ON
	Default unit:	dB

<SCPICH>	Range:	-80 dB to 0 dB
	*RST:	-3.3 dB, OFF
	Default unit:	dB
<PSCH>	Range:	-80 dB to 0 dB
	*RST:	-8.3 dB, ON
	Default unit:	dB
<SSCH>	Range:	-80 dB to 0 dB
	*RST:	-8.3 dB, ON
	Default unit:	dB
<PCCPCH>	Range:	-80 dB to 0 dB
	*RST:	-5.3 dB, ON
	Default unit:	dB
<SCCPCH>	Range:	-80 dB to 0 dB
	*RST:	-5.3 dB, OFF
	Default unit:	dB
<PICH>	Range:	-80 dB to 0 dB
	*RST:	-8.3 dB, ON
	Default unit:	dB
<DPCH>	Range:	-80 dB to 0 dB
	*RST:	-10.3 dB, ON
	Default unit:	dB

Firmware/Software: V1.0.10.1

Manual operation: See "Level" on page 41

SOURce:WCDMa:GEN<i>:LEVel:PCPich <Level>
SOURce:WCDMa:GEN<i>:LEVel:SCPich <Level>
SOURce:WCDMa:GEN<i>:LEVel:PSCH <Level>
SOURce:WCDMa:GEN<i>:LEVel:SSCH <Level>
SOURce:WCDMa:GEN<i>:LEVel:PCCPch <Level>
SOURce:WCDMa:GEN<i>:LEVel:SCCPch <Level>
SOURce:WCDMa:GEN<i>:LEVel:PICH <Level>
SOURce:WCDMa:GEN<i>:LEVel:DPCH <Level>
SOURce:WCDMa:GEN<i>:LEVel:HSSCch <Level>
SOURce:WCDMa:GEN<i>:LEVel:HSPDsch <Level>
SOURce:WCDMa:GEN<i>:LEVel:EAGCh <Level>
SOURce:WCDMa:GEN<i>:LEVel:ERGCh <Level>
SOURce:WCDMa:GEN<i>:LEVel:EHICh <Level>

Set the level of the channel indicated by the last mnemonic. Setting a power level also activates the channel.

If speed is critical, do not use these commands to set the level of more than one channel. Instead set all levels by a single command. See `SOURce:WCDMa:GEN<i>:LEVel:HSPA` on page 62 and `SOURce:WCDMa:GEN<i>:LEVel:WCDMa` on page 63.

Parameters:

<Level> Range: -80 dB to 0 dB
*RST: see SOURce:WCDMa:GEN<i>:LEVel:HSPA
Default unit: dB
Additional parameters: OFF | ON (disables | enables the channel using the previous/default level)

Example: See Specifying Channel Table Entries

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401 required for HS-x and E-x

Manual operation: See "Level" on page 41

SOURce:WCDMa:GEN<i>:LEVel:APOWer?

Queries the accumulated power (total power of all active channels relative to the base level of the generator).

Return values:

<Power> Range: -80 dB to 11 dB
Default unit: dB

Example: See Specifying Channel Table Entries

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Accumulated Power" on page 43

SOURce:WCDMa:GEN<i>:LEVel:ADJust

Corrects the power levels of the active channels to minimize the difference between the total power level of all active channels and the base power level.

Example: See Specifying Channel Table Entries

Usage: Event

Firmware/Software: V1.0.4.11

Manual operation: See "Accumulated Power" on page 43

2.5.5 Code Numbers (Physical Channels)

The following commands configure the channelization code numbers of the individual channels.

SOURce:WCDMa:GEN<i>:CCODe:HSPA <SCPICH>, <SCCPCH>, <PICH>, <DPCH>, <HSSCCH>, <HSPDSCH>, <EAGCH>, <ERGCH>, <EHICH>

Set the channelization code number of R99 and HSPA channels. For some channels the Spreading Factor (SF) is variable, resulting in a variable range of allowed code numbers. See also chapter 2.2.2, "Channel Structure", on page 18.

Parameters:

<SCPICH> Range: 0 to 255
*RST: 3

<SCCPCH> Range: 0 to SF-1
*RST: 4

<PICH> Range: 0 to 255
*RST: 14

<DPCH> Range: 0 to SF-1
*RST: 5

<HSSCCH> Range: 0 to 127
*RST: 2

<HSPDSCH> Range: 0 to 11
*RST: 5

<EAGCH> Range: 0 to 255
*RST: 240

<ERGCH> Range: 0 to 127
*RST: 12

<EHICH> Range: 0 to 127
*RST: 12

Firmware/Software: V1.0.10.1

Options: R&S CMW-KG401

Manual operation: See "Channel Code" on page 41

SOURce:WCDMa:GEN<i>:CCODe:WCDMa <SCPICH>, <SCCPCH>, <PICH>, <DPCH>

Set the channelization code number of R99 channels. For some channels the Spreading Factor (SF) is variable, resulting in a variable range of allowed code numbers. See also chapter 2.2.2, "Channel Structure", on page 18.

Parameters:

<SCPICH>	Range:	0 to 255
	*RST:	3
<SCCPCH>	Range:	0 to SF-1
	*RST:	4
<PICH>	Range:	0 to 255
	*RST:	14
<DPCH>	Range:	0 to SF-1
	*RST:	5

Firmware/Software: V1.0.10.1

Manual operation: See "Channel Code" on page 41

SOURce:WCDMa:GEN<i>:CCODe:SCPich <ChannelCode>
SOURce:WCDMa:GEN<i>:CCODe:SCCPch <ChannelCode>
SOURce:WCDMa:GEN<i>:CCODe:PICH <ChannelCode>
SOURce:WCDMa:GEN<i>:CCODe:DPCH <ChannelCode>
SOURce:WCDMa:GEN<i>:CCODe:HSSCch <Code>
SOURce:WCDMa:GEN<i>:CCODe:HSPDsch <Code>
SOURce:WCDMa:GEN<i>:CCODe:EAGCh <Code>
SOURce:WCDMa:GEN<i>:CCODe:ERGCh <Code>
SOURce:WCDMa:GEN<i>:CCODe:EHICh <Code>

Set the channelization code number of the channel indicated by the last mnemonic.

If speed is critical, do not use these commands to set the code number of more than one channel. Instead set all code numbers by a single command. See `SOURce:WCDMa:GEN<i>:CCODe:HSPA` on page 66 and `SOURce:WCDMa:GEN<i>:CCODe:WCDMa` on page 67.

Parameters:

<Code>	Range:	see SOURce:WCDMa:GEN<i>:CCODe:HSPA
	*RST:	see SOURce:WCDMa:GEN<i>:CCODe:HSPA

Example: See Specifying Channel Table Entries

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401 required for HS-x and E-x

Manual operation: See "Channel Code" on page 41

SOURce:WCDMa:GEN<i>:CCODe:PCPich?

Query the channelization code number of the P-CPICH.

Return values:

<ChannelCode>	Range:	Fixed value
	*RST:	0

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Channel Code" on page 41

SOURce:WCDMa:GEN<i>:CCODe:PCCPch?

Query the channelization code number of the P-CCPCH.

Return values:

<ChannelCode>	Range:	Fixed value
	*RST:	1

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Channel Code" on page 41

SOURce:WCDMa:GEN<i>:CCODe:CONFlict?

Queries the channelization code conflict status of the physical channels.

Return values:

<PCPICH> OFF | ON

OFF: channel causes no code conflict
ON: code settings of this channel conflict with the code settings of another channel

<SCPICH> OFF | ON

<PCCPCH> OFF | ON

<SCCPCH> OFF | ON

<PICH> OFF | ON

<DPCH> OFF | ON

<HSSCCH> OFF | ON

<HSPDSCH> OFF | ON

<EAGCH> OFF | ON

<ERGCH> OFF | ON

<EHICH> OFF | ON

<OCNS> OFF | ON

Example: See Specifying Channel Table Entries

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Code Conflict" on page 43

2.5.6 Symbol Rates (Physical Channels)

The following commands query the symbol rates of the individual channels.

SOURce:WCDMa:GEN<i>:SRATe:PCPich?

Query the symbol rate of the P-CPICH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K15

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:SCPich?

Query the symbol rate of the S-CPICH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K15

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:PCCPch?

Query the symbol rate of the P-CCPCH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K15

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:SCCPch?

Query the symbol rate of the S-CCPCH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K30

Example: See Specifying Channel Table Entries

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:PICH?

Query the symbol rate of the PICH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K15

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:DPCH?

Query the symbol rate of the DPCH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K30

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:HSSCch?

Query the symbol rate of the HS-SCCH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K30

Usage: Query only

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:HSPDsch?

Query the symbol rate of the HS-PDSCH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K240

Usage: Query only

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:EAGCh?

Query the symbol rate of the E-AGCH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K15

Usage: Query only

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:ERGCh?

Query the symbol rate of the E-RGCH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K30

Usage: Query only

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Symbol Rate" on page 42

SOURce:WCDMa:GEN<i>:SRATe:EHICh?

Query the symbol rate of the E-HICH.

Return values:

<SymbolRate> K7 | K15 | K30 | K60 | K120 | K240 | K480 | K960

K7: 7.5 ksps
K15 | ... | **K960**: 15 ksps | ... | 960 ksps

*RST: K30

Usage: Query only

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Symbol Rate" on page 42

2.5.7 Slot Format (Physical Channels)

The following commands configure the slot format of the individual channels.

SOURce:WCDMa:GEN<i>:SFORmat:SCCPch <SlotFormat>

Sets the slot format of the S-CCPCH.

Parameters:

<SlotFormat>	Range:	0 to 17
	*RST:	4

Example: See Specifying Channel Table Entries

Firmware/Software: V1.0.4.11

Manual operation: See "Slot Fmt." on page 42

SOURce:WCDMa:GEN<i>:SFORmat:DPCH?

Queries the slot format of the DPCH.

Return values:

<SlotFormat>	Range:	0 to 16
	*RST:	11

Example: See Specifying HSDPA Settings

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Slot Fmt." on page 42

2.5.8 Timing Offsets (Physical Channels)

The following commands configure the timing offsets of the individual channels relative to the P-CCPCH timing.

SOURce:WCDMa:GEN<i>:TOFFset:SCCPch <Offset>
SOURce:WCDMa:GEN<i>:TOFFset:PICH <Offset>
SOURce:WCDMa:GEN<i>:TOFFset:DPCH <Offset>

Set the timing offset of the channels S-CCPCH, PICH and DPCH.

Parameters:

<Offset>	Range: 0 slots to 14.9 slots *RST: 0 slots Default unit: slots

Example: See Specifying Channel Table Entries

Firmware/Software: V1.0.4.11

Manual operation: See "Timing Offset" on page 43

SOURce:WCDMa:GEN<i>:TOFFset:EAGCh?
SOURce:WCDMa:GEN<i>:TOFFset:ERGCh?
SOURce:WCDMa:GEN<i>:TOFFset:EHICh?

Query the timing offset of the channels E-AGCH, E-RGCH and E-HICH. The timing offset depends on the TTI.

Return values:

<Offset>	Range: -7 slots to 5 slots *RST: E-AGCH: 2 slots, E-RGCH / E-HICH: -7 slots Default unit: slots

Example: See Specifying HSUPA Settings

Usage: Query only

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Timing Offset" on page 43

2.5.9 Data (Physical Channels)

The following commands configure the bit sequences transmitted as user information via the individual channels.

SOURce:WCDMa:GEN<i>:DATA:PCCPch <Data>
SOURce:WCDMa:GEN<i>:DATA:SCCPch <Data>
SOURce:WCDMa:GEN<i>:DATA:PICH <Data>
SOURce:WCDMa:GEN<i>:DATA:HSPDsch <Data>

Define the type of data transmitted as user information via the channel indicated by the last mnemonic.

Parameters:

<Data> ALL0 | ALL1 | PAT | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23

ALL0: zeros only
ALL1: ones only
PAT: pattern defined via SOURce:WCDMa:GEN<i>:PATTern:PCCPch etc.
PN9 | ... | **PN23**: pseudo-random bit sequences generated with the indicated number of shift-register stages

*RST: PN9

Example: See Specifying Channel Table Entries

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401 required for HS-PDSCH

Manual operation: See "Data / Pattern" on page 43

SOURce:WCDMa:GEN<i>:PATTern:PCCPch <Pattern>
SOURce:WCDMa:GEN<i>:PATTern:SCCPch <Pattern>
SOURce:WCDMa:GEN<i>:PATTern:PICH <Pattern>
SOURce:WCDMa:GEN<i>:PATTern:HSPDsch <Pattern>

Define the bit pattern transmitted as user information if the data type equals PAT (see SOURce:WCDMa:GEN<i>:DATA:PCCPch etc.). The last mnemonic indicates the channel.

Parameters:

<Pattern> String to specify the pattern.

Range: up to 32 zeros and ones
*RST: '01'

Example: See Specifying Channel Table Entries

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401 required for HS-PDSCH

Manual operation: See "Data / Pattern" on page 43

2.5.10 OCNS Channels

The following commands configure the Orthogonal Channel Noise Simulator (OCNS) channels.

SOURce:WCDMa:GEN<i>:OCNS:USE <Enable>

Activates or deactivates the OCNS channels.

Parameters:

<Enable>	OFF | ON *RST: ON

Example: See Specifying OCNS Settings

Firmware/Software: V1.0.4.11

Manual operation: See "OCNS Level / Type" on page 43

SOURce:WCDMa:GEN<i>:OCNS:LEVel?

Queries the total OCNS channel power (relative to the base level of the generator).

Return values:

<Level>	Range: -17 dB to 0 dB Default unit: dB

Example: See Specifying OCNS Settings

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "OCNS Level / Type" on page 43

SOURce:WCDMa:GEN<i>:OCNS:TYPE <Standard>

Defines the type of OCNS channels to be generated, see chapter 2.2.4, "Orthogonal Channel Noise Simulator (OCNS)", on page 27.

Parameters:

<Standard>	R99 | R5 *RST: R99

Example: See Specifying OCNS Settings

Firmware/Software: V1.0.4.11

Manual operation: See "OCNS Level / Type" on page 43

2.5.11 Transport Channel Settings

The following commands configure the transport channel.

SOURce:WCDMa:GEN<i>:DCH <Model>

Defines the type of the transport channel (DCH model). See also chapter 2.2.3, "Dedicated Channel Models", on page 24.

Parameters:

<Model> R12 | R64 | R144 | R384 | BD1 | BD2 | BD3 | S1K7 | S2K5 | S3K4 | S13K

R12 | ... | **R384**: RMC 12.2 kbps, 64 kbps, 144 kbps, 384 kbps
BD1 | **BD2** | **BD3**: BTFD Rate 1, 2, 3
S1K7 | ... | **S13K**: SRB 1.7 kbps, 2.5 kbps, 3.4 kbps, 13.6 kbps

*RST: R12

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.4.11

Manual operation: See "DCH Model" on page 45

SOURce:WCDMa:GEN<i>:DTCH:DATA <Data>

Defines the type of data transmitted as user information on the DTCH.

Parameters:

<Data> ALL0 | ALL1 | PAT | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23

ALL0: zeros only
ALL1: ones only
PAT: pattern defined via `SOURce:WCDMa:GEN<i>:DTCH:PATTern`
PN9 | ... | **PN23**: pseudo-random bit sequences generated with the indicated number of shift-register stages

*RST: ALL1

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.4.11

Manual operation: See "DTCH Data / Pattern" on page 46

SOURce:WCDMa:GEN<i>:DTCH:PATTern <Pattern>

Defines the bit pattern transmitted as user information on the DTCH if the data type equals PAT (see `SOURce:WCDMa:GEN<i>:DTCH:DATA` on page 77).

Parameters:

<Pattern> String to specify the pattern

Range: up to 32 zeros and ones
*RST: '01'

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.4.11

Manual operation: See "DTCH Data / Pattern" on page 46

2.5.12 DPCCH Settings

The following commands configure the Dedicated Physical Control Channel (DPCCH).

SOURce:WCDMa:GEN<i>:FDPCh <Enable>

Activates or deactivates the F-DPCH. Activating the F-DPCH overrides the selected DCH model (see `SOURce:WCDMa:GEN<i>:DCH` on page 77) and configures the dedicated channel as fractional DPCH.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Specifying HSDPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "F-DPCH (Option R&S CMW-KG401)" on page 47

SOURce:WCDMa:GEN<i>:TFCI <Value>

Defines a value to be transmitted in the TFCI field if a TFCI is present in the DPCCH (depends on the DCH Model selected via `SOURce:WCDMa:GEN<i>:DCH`).

A query returns the selected value and indicates additionally whether a TFCI is present.

Parameters:

<Value>

Range: 0 to 1023
*RST: 3

Return values:

<Enable>

OFF | ON

ON: The selected <Value> is transmitted in the TFCI field.
OFF: The TFCI field is filled by DTX bits.

*RST: ON

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.4.11

Manual operation: See "TFCI" on page 47

SOURce:WCDMa:GEN<i>:TPC:SET <SetType>

Selects the active TPC setup. A query returns also properties of the active setup.

Parameters:

<SetType>

ALTernating | ALL1 | ALL0 | SALT | SAL1 | SAL0 | CONTinuous | TSE | TSF | TSEF | TSGH | PUP | PDOWn

ALTernating: Alternating
ALL1: All 1
ALL0: All 0
SALT: Single Pattern + Alternating
SAL1: Single Pattern + All 1
SAL0: Single Pattern + All 0
CONTinuous: Continuous Pattern
TSE: TPC Test Step E
TSF: TPC Test Step F
TSEF: TPC Test Step EF
TSGH: TPC Test Step GH
PUP: Phase Discontinuity Up
PDOWn: Phase Discontinuity Down

*RST: ALT

Return values:

<PreCondition>

NONE | ALTernating | MAXPower | MINPower

Precondition of the active setup
NONE: no precondition
ALTernating: alternating bit sequence
MAXPower: maximum transmit power
MINPower: minimum transmit power

<PConfig>

Active setup configuration information. The content depends on the setup type:
single and continuous patterns: user defined pattern
phase discontinuity: number of repetitions
test step EF, GH: number of 0 bits for step E or G
others: presentation of the fixed pattern

<Trigger> ONCE | PERiodic

Type of generated trigger signal, see chapter 2.2.8.5, "Generating TPC Trigger Signals", on page 36

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.15.0
V2.1.20: setup TSEF and TSGH added

Manual operation: See "TPC Settings > Active TPC Setup" on page 48

SOURce:WCDMa:GEN<i>:TPC:PRECondition

Reach the precondition defined for the active TPC pattern setup. Corresponds to pressing the "Precond." button.

Example: See Specifying DCH and DPCCH Settings

Usage: Event

Firmware/Software: V1.0.4.11

Manual operation: See "TPC Settings > TPC Control" on page 48

SOURce:WCDMa:GEN<i>:TPC:PEXecute

Executes the active TPC pattern setup. Corresponds to pressing the "Execute" button.

For pattern setups with precondition it is recommended to press the "Precond." button first (`SOURce:WCDMa:GEN<i>:TPC:PRECondition`).

Example: See Specifying DCH and DPCCH Settings

Usage: Event

Firmware/Software: V1.0.4.11

Manual operation: See "TPC Settings > TPC Control" on page 48

SOURce:WCDMa:GEN<i>:TPC:STATe?

Queries the current state of the TPC pattern transmission.

Return values:

<State> IDLE | CONTinuous | SINGle | ALTernating | MAXPower | MINPower | TRANsition

IDLE: generator switched off
CONTinuous: transmitting user defined continuous pattern
SINGle: transmitting a single user defined pattern
ALTernating: transmitting alternating pattern
MAXPower: maximum power reached
MINPower: minimum power reached
TRANsition: transition to a state, e.g. to maximum power

*RST: IDLE

Example: See Specifying DCH and DPCCH Settings

Usage: Query only

Firmware/Software: V1.0.10.1

Manual operation: See "TPC Settings > TPC State" on page 48

SOURce:WCDMa:GEN<i>:TPC:MODE <Mode>

Defines the power control algorithm and the TPC step size configured at the UE.

Parameters:

<Mode> A2S1 | A1S1 | A1S2

A2S1: algorithm 2, step size 1 dB
A1S1: algorithm 1, step size 1 dB
A1S2: algorithm 1, step size 2 dB

*RST: A1S1

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.4.11

Manual operation: See "TPC Settings > Alg. / Step Size" on page 48

SOURce:WCDMa:GEN<i>:TPC:PATTern <Pattern>

Sets the "User Defined Pattern" to be used for "Single Pattern" and "Continuous Pattern".

Parameters:

<Pattern> String to specify the pattern

Range: up to 60 zeros and ones
*RST: '00000000001111111111'

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.4.11

Manual operation: See "TPC Settings > User Defined Pattern" on page 49

SOURce:WCDMa:GEN<i>:TPCSet:PRECondition:SINGle <Condition>
SOURce:WCDMa:GEN<i>:TPCSet:PRECondition:CONTinuous <Condition>
SOURce:WCDMa:GEN<i>:TPCSet:PRECondition:PHUP <Condition>
SOURce:WCDMa:GEN<i>:TPCSet:PRECondition:PHDown <Condition>

Select the preconditions for the TPC patterns "Single Pattern", "Continuous Pattern", "Phase Discontinuity Up" and "Phase Discontinuity Down".

Parameters:

<Condition> NONE | ALTernating | MAXPower | MINPower

NONE: no precondition (only for "Continuous Pattern")
ALTernating: alternating bit sequence
MAXPower: maximum transmit power
MINPower: minimum transmit power

*RST: ALT (for CONTinuous: NONE)

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.15.0

Manual operation: See "TPC Settings > TPC Setup" on page 49

SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:TSEF <Length>

Defines the number of 0 bits to be sent before the all 1 pattern is started for TPC setup "TPC Test Step EF".

Parameters:

<Length> Range: 1 to 170
*RST: 120

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V2.1.20

Manual operation: See "TPC Settings > TPC Setup" on page 49

SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:TSGH <Length>

Defines the number of 0 bits to be sent before the all 1 pattern is started for TPC setup "TPC Test Step GH".

Parameters:

<Length> Range: 1 to 170
*RST: 80

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V2.1.20

Manual operation: See "TPC Settings > TPC Setup" on page 49

SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:TSSegment <Enable>

Enables or disables segmentation for test steps E, F, G and H.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V2.1.20

Manual operation: See "TPC Settings > TPC Setup" on page 49

SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:PHUP <Repetition>
SOURce:WCDMa:GEN<i>:TPCSet:PCONfig:PHDown <Repetition>

Define the number of times the pattern shall be repeated for Phase Discontinuity Up/Down.

Parameters:

<Repetition> Range: 1 to 13
*RST: 13

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.15.0

Manual operation: See "TPC Settings > TPC Setup" on page 49

SOURce:WCDMa:GEN<i>:POFFset:PILot <Power>
SOURce:WCDMa:GEN<i>:POFFset:TPC <Power>
SOURce:WCDMa:GEN<i>:POFFset:TFCI <Power>

Define the relative power of the control parts of the DPCH compared to the power in the data part (see `SOURce:WCDMa:GEN<i>:LEVel:DPCH` on page 64).

Parameters:

<Power> Range: 0 dB to 6 dB
*RST: 0 dB
Default unit: dB

Example: See Specifying DCH and DPCCH Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Power Control Bits" on page 49

2.5.13 HSDPA Settings

The following commands configure the High Speed Downlink Packet Access (HSDPA).

SOURce:WCDMa:GEN<i>:HSDPa:FRCHannel <HSet>

Selects the H-Set defining the properties of the fixed reference channel.

Parameters:

<HSet> H1P | H1Q | H2P | H2Q | H3P | H3Q | H4P | H5P

H1P: H-Set 1, QPSK
H1Q: H-Set 1, 16QAM
H2P: H-Set 2, QPSK
H2Q: H-Set 2, 16QAM
H3P: H-Set 3, QPSK
H3Q: H-Set 3, 16QAM
H4P: H-Set 4, QPSK
H5P: H-Set 5, QPSK

*RST: H1P

Example: See Specifying HSDPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Fixed Reference Channel" on page 50

SOURce:WCDMa:GEN<i>:HSDPa:RVERsion <Value>

Defines the redundancy version for coding of the HS-DSCH.

Parameters:

<Value> Range: 0 to 7
*RST: 0

Example: See Specifying HSDPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Redundancy Version" on page 50

SOURce:WCDMa:GEN<i>:HSDPa:UEID <ID>

Defines the UE identification to be transmitted via the HS-SCCH.

Parameters:

<ID> Range: 0 to 65535
*RST: 0

Example: See Specifying HSDPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "UE ID" on page 50

SOURce:WCDMa:GEN<i>:HSDPa:USFRames <Filling>

Defines the transmission in the gaps (unscheduled subframes) between consecutive HS-SCCH and HS-PDSCH subframes allocated to the UE.

Parameters:

<Filling> DD | DTX

DD: transmission of dummy data
DTX: discontinuous transmission (power off)

*RST: DD

Example: See Specifying HSDPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Unscheduled Subframes" on page 50

2.5.14 HSUPA Settings

The following commands configure the downlink channels that are related to High Speed Uplink Packet Access (HSUPA).

SOURce:WCDMa:GEN<i>:HSUPa:CTYPe?

Queries the type of the transmitting cell.

Return values:

<CellType> SERVing | NSERving

SERVing: serving cell
NSERving: non-serving cell

*RST: SERV

Example: See Specifying HSUPA Settings

Usage: Query only

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "Cell Type" on page 51

SOURce:WCDMa:GEN<i>:HSUPa:TTI <TTI>

Defines the Transmission Time Interval (TTI) of the E-DCH.

Parameters:

<TTI> T2 | T10

T2: 2 ms
T10: 10 ms

*RST: T10

Example: See Specifying HSUPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "TTI" on page 51

SOURce:WCDMa:GEN<i>:HSUPa:EHICh:SINDex <SequenceIndex>

Defines the index of the E-HICH signature sequence used to separate the E-HICH channel from the E-RGCH.

Parameters:

<SequenceIndex> Range: 0 to 29
*RST: 0

Example: See Specifying HSUPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "E-HICH – Sequence Index" on page 51

SOURce:WCDMa:GEN<i>:HSUPa:EHICh:MODE <Mode>

Defines the HARQ acknowledgement indicator sequence to be transmitted via the E-HICH to the UE.

Parameters:

<Mode> AACK | ANACk | ALTacknack | ALTNackack | PATTern

AACK: all ACK
ANACk: all NACK
ALTacknack: alternating ACK NACK
ALTNackack: alternating NACK ACK
PATTern: pattern defined via `SOURce:WCDMa:GEN<i>:HSUPa:EHICh:PATTern`

*RST: AACK

Example: See Specifying HSUPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "E-HICH – Mode / Pattern" on page 51

SOURce:WCDMa:GEN<i>:HSUPa:EHICh:PATTern <Pattern>

Defines the pattern to be transmitted as HARQ acknowledgement indicator sequence if the data type equals PATT (see `SOURce:WCDMa:GEN<i>:HSUPa:EHICh:MODE` on page 86).

Parameters:

<Pattern> String to specify the pattern

Range: up to 32 hyphens and ones (- = NACK, 1 = ACK)
*RST: '1'

Example: See Specifying HSUPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "E-HICH – Mode / Pattern" on page 51

SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:SINDex <SequenceIndex>

Defines the index of the E-RGCH signature sequence used to separate the E-HICH channel from the E-RGCH.

Parameters:

<SequenceIndex> Range: 0 to 39
*RST: 1

Example: See Specifying HSUPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "E-RGCH – Sequence Index" on page 52

SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:MODE <Mode>

Defines the relative grant sequence to be transmitted via the E-RGCH to the UE.

Parameters:

<Mode> HOLD | UP | DOWN | DHUP | DHOLd | UHDown | HDOWn | PATTern

HOLD: all Hold
UP: all Up
DOWN: all Down
DHUP: alternating Down Hold Up
DHOLd: alternating Down Hold
UHDown: alternating Up Hold Down
HDOWn: alternating Hold Down
PATTern: pattern defined via `SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:PATTern`

*RST: HOLD

Example: See Specifying HSUPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "E-RGCH – Mode / Pattern" on page 52

SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:PATTern <Pattern>

Defines the pattern to be transmitted as relative grant sequence if the data type equals PATT (see `SOURce:WCDMa:GEN<i>:HSUPa:ERGCh:MODE` on page 87).

Parameters:

<Pattern> String to specify the pattern

Range: up to 32 zeros, ones and hyphens (0 = Hold, 1 = Up, - = Down)

*RST: '0'

Example: See Specifying HSUPA Settings

Firmware/Software: V1.0.4.11

Options: R&S CMW-KG401

Manual operation: See "E-RGCH – Mode / Pattern" on page 52

2.6 List of Commands

3 WCDMA Multi Evaluation Measurement

The WCDMA multi evaluation measurement provides TX tests on WCDMA FDD uplink signals and an RX test (Bit Error Rate and Block Error Ratio). The TX tests cover the following UE transmitter properties:

- UE output power and power steps
- Modulation accuracy (EVM, phase error, magnitude error, frequency error, I/Q origin offset and I/Q imbalance)
- Phase discontinuity
- Spectrum emissions (ACLR and spectrum emission mask)
- Code Domain Power (CDP) and Code Domain Error (CDE)

Many of the tests and conformance requirements are specified in 3GPP TS 34.121-1, "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) conformance specification; Radio transmission and reception (FDD)".

The multi evaluation measurement requires option R&S CMW-KM400.

3.1 What's New in this Revision

This revision describes version 3.0.30 and later of the WCDMA multi evaluation measurement. Compared to version 3.0.20 it provides the following new features:

- Additional commands for channel configuration (`CONFigure:WCDMa:MEAS:UEChannels:...`), see UE Signal Info
- When using a segment retrigger in list mode, the trigger source is configurable per segment, see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup`

Software Version

To check your R&S CMW software version, open the "Setup" dialog and click "HW/SW Equipment". The initial software version for each remote control command is quoted in the reference description.

3.2 General Description

The WCDMA multi evaluation measurement included in option R&S CMW-KM400 captures an uplink (UL) WCDMA signal and provides the TX measurement results over a series of consecutive slots. The uplink signal may contain HSPA or HSPA+ channels if the relevant option is installed: R&S CMW-KM401 for HSPA and additionally R&S CMW-KM403 for HSPA+.

For RX measurements, a well defined downlink (DL) WCDMA signal has to be looped back by the UE. This DL signal can be generated using the WCDMA generator (option

R&S CMW-KG400) or an ARB file (option R&S CMW-KW400). The WCDMA multi evaluation measurement captures the resulting uplink WCDMA signal and provides RX measurement results, under the assumption that all bit errors are caused by the RX part of the UE.

The following sections describe how to perform and configure the measurement.

3.2.1 WCDMA TX Tests

TX tests have many characteristics in common. The following sections describe these characteristics and show how to perform TX tests.

3.2.1.1 Test Setup

The external RF signal source (mobile station, signal generator etc.) is connected to one of the RF input connectors (RF COM) at the front panel of the R&S CMW. No additional cabling and no external trigger is needed.

The input level ranges of all RF COM connectors are identical.

See also: "RF Connectors" in the R&S CMW user manual, chapter "Getting Started"

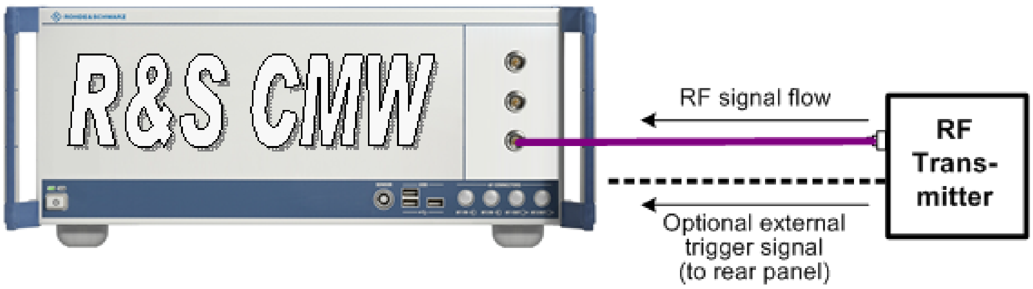


Fig. 3-1: Connecting an RF transmitter to the instrument

3.2.1.2 Measuring an Uplink WCDMA Signal

After connecting your WCDMA UE to the R&S CMW you have to adjust the following analyzer settings to the properties of the analyzed UL WCDMA signal:

- The analyzer "Frequency"
- The "Expected Nominal Power" and (optional) a "User Margin" and "External Attenuation". Recommended values: "Expected Nominal Power" = peak power of the UE signal over the entire measurement range; "User Margin" = 0 dB (the smallest possible value ensures maximum dynamic range).

For synchronization to the received signal and proper decoding, the "UE Signal Info" settings in the configuration dialog must be in accordance with the measured signal. In particular, ensure that the following parameters match up:

- The "Scrambling Code" and the "UL DPCCH Slot Format"
- The "UL Configuration"
- The information whether a DPDCH is configured or not ("UL DPDCH Available").

The R&S CMW can auto-detect the spreading factor of the DPDCH and of the E-DPDCHs (for HSUPA) and the corresponding symbol rates.

With matching "UE Signal Info" settings, the R&S CMW is able to decode the WCDMA UL signal and determine its slot timing. No additional measurement trigger is required.

3.2.1.3 Defining the Scope of the Measurement

The WCDMA multi evaluation measurement is a multislot application: The R&S CMW can measure up to 120 consecutive WCDMA slots (8 frames) in a single measurement cycle and store the measurement results for each slot. The total number n of slots per measurement cycle is termed the "Measurement Length" (slots no. 0 to n – 1).

Within this measurement interval, two individual slots are selected for a more detailed analysis:

- The "Preselected Slot" is used for single slot measurements, e.g. to measure the Adjacent Channel Leakage power Ratio (ACLR), the spectrum emissions, the code domain monitor results and single slot modulation measurements (vs. chip results).
- For the multislot measurements statistical results are measured for all slots and are displayed for one slot at a time, the "Slot Number (Table)". Statistical results are relevant in particular if the "Measurement Length" is measured repeatedly.

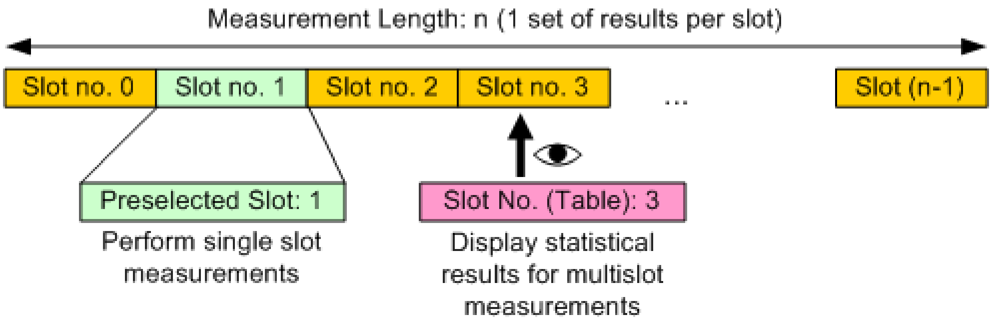


Fig. 3-2: Preselected Slot and Slot Number (Table)

The "Preselected Slot" and the "Slot Number (Table)" are completely independent from each other.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

WCDMA frame synchronization

The trigger settings ensure WCDMA slot and frame synchronization with the analyzed UL WCDMA signal. The "Measurement Length" can start with any WCDMA slot number, see parameter "Synchronization" on page 137.

3.2.1.4 Parallel Signaling and Measurement

The multi evaluation measurement can be used in parallel to the WCDMA signaling application (option R&S CMW-KS400), i.e. a connection to the UE can be set up by the signaling application and the resulting uplink signal can be measured using the multi evaluation measurement.

To use both applications in parallel, the combined signal path scenario must be activated (see "Scenario = Combined Signal Path" on page 129). The signal routing and analyzer settings are then configured by the signaling application only. The multi evaluation measurement displays the corresponding signaling settings instead of its own settings. These signaling settings can be configured both in the measurement GUI and in the GUI of the signaling application. To configure the signal routing and analyzer settings via remote commands, the commands of the signaling application have to be used.

The UE signal info settings are configured by the signaling application only. The multi evaluation measurement displays the values determined by the signaling application as "fixed" values. Most of these values cannot be configured at all. The UL scrambling code can be configured in the signaling application. See also chapter 3.3.2.2, "UE Signal Info", on page 132.

Additional signaling parameters can be accessed in the measurement GUI via hotkeys, see chapter 3.3.2.6, "Additional Softkeys and Hotkeys", on page 143.

Select a trigger signal provided by the signaling application as trigger source.

3.2.1.5 Trigger Modes

The WCDMA multi evaluation measurement can be performed in the following trigger modes (trigger source settings):

- Free Run (Standard): The measurement starts immediately after it is initiated. The R&S CMW decodes the signal to derive its slot timing so that the "Measurement Length" can start at a slot boundary of the UL WCDMA signal. This procedure is repeated after each measurement cycle.
- Free Run (Fast Sync): Similar to "Free Run (Standard)", however, the R&S CMW assumes that the frame period of the detected signal is close to the nominal 10 ms WCDMA frame length. The timing is only corrected after each measurement cycle using a faster algorithm, which results in faster continuous measurements.
  If you experience problems with this trigger mode, use Free Run (Standard) instead.
- IF Power: With an internal IF power trigger, the measurement is triggered by the power ramp of the received bursts. This trigger can be used if no continuous WCDMA signal is available and a short signal burst has to be measured.
- IF Power (Sync):

Similar to "IF Power", however, the R&S CMW tries to synchronize to the signal during a full slot after the trigger event. This setting can be used to measure short signal bursts where the beginning of the burst does not exactly coincide with a slot boundary. The start of the measurement takes longer than with "IF Power".

- External Trigger A/B: External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument.
- Additional trigger modes: Other firmware applications, e.g. the WCDMA signaling application (option R&S CMW-KS400) or the WCDMA generator (option R&S CMW-KG400) may provide additional trigger modes. Refer to the documentation of the corresponding firmware application for a description of these trigger modes.

For configuration see chapter 3.3.2.4, "Trigger Settings", on page 140.

3.2.2 WCDMA RX Tests

RX tests can be carried out in parallel to the TX tests. The following sections describe how to perform RX tests.

3.2.2.1 Test Setup

The downlink RF generator signal of the R&S CMW is fed to the input of the DUT. The R&S CMW measures the uplink signal. Most conveniently, a bi-directional connection with a single coax cable is used. The DUT is connected to one of the RF input connectors (RF COM) at the front panel of the R&S CMW. No additional cabling and no external trigger is needed.

The input level ranges of all RF COM connectors are identical.

See also: "RF Connectors" in the R&S CMW user manual, chapter "Getting Started"

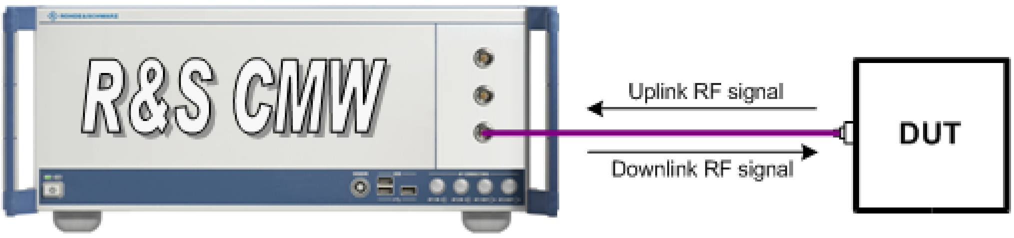


Fig. 3-3: Test setup for RX tests

3.2.2.2 Performing a WCDMA RX Test

For an RX measurement you need the WCDMA generator (option R&S CMW-KG400), the UE and the WCDMA multi evaluation measurement. Generate a WCDMA downlink signal, containing a Reference Measurement Channel (RMC) with an information bit rate of 12.2 kbps transporting an all 1 pattern as data. Order the UE to loop back the received data, using a test mode and measure the resulting uplink signal using the multi evaluation measurement.

The following settings are required for this scenario:

- Generator: In the transport channel settings select a 12.2 kbps RMC as DCH model. Set the DTCH data to an all 1 pattern.
- UE: Select an appropriate test mode, so that the UE loops back the received data via a 12.2 kbps RMC.
- Measurement: Select the DCCH TTI trigger signal provided by the generator as trigger source. Enable the BER measurement (i.e. the view, by default it is deactivated). Adjust the settings so that the uplink signal can be measured (see chapter 3.2.1.2, "Measuring an Uplink WCDMA Signal", on page 93). Only full-slot measurements are supported.

The measurement compares the received data with the expected all 1 pattern and provides the resulting error rates. One data block of the RMC contains 244 bits. They are mapped to two radio frames (30 slots). For that reason the measurement length used for RX measurements equals at least 30 slots. If a smaller value is set, 30 slots are measured nevertheless (see parameter "Measurement Length" on page 137).

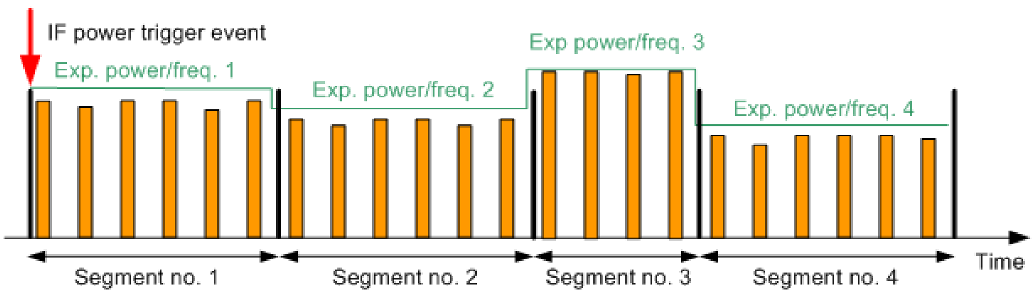
Enable the BER view only when needed. It slows down the multi evaluation measurement considerably.

3.2.3 Multi Evaluation List Mode

The WCDMA multi evaluation list mode requires option R&S CMW-KM012. In this mode the measurement interval is subdivided into segments, according to the expected nominal power and frequency steps of the user equipment (UE) under test.

3.2.3.1 List Mode Configuration

Each segment contains an integer number of timeslots and is measured at constant analyzer settings (i.e. at constant expected nominal power and RF frequency). The figure below shows a series of four segments with different lengths, powers and frequencies. Orange rectangles depict measured timeslots.



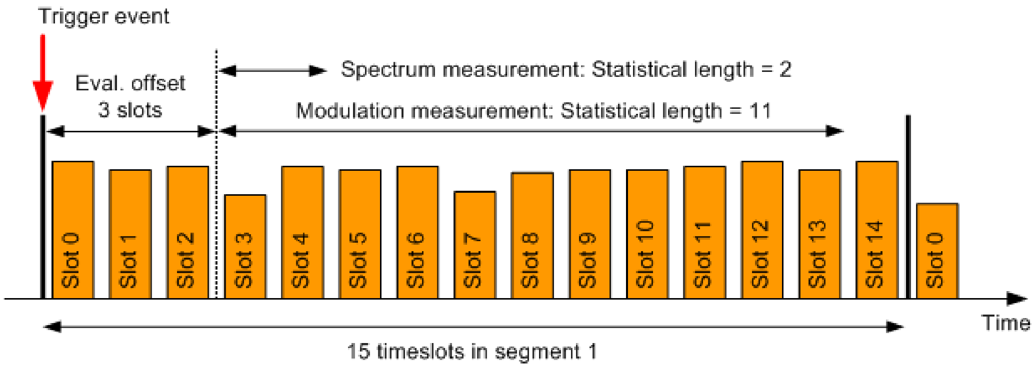
In list mode the R&S CMW can measure code domain, modulation and spectrum results. The measured quantities can be enabled or disabled individually for each segment.

In addition to segments with enabled measurements (active segments), the R&S CMW can also capture segments without any enabled measurements (inactive segments). Inactive segments are useful for time-consuming UE reconfiguration. For that purpose you define alternating active and inactive segments. During the active segments you perform measurements. During the inactive segments you reconfigure the UE for the next measured segment.

The R&S CMW can capture up to 192000 timeslots (active plus inactive segments). It can measure up to 6000 timeslots (active segments). An active segment may comprise up to 1000 timeslots, an inactive segment up to 192000 timeslots.

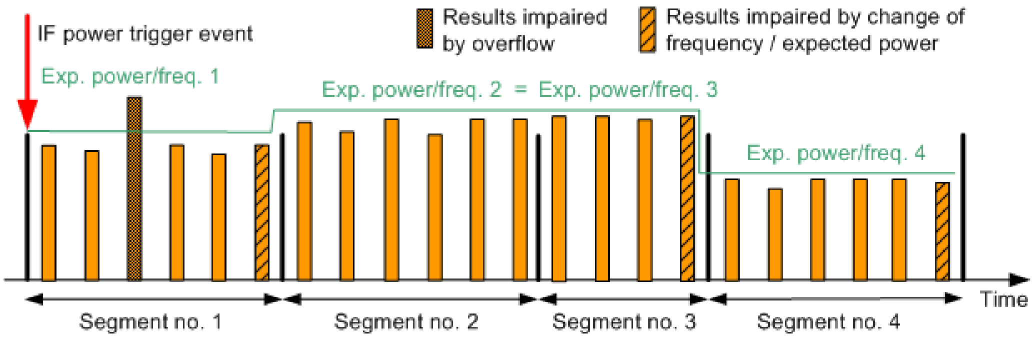
It is possible to measure all slots of an active segment or to exclude slots at the beginning and/or the end of the segment. The evaluation offset specifies how many slots are excluded at the beginning of each segment. The statistical length defines the number of slots to be measured. The "current" result of a segment refers to the last measured slot of the statistical length. Additional statistical values (average, minimum, maximum and standard deviation) are calculated for the entire statistical length. The following figure provides a summary.

The modulation results provide also the UE power per segment. Additionally a UE power vs. slot measurement allows to measure the UE power per slot. It can be enabled/disabled per segment. If enabled, it measures all slots of the segment. Similarly, the phase discontinuity vs. slot measurement provides one phase discontinuity result per slot.



If two consecutive segments are measured at different RF frequencies or expected powers, the R&S CMW changes the analyzer settings in the last timeslot of the first segment. This usually impairs the accuracy of the measurement results for this last slot (see segments 1, 3 and 4 in the figure below). It is recommended to exclude these slots from the statistical length. UE power vs. slot measurements exclude these slots automatically and return NCAP as result. In the figure below segment 2 and segment 3 have the same analyzer settings, so that the last slot of segment 2 can be measured accurately.

If a slot cannot be measured accurately because of overflow (third slot of segment 1 in the figure), low signal or synchronization error and Measure on Exception is "Off", the results of the entire segment are INValid. The error cause is reported by the reliability indicator and the return code included in the measurement results. To identify the slot causing problems you may use the UE power vs. slot measurement. This measurement returns the error cause as measurement result of the corresponding slot.



Trigger modes

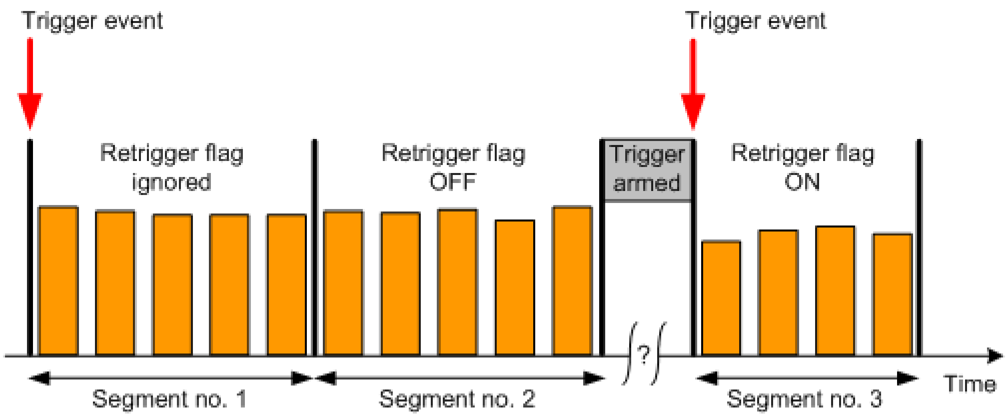
A list mode measurement can either be triggered only once, or it can be retriggered at the beginning of specified segments.

In "Once" mode a trigger event is only required to start the measurement. As a result the entire range of segments is measured without additional trigger event. The trigger is rearmed after the measurement has been finished. Specified retrigger flags are ignored.

The "Once" mode is recommended for UL signals with accurate timing over the entire range of segments.

In "Segment" mode the retrigger flag of each segment is evaluated. It defines whether the measurement waits for a trigger event before measuring the segment, or not. Retriggering the measurement is recommended if the timing of the first slot of a segment is inaccurate, e.g. because of signal reconfiguration at the UE. Furthermore retriggering from time to time can compensate for a possible time drift of the UE. The retrigger flag of the first segment of the measurement is always ignored (implicitly set to ON).

In the example shown below the "Segment" mode is enabled. The retrigger flag is OFF for the second segment and ON for the third segment. Thus the measurement stops when the first and second segment have been captured and waits for a trigger event before capturing the third segment.



The list mode is essentially a single-shot remote control application. When a measurement is initiated in list mode, all defined segments are measured once. Afterwards the results can be retrieved using FETCh commands. The parameters in the figures are set by means of the following remote control commands:

Parameters	SCPI commands
Activate / deactivate list mode	CONFigure:WCDMa:MEAS<i>:MEValuation:LIST
Number of segments	CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt
Timeslots per segment, power and frequency	CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup
Evaluation offset	CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:EOFFset
Statistical length	CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation etc.
Select trigger mode	TRIGger:WCDMa:MEAS<i>:MEValuation:LIST:MODE
Retrieve results	FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:... FETCh:WCDMa:MEAS<i>:MEValuation:LIST:... See chapter 3.5.3.32, "List Mode Results (One Segment)", on page 247, chapter 3.5.3.33, "List Mode Results (All Segments, One Result)", on page 253 and chapter 3.5.3.34, "List Mode Results (All Segments, Result Groups)", on page 266.

The list mode can be deactivated via command (see table above) and also via the GUI:

1. Go to local using the corresponding hotkey.

   The active list mode is indicated in the upper right corner of the current view by the words "List Mode!".

2. Open the configuration dialog box and disable the list mode in section "Measurement Control ".

Global and list mode parameters

The RF settings (expected power, RF frequency) and most of the "Measurement Control" settings (timeslots per segment, statistical lengths, enable/disable results) are special list mode settings. The R&S CMW ignores the corresponding "multi evaluation" parameters. All other settings are taken from the multi evaluation measurement, e.g.:

- Measure on Exception
- Some "Modulation / CDP" settings, e.g. Measurement Period and Analysis Mode
- Trigger settings

3.2.4 WCDMA UL Signal Properties

This section describes the following selected topics related to WCDMA UL signal properties.

3.2.4.1 Dedicated Physical Channels

There are five types of uplink dedicated physical channels, listed in the following table. The third column indicates the Spreading Factor (SF) and for the (E-)DPCCH also the channelization code. For the other channels the channelization code is variable. See also chapter 3.2.4.2, "Channelization Codes", on page 101.

Table 3-1: Uplink dedicated physical channels

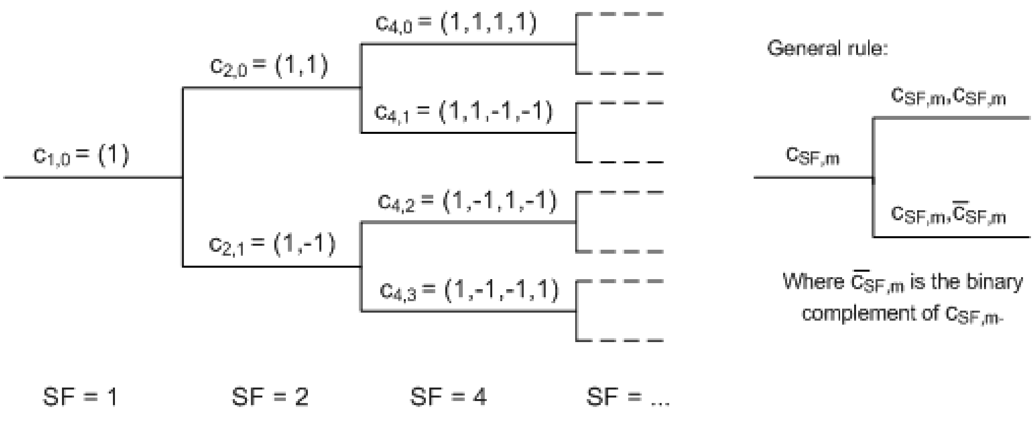
Channel type	Purpose	Properties
Dedicated Physical Control Channel (DPCCH)	Carries control information associated with the DCH.	SF = 256 $c_{256,\,0}$
Dedicated Physical Data Channel (DPDCH)	Carries the DCH transport channel.	SF = 4 to 256
E-DCH Dedicated Physical Control Channel (E-DPCCH)	Carries control information associated with the E-DCH.	SF = 256 $c_{256,\,1}$
E-DCH Dedicated Physical Data Channel (E-DPDCH)	Carries the E-DCH transport channel.	SF = 2 to 256
High Speed Dedicated Physical Control Channel (HS-DPCCH)	Carries uplink feedback signaling related to High Speed Downlink Shared Channel (HS-DSCH) transmission.	SF = 256

3.2.4.2 Channelization Codes

Channelization codes are used to separate different physical channels of the same carrier frequency, cell and user. The channelization operation is applied to the data part of physical channels. It transforms each data symbol into a number of chips. The number of chips per data symbol is called Spreading Factor (SF). The symbol rate of the resulting channel equals the chip rate of the total signal divided by the spreading factor:

Symbol rate (Channel) = 3.84 Mcps / SF (Channel)

The transformation operation involves channelization codes $c_{SF,m}$ defined in terms of the spreading factor SF and a code number m ranging from 0 to SF - 1. The codes $c_{SF,m}$ are called Orthogonal Variable Spreading Factor (OVSF) codes and are derived from a hierarchical tree:

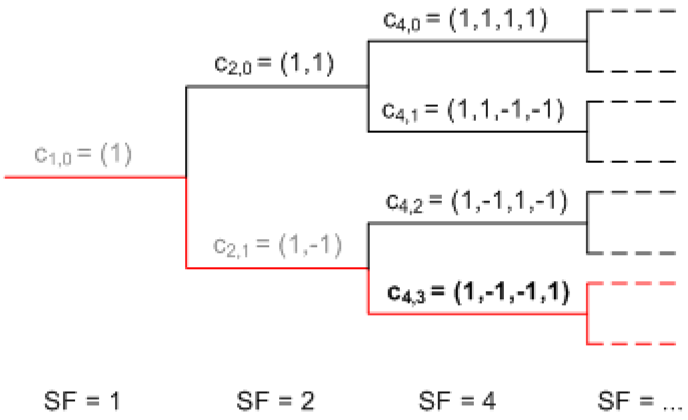


The following rule has to be observed for assignment of channelization codes in order to avoid code conflicts: Within each branch only one code can be used at the same time.

This means:

- Other codes on the path between the code and the root of the tree must not be used.
- Codes in sub-branches of the code (to the right of the code) must not be used.

For an example see the figure below. The red parts are blocked when $c_{4,3}$ is used.



3.2.4.3 Operating Bands

The carrier frequencies for WCDMA uplink signals are defined in 3GPP TS 25.101 (except the S and L operating bands which are not standardized). Each operating band contains a number of uplink carrier frequencies and corresponding channel numbers (UARFCN, UTRA Absolute Radio Frequency Channel Number). The assignment between channel numbers N and carrier center frequencies F is defined as:

$N = 5 * (F - F_{Offset}) / MHz$

The table below provides an overview of all bands. For each band it lists the offset frequencies F_{Offset}, channel numbers N and carrier center frequencies F. For some operating bands a second row indicates additional center frequencies, which are shifted by 100 kHz relative to the normal 200 kHz raster. The channel numbers for these additional frequencies are either explicitly listed or indicated as discontinuous range with a step width of 25. The related center frequencies are listed as discontinuous ranges.

Table 3-2: Operating bands for uplink signals

Band	F_{Offset} [MHz]	Channel No N	F [MHz]
1	0	9612 to 9888	1922.4 to 1977.6
2	0 1850.1	9262 to 9538 12 to 287 (step 25)	1852.4 to 1907.6 1852.5 to 1907.5
3	1525	937 to 1288	1712.4 to 1782.6
4	1450 1380.1	1312 to 1513 1662 to 1862 (step 25)	1412.4 to 1752.6 1712.5 to 1752.5

Band	F_{Offset} [MHz]	Channel No N	F [MHz]
5	0 670.1	4132 to 4233 782, 787, 807, 812, 837, 862	826.4 to 846.6 826.5 to 842.5
6	0 670.1	4162 to 4188 812, 837	832.4 to 837.6 832.5, 837.5
7	2100 2030.1	2012 to 2338 2362 to 2687 (step 25)	2502.4 to 2567.6 2502.5 to 2567.5
8	340	2712 to 2863	882.4 to 912.6
9	0	8762 to 8912	1752.4 to 1782.4
10	1135 1075.1	2887 to 3163 3187 to 3462 (step 25)	1712.4 to 1767.6 1712.5 to 1767.5
11	733	3487 to 3587	1430.4 to 1450.4
12	-22 -39.9	3612 to 3678 3702, 3707, 3732, 3737, 3762, 3767	700.4 to 713.6 700.5 to 713.5
13	21 11.1	3792 to 3818 3842, 3867	779.4 to 784.6 779.5, 784.5
14	12 2.1	3892 to 3918 3942, 3967	790.4 to 795.6 790.5, 795.5
19	770 755.1	312 to 363 387, 412, 437	832.4 to 842.6 832.5, 837.5, 842.5
20	-23	4287 to 4413	834.4 to 859.6
21	1358	462 to 512	1450.4 to 1460.4
S	0 1000.1	10012 to 10088 5012 to 5087 (step 25)	2002.4 to 2017.6 2002.5 to 2017.5
S 170 MHz	0	10050 to 10100	2010.0 to 2020.0
S 190 MHz	0 1000.1	10000 to 10050 5012, 5037	2000.0 to 2010.0 2002.5, 2007.5
L	0 -30.1	8145 to 8290 8295 to 8441	1629.0 to 1658.0 1628.9 to 1658.1

3.2.5 Limit Settings and Conformance Requirements

Conformance requirements for WCDMA transmitter tests are specified in 3GPP TS 34.121, section 5, "Transmitter Characteristics".

The following sections give an overview of the WCDMA multi evaluation limit settings and the related test requirements.

3.2.5.1 Transmit Modulation Limits

A poor modulation accuracy of the UE transmitter increases the transmission errors in the uplink channel of the WCDMA network. The Error Vector Magnitude (EVM) is the critical quantity to assess the modulation accuracy of a WCDMA UE.

According to 3GPP, the EVM measured at UE output powers ≥ −20 dBm and under normal operating conditions shall not exceed 17.5 %. The frequency error shall not exceed ±0.1 ppm. Both values are set by default in the configuration dialog.

For the phase discontinuity 3GPP defines different requirements for signals with and without HSPA channels:

- For signals without HSPA channels the phase discontinuity measured between any two adjacent slots shall be less than or equal to 36°. If a phase discontinuity measurement is greater than 36° then the next four measurements shall be less than or equal to 36°. No measurement shall exceed 66°.
- For signals with HSPA channels, the phase discontinuity must not exceed 36°. This limit must be checked at two specific measurement points of the transmitted UE on/off pattern. The pattern that must be transmitted by the UE is the same as for the HS-DPCCH Power Step measurement, test case "TPC 0 dB" (see chapter 3.2.5.3, "Power Control Limits", on page 108).
  For a measurement conform to 3GPP use the default measurement positions (0.5 slots and 10.5 slots). Trigger the measurement using the HS-DPCCH trigger offered by the WCDMA generator or an external trigger one half-slot before the pattern starts with the DTX > ACK/NACK boundary.
  According to 3GPP the same measurement points can be used for the EVM limit check. However the R&S CMW checks the limit for all EVM results.

The configuration dialog provides separate phase discontinuity limit sets for signals with HSPA channels ("Phase Disc. HS-DPCCH") and without HSPA channels ("UE Phase Discontinuity"). Which limit set is active depends on the selected measurement period. A half-slot measurement is suitable for signals with HSPA channels (option R&S CMW-KM401 required), a full-slot measurement for signals without HSPA channels. See also parameter "Modulation / CDP > Measurement Period" on page 138.

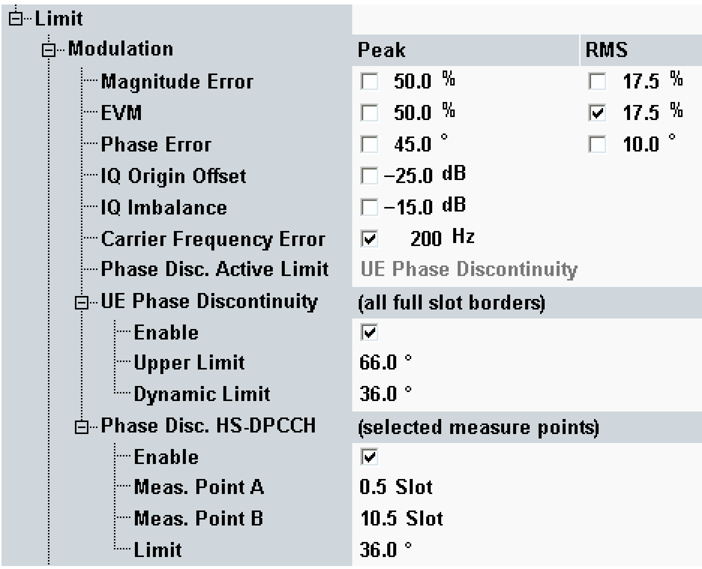


Fig. 3-4: Modulation limit settings

The table below lists the test requirements of 3GPP TS 34.121.

Characteristics	Refer to 3GPP TS 34.121, section...	Specified Limit
EVM (RMS)	5.13.1 Error Vector Magnitude (EVM) 5.13.1A Error Vector Magnitude (EVM) with HS-DPCCH	< 17.5 %
Frequency Error	5.3 Frequency Error	< 0.1 ppm
Phase Discontinuity	5.13.3 UE Phase Discontinuity 5.13.1AA Error Vector Magnitude (EVM) and phase discontinuity with HS-DPCCH	< 36° or 66°, see above for details

3.2.5.2 Code Domain Limits

According to the conformance requirements the Relative Code Domain Error (RCDE) has to be measured for several UL signal configurations. The RCDE is affected by the beta values and spreading factors (SF) of the configured UL channels. The Effective Code Domain Power (ECDP) is defined to capture both effects into one parameter. The ECDP of a channel is calculated from the nominal CDP and the SF of the channel as follows:

*ECDP [dB] = Nominal CDP + 10*log(SF/256)*

The nominal CDP of a channel is calculated from the beta factor of the channel (β_{CH}) and the beta factors of all active channels (β_i):

$$\text{Nominal CDP [dB]} = 10 \cdot \log_{10}\left(\frac{\beta_{CH}^2}{\sum \beta_i^2}\right)$$

Both ECDP and nominal CDP are rounded to one decimal place.

To calculate ECDP and nominal CDP, the configured channels, their beta factors and spreading factors (SF) must be known by the instrument. Use the section "Expected ECDP" of the configuration dialog to specify this information. Activate exactly the channels configured in the UL signal and specify the beta values (the denominators are fix) and spreading factors. The resulting nominal CDP and ECDP values are displayed for information.

For the HS-DPCCH you can configure three sets of values, depending on whether the HS-DPCCH transports an ACK, NACK or CQI. Use parameter "Used HS-DPCCH Config" to select which of the three sets is displayed and applied for the HS-DPCCH.

If the combined signal path scenario is active, the required information is delivered by the signaling application and displayed for information. In that case you need only to select which set of values shall be used for the HS-DPCCH.

The default values for the channels DPCCH, DPDCH and HS-DPCCH correspond to subtest 1 as specified in 3GPP TS 34.121, table C.10.1.4.

The default values for the enhanced channels correspond to subtest 4 as specified in 3GPP TS 34.121, table C.11.1.3.

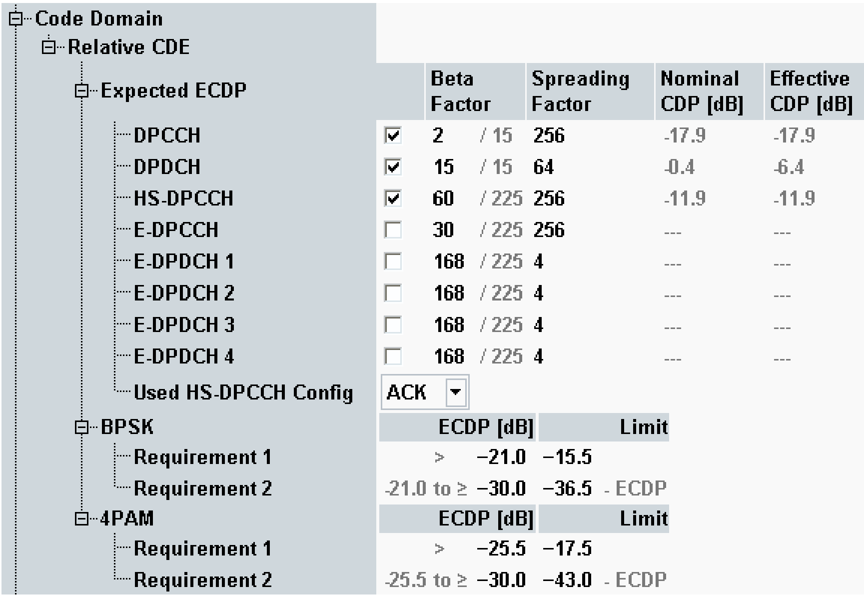


Fig. 3-5: Relative CDE limit settings

The RCDE limits defined in 3GPP TS 34.121 depend on the modulation types of the channels. A single uplink channel is either BPSK or 4PAM modulated and located on one branch (I or Q) at a time. The combination of two BPSK or 4PAM modulated channels, one on the I branch and one on the Q branch, may result in a constellation diagram resembling a QPSK or 16QAM modulation. These terms are used by 3GPP.

3GPP defines two requirements for each modulation type. The BPSK limits depend on the presence of 4PAM modulated channels in the signal. All limits are described below.

Only BPSK Modulated Channels Configured

This section applies if the uplink signal contains only BPSK modulated channels, i.e. no 4PAM modulated channels at all are configured. The requirements are described in the following 3GPP TS 34.121 sections:

- 5.13.2A Relative Code Domain Error with HS-DPCCH
- 5.13.2B Relative Code Domain Error with HS-DPCCH and E-DCH

Limit checks are required if the following conditions are met for all channels:

- nominal CDP ≥ -20 dB
- ECDP ≥ -30 dB

These conditions are not checked automatically. Please enable/disable the limit checks of the individual channels manually, according to the displayed nominal CDP and ECDP values.

The applicable limits are listed in the following table.

Table 3-3: Limits for BPSK modulated channels (no 4PAM channels present)

ECDP	RCDE Limit
ECDP > -21 dB	≤ -15.5 dB
-21 dB ≥ ECDP ≥ -30 dB	≤ -36.5 dB - ECDP

These limits are configured as default values in the configuration dialog.

4PAM Modulated Channels Configured

This section applies if the uplink signal contains at least one 4PAM modulated channel. BPSK modulated channels may also be configured. The requirements are described in the following 3GPP TS 34.121 section:

- 5.13.2C Relative Code Domain Error for HS-DPCCH and E-DCH with 16QAM

According to 3GPP limit checks are required if the following conditions are met for all channels:

- nominal CDP ≥ -30 dB
- ECDP ≥ -30 dB

These conditions are not checked automatically. Please enable/disable the limit checks of the individual channels manually, according to the displayed nominal CDP and ECDP values.

The applicable limits differ for BPSK and 4PAM modulated channels and are listed in the following tables.

Table 3-4: Limits for BPSK modulated channels (4PAM channels present)

ECDP	RCDE Limit
ECDP > -22 dB	≤ -17.5 dB
-22 dB ≥ ECDP ≥ -30 dB	≤ -39.5 dB - ECDP

Table 3-5: Limits for 4PAM modulated channels

ECDP	RCDE Limit
ECDP > -25.5 dB	≤ -17.5 dB
-25.5 dB ≥ ECDP ≥ -30 dB	≤ -43 dB - ECDP

The 4PAM limits are configured as default values in the configuration dialog. The BPSK limits have to be adjusted if 4PAM channels are present.

3.2.5.3 Power Control Limits

The transmission of ACK/NACK or CQI over the HS-DPCCH causes UE power steps. The allowed limits for these power steps are defined in 3GPP TS 34.121, section 5.7A "HS-DPCCH power control". Two test cases are distinguished in the specification:

- Measurement at maximum UE power with TPC command = 1 ("TPC 1dB")
- Measurement below maximum UE power with TPC command = 0 ("TPC 0dB")

For these test cases the UE must transmit specific patterns of ACK/NACK and CQI via the HS-DPCCH, as defined in the specification. To perform a conformance test ensure that the UE transmits the required pattern. Trigger the measurement using the HS-DPCCH trigger offered by the WCDMA generator or an external trigger one half-slot before the pattern starts with the DTX > ACK/NACK boundary.

The specification defines power step limit ranges for both test cases, for power steps caused by TPC commands as well as for power steps at the boundaries between ACK/NACK, CQI and DTX transmission. The limit ranges are calculated as follows:

First a nominal power step size is defined. This nominal power step size is rounded to the closest integer dB value. The integer value determines the tolerance (see table in specification and configuration dialog below). Finally the allowed limit range is calculated as the range between nominal power step size and integer value extended by the tolerance.

Example: nominal power step size at boundary DTX > ACK/NACK = 6.14 dB, integer value = 6 dB, tolerance = 2 dB, resulting range = (6-2 to 6.14+2)dB = 4 dB to 8.14 dB.

The configuration dialog allows to set the following values:

- Nominal power step sizes for the boundaries DTX > ACK/NACK, ACK/NACK > CQI and CQI > DTX. The TPC nominal power step size is determined by the test case. The other required nominal power step sizes are calculated from these values (e.g. limit "DTX > CQI" = - limit "CQI > DTX"). All settings are located in the "HS-DPCCH Power Steps" section, see figure below.
- Tolerance values for several power step integer values. These settings are located in the "Exp. Power Step Limit" section, see figure below.

The HS-DPCCH power step limits are only active ("Active Limit Set" = "HS-DPCCH") when a half-slot measurement period is selected (option R&S CMW-KM401 required). See also parameter "Modulation / CDP > Measurement Period" on page 138.

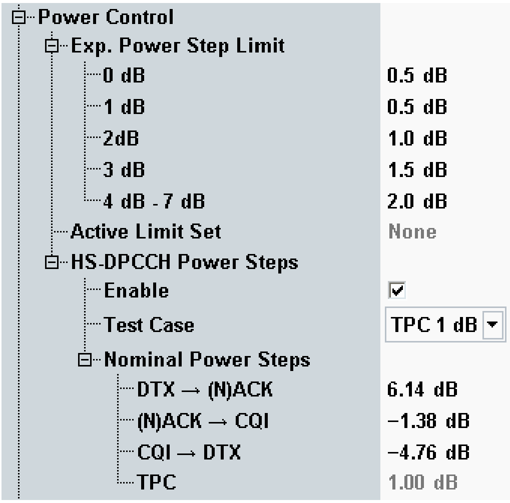


Fig. 3-6: Power control limit settings

The TPC measurement provides additional power control tests and limit checks, see chapter 4.2.6, "Limit Settings and Conformance Requirements", on page 296.

3.2.5.4 ACLR Limits

The energy that spills outside the designated radio channel increases the interference with adjacent channels and decreases the system capacity. The amount of unwanted off-carrier energy is assessed by the out-of-band emissions (excluding spurious emissions) that are specified in terms of the Adjacent Channel Leakage power Ratio (ACLR) and the Spectrum Emission Mask.

The ACLR limits are defined in the configuration dialog.

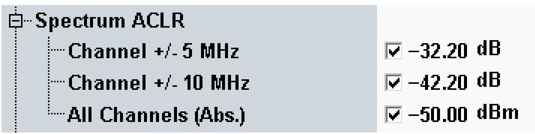


Fig. 3-7: ACLR limit settings

For both power class 3 and power class 4 UE, the ACLR shall not exceed –32.2 dB at frequencies ±5 MHz from the carrier (channels ±1) and –42.2 dB at frequencies ±10 MHz from the carrier (channels ±2). The limits must be met if the adjacent channel power is larger than –50 dBm (absolute limit).

The table below lists the test requirements of specification 3GPP TS 34.121.

Characteristics	Refer to 3GPP TS 34.121, section...	Specified Limit
ACLR	5.10 Adjacent Channel Leakage power Ratio (ACLR) 5.10A Adjacent Channel Leakage power Ratio (ACLR) with HS-DPCCH 5.10B Adjacent Channel Leakage power Ratio (ACLR) with E-DCH	<–32.2 dB (channels ±1) <–42.2 dB (channels ±2)[1)]

Note 1) For compatibility with other R&S CMW measurements, we define the ACLR and the limits with a relative minus sign compared to the 3GPP specification.

ACLR values are available as absolute power levels (dBm) and as power levels relative to the carrier power (dB). The relative power levels are used to check relative limits, the absolute power levels to check absolute limits. The absolute power levels are derived from the relative power levels via a conversion procedure. For current values the conversion is based on the current carrier power. For average and maximum values it is based on the average carrier power.

3.2.5.5 Spectrum Emission Mask

The spectrum emission mask complements the ACLR Limits. The limits are defined in the configuration dialog.

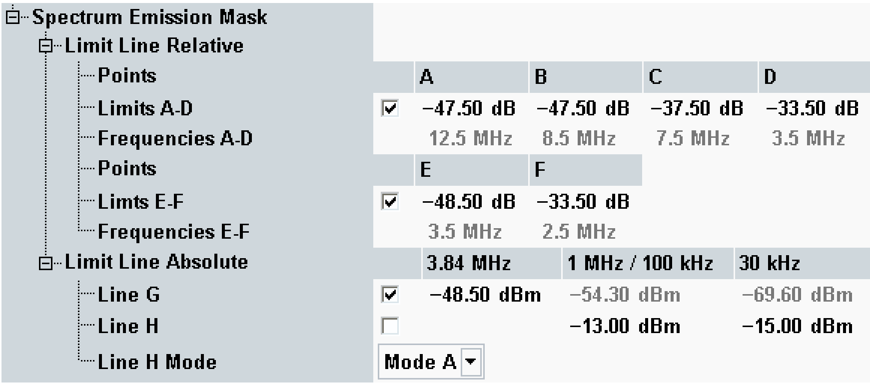


Fig. 3-8: Spectrum emission mask limit settings

The mask is defined as described in the following tables. The corresponding R&S CMW settings (points and lines) are indicated.

These requirements are defined in 3GPP TS 34.121, sections 5.9 "Spectrum Emission Mask, 5.9A and 5.9B.

The first table lists a relative requirement (dB relative to carrier) and an absolute requirement (dBm). The higher of the two power limits applies.

Additionally the requirements in the subsequent tables have to be fulfilled, depending on the operating band. When you select an operating band with additional requirements, the "Line H Mode" is set automatically (a manual override is possible). The mode determines the frequency offset range to be used for the limit check (first column of the tables) and the measurement bandwidth (last column). The limit value settings (second column) are not influenced by the line H mode and have to be set manually.

Table 3-6: Spectrum emission mask

Frequency Offset from carrier Δf [1)]	Relative requirement	Absolute requirement 2)	Measurement bandwidth
2.5 MHz to 3.5 MHz	–33.5 dBc – 15*(Δf/MHz – 2.5) dBc (--> **Point E, F**)	-69.6 dBm (--> **Line G**)	30 kHz
3.5 MHz to 7.5 MHz	–33.5 dBc – 1*(Δf/MHz – 3.5) dBc (--> **Point C, D**)	-54.3 dBm (--> **Line G**)	1 MHz
7.5 MHz to 8.5 MHz	–37.5 dBc – 10*(Δf/MHz – 7.5) dBc (--> **Point B, C**)	-54.3 dBm (--> **Line G**)	1 MHz
8.5 MHz to 12.5 MHz	–47.5 dBc (--> **Point A, B**)	-54.3 dBm (--> **Line G**)	1 MHz

Table 3-7: Additional requirements for bands II, IV, X

Frequency Offset from carrier Δf 1)	Additional requirement	Measurement bandwidth
2.5 MHz to 3.5 MHz	–15 dBm (--> **Line H, mode A**)	30 kHz
3.5 MHz to 12.5 MHz	–13 dBm (--> **Line H, mode A**)	1 MHz

Table 3-8: Additional requirements for band V

Frequency Offset from carrier Δf 1)	Additional requirement	Measurement bandwidth
2.5 MHz to 3.5 MHz	–15 dBm (--> **Line H, mode B**)	30 kHz
3.5 MHz to 12.5 MHz	–13 dBm (--> **Line H, mode B**)	100 kHz

Table 3-9: Additional requirements for bands XII, XIII, XIV

Frequency Offset from carrier Δf 1)	Additional requirement	Measurement bandwidth
2.5 MHz to 2.6 MHz	–13 dBm (--> **Line H, mode C**)	30 kHz
2.6 MHz to 12.45 MHz	–13 dBm (--> **Line H, mode C**)	100 kHz

Note 1) Δf is the separation between the carrier frequency and the center of the measurement bandwidth. Each linear limit line section is defined by a pair of points (A, B), (B, C) ... (E, F), assuming a linear power/frequency dependence or by a horizontal line. The first and last measurement position depend on the measurement bandwidth and on the operating band. They are implemented as defined in 3GPP TS 34.121, section 5.9.

Note 2) The absolute limit equals –48.5 dBm referenced to a 3.84 MHz filter. The corresponding limits for a 1 MHz filter and a 30 kHz filter can be calculated from this limit as follows:

$$-48.5\ \mathrm{dBm} + 10 \cdot \log_{10}\left(\frac{1}{3.84}\right)\mathrm{dB} \approx -54.3\ \mathrm{dBm}$$

Fig. 3-9: Absolute limit for 1 MHz filter

$$-48.5\ \mathrm{dBm} + 10 \cdot \log_{10}\left(\frac{0.03}{3.84}\right)\mathrm{dB} \approx -69.6\ \mathrm{dBm}$$

Fig. 3-10: Absolute limit for 30 kHz filter

All measured spectrum emission values are relative to the UE output power measured in a 3.84 MHz bandwidth (reference power). These dB values are used to check relative limits. In order to check absolute limits, the relative spectrum emission values are converted into absolute values (dBm). For current values the conversion is based on the current reference power. For average and maximum values it is based on the average reference power.

The complete spectrum emission mask for band II is shown in the figure below.

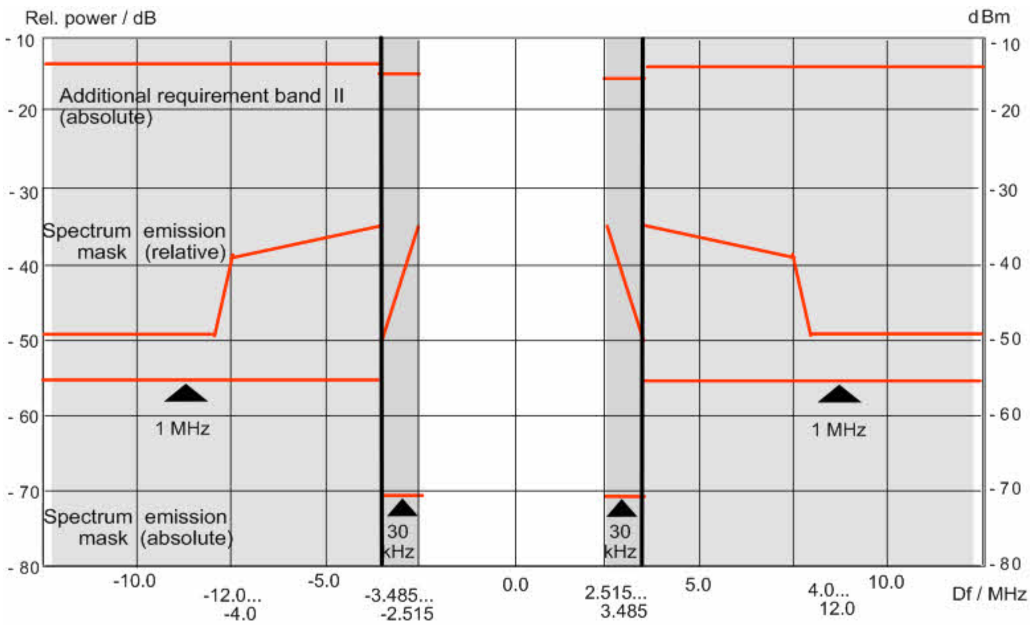


Fig. 3-11: Spectrum emission mask (band II)

3.2.6 Measurement Results

The results of the WCDMA multi evaluation measurement are displayed in several different views. Use the "Display" parameters to select the views and to change the appearance and contents of the views. The views are described in the following sections.

3.2.6.1 Overview

In the overview a selection of the following results can be displayed:

- Error Vector Magnitude (multislot and vs chip)
- Magnitude Error (multislot and vs chip)
- Phase Error (multislot and vs chip)
- I/Q Constellation Diagram
- Phase Discontinuity
- Frequency Error
- UE Power
- Power Steps
- Code Domain Monitor (CDM)
- Code Domain Power (CDP) vs Slot
- Relative CDE vs Slot
- ACLR
- Spectrum Emission Mask
- Most important results of detailed views "TX Measurement" and "RX Measurement"

See also: "TX Measurements" in the R&S CMW user manual, chapter "System Overview"

Fig. 3-12: WCDMA Multi Evaluation: Overview

The results to be measured and displayed in the overview can be limited using the hotkey "Assign Views", see "Assign Views (Hotkey)" on page 136.

You can enlarge one of the diagrams in the overview and show a detailed view with additional measurement results, see chapter 3.2.6.11, "Selecting and Modifying Views", on page 126.

The traces and bar graphs are described in the "Detailed Views" sections.

3.2.6.2 Detailed Views: Modulation, CDP and CDE

This section applies to the following detailed views:

- Error Vector Magnitude (multislot and vs chip)
- Magnitude Error (multislot and vs chip)
- Phase Error (multislot and vs chip)
- Frequency Error
- Code Domain Power (CDP) vs Slot
- Code Domain Error (CDE) vs Slot

Each of the detailed views shows a diagram and a statistical overview of single-slot results.

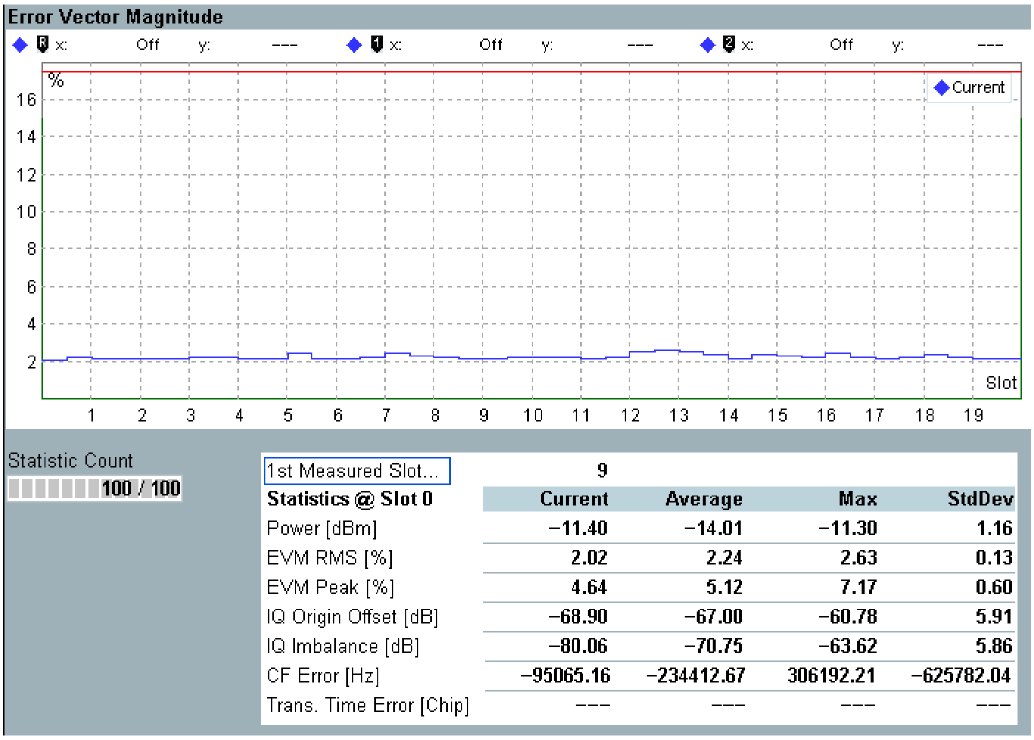


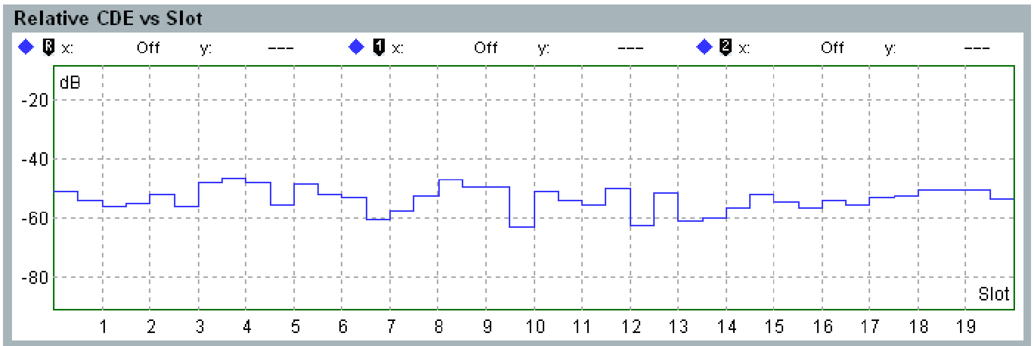
Fig. 3-13: WCDMA Multi Evaluation: EVM

- Error Vector Magnitude, Magnitude Error, Phase Error and Frequency Error
  The diagrams cover a time interval of up to 120 slots. The "Current" traces contain one measurement result per slot or half-slot, which is calculated as the average of the measured quantity of all samples in the slot or half-slot, excluding a 25 μs guard period at the beginning and at the end.
- Error Vector Magnitude vs Chip, Magnitude Error vs Chip, and Phase Error vs Chip
  The diagrams cover all 2560 chips of the "Preselected Slot" and contain one measurement result per chip.
- CDP vs Slot and CDE vs Slot
  The diagrams cover a time interval of up to 120 slots. The CDP or CDE of all uplink dedicated physical channels can be displayed simultaneously. A gap within a line indicates that the channel was not present (detected) during that time. The code domain measurements are not relevant for QPSK-modulated signals (see parameter "UL Configuration" on page 133).
  See also chapter 3.2.4.1, "Dedicated Physical Channels", on page 101

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.3 Detailed Views: Relative CDE

The Relative Code Domain Error (RCDE) results are displayed in a diagram and two tables.



Statistic Count 10 / 10

1st Measured Slot No	7				
Statistics @ Slot 0	**Curr**	**Avg**	**Max**	**StdDev**	**SF**
DPCCH [dB]	−50.85	−51.27	−50.19	1.07	256
DPDCH [dB]	−51.74	−52.21	−50.76	1.00	256
HS-DPCCH [dB]	---	---	---	---	---
E-DPCCH [dB]	NCAP	NCAP	NCAP	NCAP	NCAP
E-DPDCH1 [dB]	NCAP	NCAP	NCAP	NCAP	NCAP
E-DPDCH2 [dB]	NCAP	NCAP	NCAP	NCAP	NCAP
E-DPDCH3 [dB]	NCAP	NCAP	NCAP	NCAP	NCAP
E-DPDCH4 [dB]	NCAP	NCAP	NCAP	NCAP	NCAP

Overall Channel Info		
State	**SF**	**Modulation**
On	256	BPSK
On	256	BPSK
Var	256	BPSK
NCAP	NCAP	NCAP
NCAP	NCAP	NCAP
NCAP	NCAP	NCAP
NCAP	NCAP	NCAP
NCAP	NCAP	NCAP

Fig. 3-14: WCDMA Multi Evaluation: RCDE results

Each RCDE vs slot value is determined by projecting the error vector onto the code domain. As defined by 3GPP, the error vector is calculated relative to the reference signal of the channel (in contrast to CDE vs slot results, for which the error vector is calculated relative to the entire composite reference signal).

The diagram covers a time interval of up to 120 slots with one measurement result per slot or half-slot. The RCDE of all uplink dedicated physical channels can be displayed simultaneously. A gap within a line indicates that the channel was not present (detected) during that time. See also chapter 3.2.4.1, "Dedicated Physical Channels", on page 101.

The table to the left provides a statistical overview of RCDE single-slot results and the current spreading factor (SF).

The "Overall Channel Info" table to the right shows results related to the entire measurement duration and allows to assess the stability of the physical channels concerning presence, SF and modulation type.

- State:
  On = Channel on since start of measurement
  Off = Channel off since start of measurement
  Var = Channel has been on and off
- SF:
  <SF> = constant spreading factor <SF>
  <SF> (Var) = varying spreading factor, <SF> is smallest value
- Modulation:
  BPSK / 4PAM = constant modulation type
  4PAM (Var) = BPSK and 4PAM occurred

You can use the overall channel info to verify the success of the measurement. Critical values are:

- "Var" values (instability)
- State = Off for configured channels
- Unexpected SF or modulation type

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.4 Detailed Views: I/Q Constellation Diagram

The constellation diagram shows the modulation symbols as points in the I/Q plane.

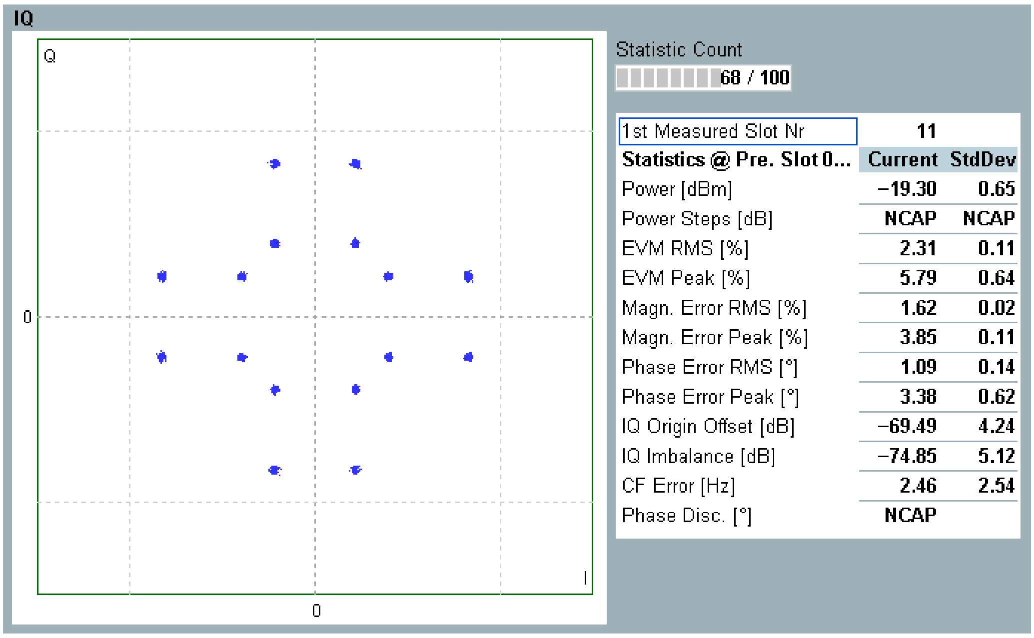


Fig. 3-15: WCDMA Multi Evaluation: I/Q constellation diagram

The constellation diagram depends on the modulation type. For an ideal single QPSK signal, the constellation diagram consists of four points, located on a circle around the origin, with relative phase angles of 90 deg. If several physical channels with different power levels contribute to the analyzed signal, more constellation points occur. The example above shows a signal configuration including high speed channels.

For QPSK signals the correct orientation of the diagram has to be selected to determine correct I/Q imbalance results, see parameter "Modulation / CDP > Rotation" on page 140.

See also: "I/Q Constellation Diagram" in the R&S CMW user manual, chapter "System Overview"

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.5 Detailed Views: UE Power and Power Steps

Each of the detailed views shows a diagram and a statistical overview of single-slot results.

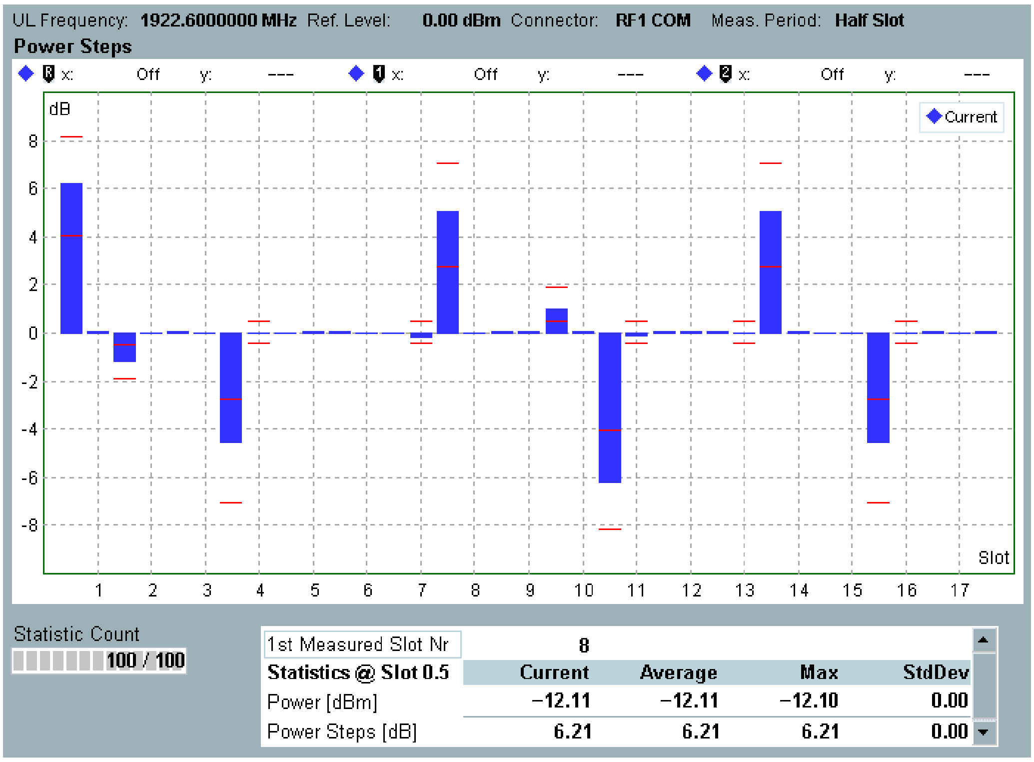


Fig. 3-16: WCDMA Multi Evaluation: Power Steps (with HSPA channels, test case "TPC 0 dB")

- Power
  Transmitter output power of the UE, measured in a bandwidth of at least (1+α) times the chip rate, where α is the roll-off factor of the WCDMA channel filter. The UE power corresponds to the "mean power" defined in 3GPP TS 34.121.
  The diagram covers a time interval of up to 120 slots. The "Current" traces contain one measurement result per slot or half-slot, which is calculated as the average of the measured quantity of all samples in the slot or half-slot, excluding a 25 μs guard period at the beginning and at the end.
- Power Steps
  The bar graph covers a time interval of up to 120 slots. For each slot boundary it displays the difference between the UE power of the previous and the next slot (for a half-slot "Measurement Period": the difference between the previous and next half-slot for each half-slot boundary).
  The example above shows a half-slot measurement. The red limit lines display the limit ranges resulting from the HS-DPCCH limit set with test case "TPC 0 dB", see chapter 3.2.5.3, "Power Control Limits", on page 108.

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

Additional UE power and power step measurements of Release 99 uplink signals are provided by the TPC measurement, see chapter 4, "WCDMA TPC Measurement", on page 287.

3.2.6.6 Detailed Views: Phase Discontinuity

The phase discontinuity is displayed in a bar graph and as statistical data.

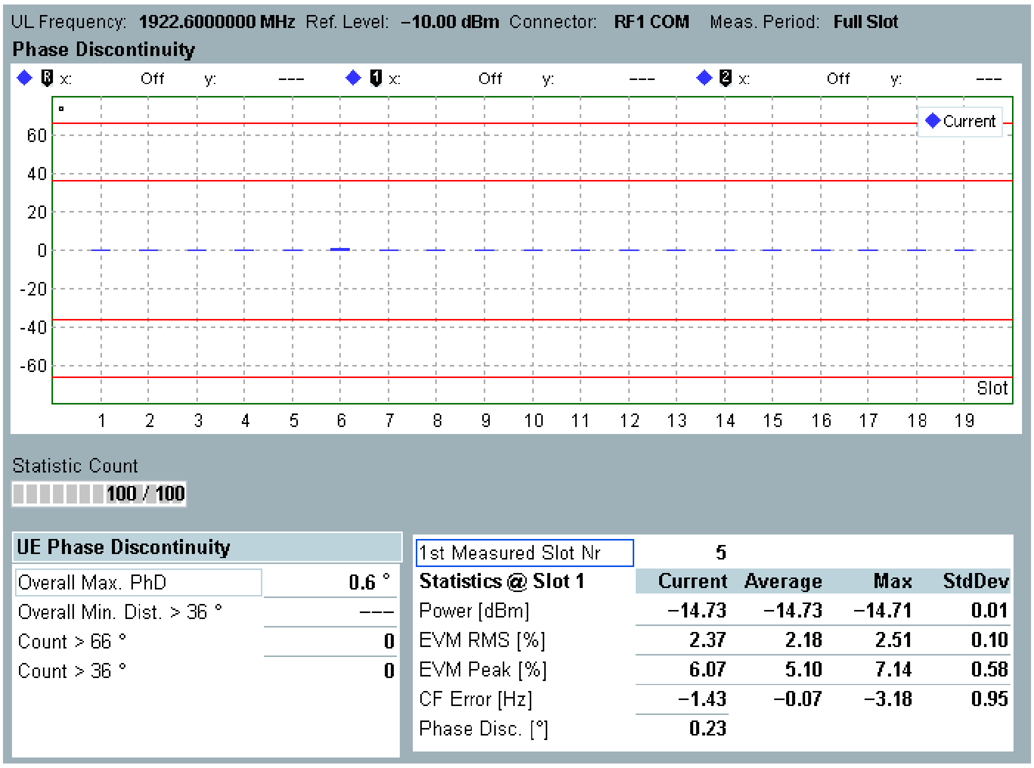


Fig. 3-17: WCDMA Multi Evaluation: Phase Discontinuity (configuration without HSPA channels)

The bar graph of a full-slot measurement shows the phase discontinuity at up to 119 slot boundaries. The bar graph of a half-slot measurement shows the phase discontinuity at the boundaries between first and second half-slot of up to 120 slots.

Below the bar graph two tables display statistical data. The table to the left is directly related to the limits. The applicable limits depend on the measurement period. Different data is displayed for half-slot measurements (used to measure signals with HSPA channels) and full-slot measurements (used to measure signals without HSPA channels). Both table versions are described below.

See also parameter "Modulation / CDP > Measurement Period" on page 138 and chapter 3.2.5.1, "Transmit Modulation Limits", on page 104

UE Phase Discontinuity (configuration without HSPA channels)

All values are related to the entire measurement duration:

- Overall Maximum Phase Discontinuity since the start of the measurement

- Overall Minimum Distance > 36°: Minimum slot distance (since the start of the measurement) between phase discontinuity results exceeding the dynamic limit
- Count > 66°: Number of phase discontinuity results exceeding the upper limit. The value 66° is the default upper limit. If the upper limit has been modified, the new value is displayed instead.
- Count > 36°: Number of phase discontinuity results exceeding the dynamic limit. The value 36° is the default dynamic limit. If the dynamic limit has been modified, the new value is displayed instead.

The values 36° and 66° are administrable limits.

Phase Discontinuity HS-DPCCH (configuration with HS-DPCCH)

The following data is displayed instead of the "UE Phase Discontinuity".

Phase Discontinuity HS-DPCCH		
Overall Max. PhD	43.1 °	
Measure Points	76	
Count > 36 °	0	0.00 %
PhD (HS-DPCCH)	**Current**	**Maximum**
A @ Slot 0.5	6.1 °	17.1 °
B @ Slot 10.5	2.5 °	17.7 °

- Overall Maximum Phase Discontinuity since the start of the measurement
- Measure Points: number of points (A + B) measured since the start of the measurement
- Count > 36°: Number of phase discontinuity results exceeding the limit. All results measured at point A or B are considered. The count is indicated as absolute number and as percentage of the "Measure Points". The value 36° is the default limit value. If the limit has been modified, the new value is displayed instead.
- Phase Discontinuity at point A and point B. "Current" shows the result obtained in the last measurement interval while "Maximum" refers to the largest "Current" value since the start of the measurement.

Additional information: Phase Discontinuity

Phase discontinuity is the change in phase between two adjacent timeslots. The phase discontinuity is measured in accordance with the definition of the conformance test specification 3GPP TS 34.121:

For full-slot measurements (no HSPA channels) a linear best-fit to the phase error curve in each timeslot (excluding the 25 µs transient periods on either side of the timeslot boundaries) and an extrapolation onto the slot boundaries yields an estimate of the phase error at the beginning and at the end of each slot. The phase discontinuity is defined as the difference between the extrapolated phase at the end of the timeslot preceding the slot boundary and the extrapolated phase at the start of the timeslot following the slot boundary.

For configurations with HSPA channels a timing offset of one half-slot between a DPCCH timeslot and a HS-DPCCH timeslot is required (according to 3GPP TS 34.121). Thus the HS-DPCCH slot boundaries are located at the middle of the DPCCH timeslots, between the first and second half-slot. Using a half-slot measurement, a linear best-fit is applied to the phase error curve in each half-slot (excluding the 25 µs transient periods) and extrapolated onto the boundary between the first and second half-slot. The phase discontinuity is defined as the difference between the extrapolated phase at the end of the first half-slot and the extrapolated phase at the start of the second half-slot.

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.7 Detailed Views: CD Monitor

The code domain monitor displays the Code Domain Power (CDP) and Code Domain Error (CDE) for all code channels, measured in the "Preselected Slot". The code domain measurements are not relevant for QPSK-modulated signals (see parameter "UL Configuration" on page 133).

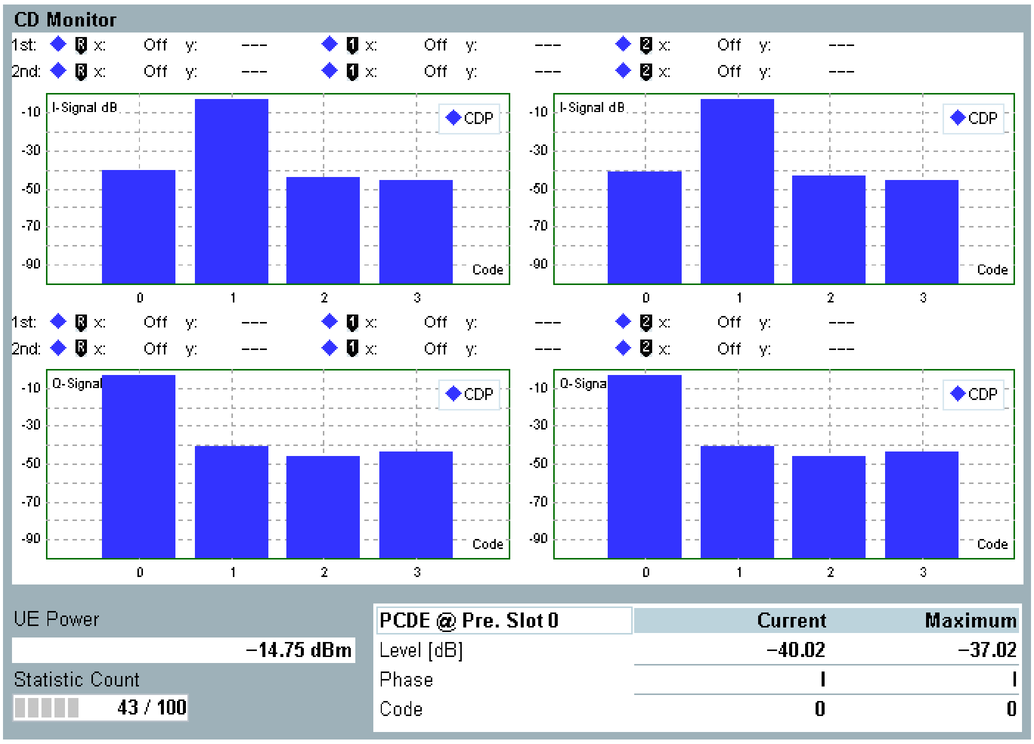


Fig. 3-18: WCDMA Multi Evaluation: CD Monitor (half-slot measurement, CDP only)

Separate bar graphs are available for the I-branch and the Q-branch of the signal. For each bar graph the displayed trace type (CDP and/or CDE) can be selected. The example above shows the bar graphs of a half-slot measurement. Both the results for the first half-slot (left) and the second half-slot (right) are displayed. For a full-slot measurement the view contains two bar graphs instead of four.

The results are determined assuming a selectable uniform spreading factor (SF) for all channels (see parameter "Modulation / CDP > CDP Spreading Factor" on page 140). The number of displayed bars (code channels) corresponds to the selected SF. A signal component with a spreading factor smaller than the selected SF occupies several adjacent bars.

The table below the bar graphs provides information concerning the Peak Code Domain Error (PCDE). In addition to the PCDE value (Level [dB]) the Phase (I-Signal or Q-Signal) and the Code of the channel where the PCDE was measured are displayed in the table. For a PCDE measurement conform to 3GPP TS 34.121 the spreading factor must be set to 4.

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.8 Detailed Views: ACLR

The ACLR results are measured in the "Preselected Slot". The results are displayed in a bar graph and as a table of statistical results.

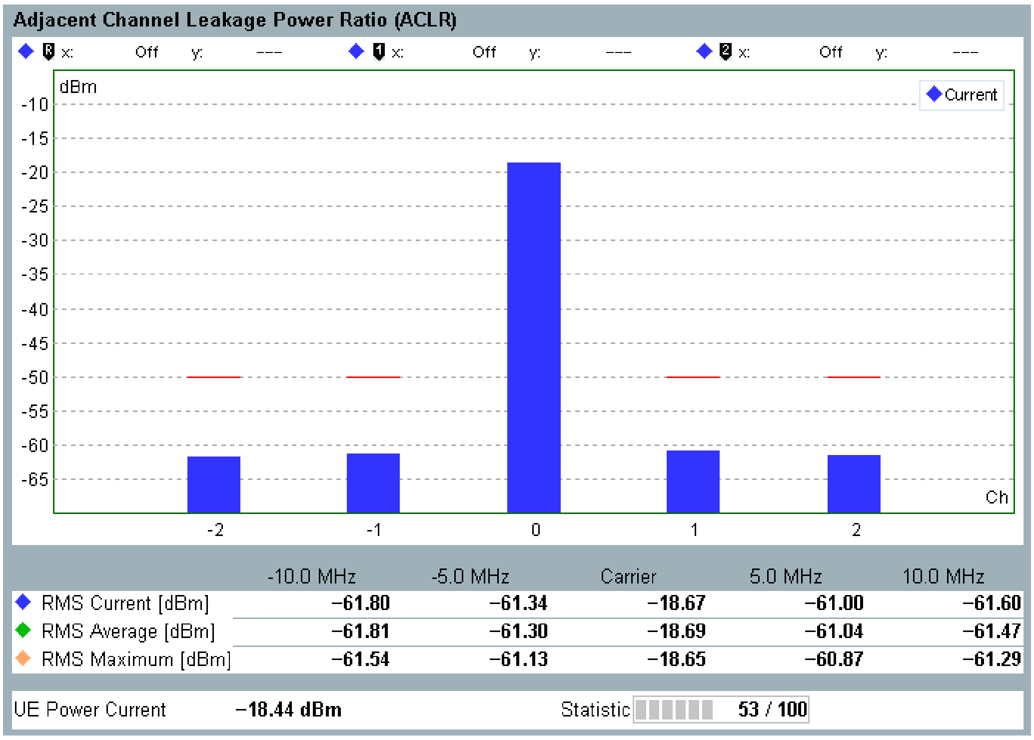


Fig. 3-19: WCDMA Multi Evaluation: ACLR

The method of measurement ensures that the results correspond to the ACLR specified in 3GPP TS 34.121 where a WCDMA channel filter is used. According to the specification, ACLR tests must be carried out at maximum output power of the UE.

The central bar shows the power at the nominal carrier frequency (UL Frequency); the bars ±1 correspond to the 1st adjacent channels (±5 MHz from the UL frequency) and the 2nd adjacent channels (±10 MHz from the UL frequency). Either the "Current", "Average" or "Maximum" values can be displayed in the bar graph. The table below the bar graph provides all these values.

The adjacent channel powers can be displayed as relative power levels (dB) referenced to the carrier power or as absolute power levels (dBm). The absolute power levels are derived from the relative power levels via a conversion procedure. For current values the conversion is based on the current carrier power. For average and maximum values it is based on the average carrier power.

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.9 Detailed Views: Spectrum Emission Mask

The spectrum emission of the UE is measured in the "Preselected Slot". The results are displayed in a diagram and as a table of statistical results.

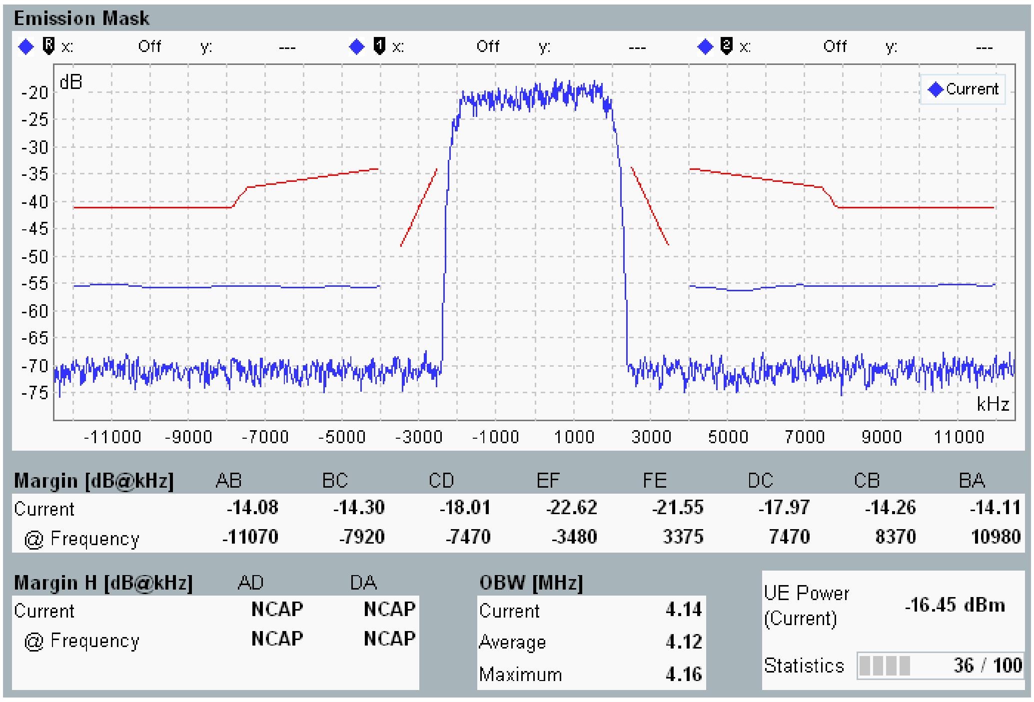


Fig. 3-20: WCDMA Multi Evaluation: Emission Mask

The measurement covers a symmetric, 25 MHz wide frequency range around the UE center carrier frequency. The maximum display range is [carrier frequency -12.5 MHz, carrier frequency +12.5 MHz]. According to the specification 3GPP TS 34.121, a resolution filter of Gaussian shape with a bandwidth of 30 kHz, 100 kHz or 1 MHz is used. All measured spectrum emission values are relative to the UE output power measured in a 3.84 MHz bandwidth (reference power).

The example shows results measured with the 30 kHz filter bandwidth (lower blue curve, including the center) and 1 MHz bandwidth (curves at offset frequencies larger than 4 MHz).

The "Margin" and "Margin H" tables below the diagram contain values which are relevant for the limit check; see chapter 3.2.5.5, "Spectrum Emission Mask", on page 110.

The "Margin" values indicate the vertical distance between the spectrum emission mask and the result trace. Within each limit line section (e.g. "AB") the margin represents the "worst" value, i.e. the maximum determined for the frequencies of the section:

Margin = maximum (P(f)trace - P(f)mask)

A positive margin indicates that the limit is exceeded. The X-position of each margin (offset frequency at which the margin has been found) is displayed below the margin value.

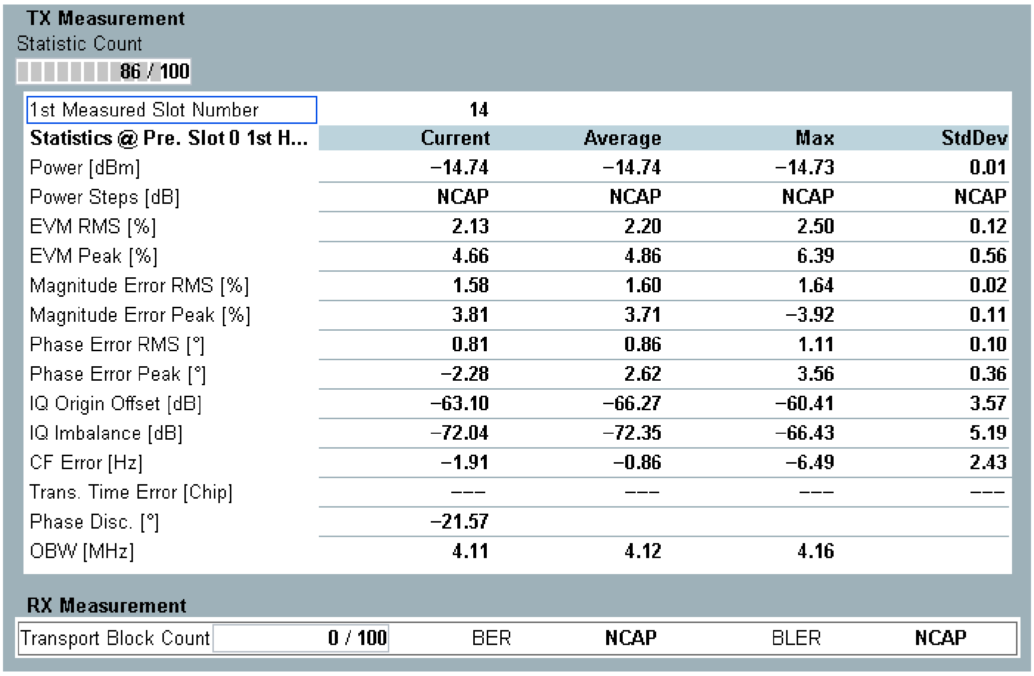
In the same way, the "Margin H" values indicate distances to limit "Line H" (additional requirements).

The Occupied Bandwidth (OBW) is defined as width of a frequency range around the assigned channel frequency containing 99% of the total integrated power of the transmitted spectrum.

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.10 TX Measurement and RX Measurement

This view contains tables of statistical results for the TX and RX measurements.



TX Measurement

Statistic Count

86 / 100

1st Measured Slot Number	14			
Statistics @ Pre. Slot 0 1st H...	**Current**	**Average**	**Max**	**StdDev**
Power [dBm]	-14.74	-14.74	-14.73	0.01
Power Steps [dB]	NCAP	NCAP	NCAP	NCAP
EVM RMS [%]	2.13	2.20	2.50	0.12
EVM Peak [%]	4.66	4.86	6.39	0.56
Magnitude Error RMS [%]	1.58	1.60	1.64	0.02
Magnitude Error Peak [%]	3.81	3.71	-3.92	0.11
Phase Error RMS [°]	0.81	0.86	1.11	0.10
Phase Error Peak [°]	-2.28	2.62	3.56	0.36
IQ Origin Offset [dB]	-63.10	-66.27	-60.41	3.57
IQ Imbalance [dB]	-72.04	-72.35	-66.43	5.19
CF Error [Hz]	-1.91	-0.86	-6.49	2.43
Trans. Time Error [Chip]	---	---	---	---
Phase Disc. [°]	-21.57			
OBW [MHz]	4.11	4.12	4.16	

RX Measurement

Transport Block Count	0 / 100	BER	NCAP	BLER	NCAP

Fig. 3-21: WCDMA Multi Evaluation: Overview of statistical results

TX Measurement

The table provides an overview of statistical values measured in the "Preselected Slot". Other detailed views provide a subset of these values:

- Power: Transmitter output power of the UE, see also chapter 3.2.6.5, "Detailed Views: UE Power and Power Steps", on page 118.
- Power Steps: Difference between the UE power of the preselected (half-) slot and the previous (half-) slot, see also chapter 3.2.6.5, "Detailed Views: UE Power and Power Steps", on page 118.
- EVM, Magnitude Error, Phase Error, I/Q Origin Offset, I/Q Imbalance and Carrier Frequency Error.
- Transmit Time Error: Difference between the actual timing and the expected timing. The timing error measurement requires an "external" trigger signal to derive the expected timing. Suitable trigger signals are e.g. the frame trigger signal provided by the signaling application or an external trigger fed in at the TRIG A or TRIG B connector.
  Please check the data sheet to verify whether the timing error measurement has already been officially released and provides a sufficient accuracy.

- Phase Discontinuity: change in phase between two adjacent timeslots, see also "Additional information: Phase Discontinuity" on page 121.
- Occupied Bandwidth (OBW): width of a frequency range around the assigned channel frequency containing 99% of the total integrated power of the transmitted spectrum.

See also: "TX Measurements" in the R&S CMW user manual, chapter "System Overview"

RX Measurement

For information about this measurement refer to chapter 3.2.2, "WCDMA RX Tests", on page 96.

The table provides the following results:

- Transport Block Count: Number of transport data blocks received since the start of the measurement
- Bit Error Rate (BER): Percentage of received data bits that were erroneous
- Block Error Ratio (BLER): Percentage of received transport data blocks containing at least one erroneous bit. One data block contains 244 bits.

For additional information refer to chapter 3.2.6.13, "Common View Elements", on page 127.

3.2.6.11 Selecting and Modifying Views

Use the "Display" parameters to select the views and to change the appearance and contents of the views. Depending on the selected view the following "Display" hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Select View ..."	Switch to a certain detailed view or overview. Alternatively select a diagram in the overview and press ENTER or the rotary knob.
"Select Trace ..."	Select the trace types to be displayed in the view.
"X Scale... / Y Scale... / Scale IQ"	Modify the ranges of the X-axis and the Y-axis. For the Y-axis both manual scaling and automatic scaling are possible. Manual scaling allows to enter a range, to display the full range or to display the default range.
"Half Slot 1st / 2nd"	Toggle between the results for the first and second half slot (half-slot measurements only).
"Slot Number Table"	Select a slot for display of statistical results.
"Select Unit ACLR"	Select the unit of the Y-axis: dBm or dB (relative to carrier power level).

Additional options are available in the "Measurement Control" section of the configuration dialog, e.g. change the preselected slot or the Spreading Factor (SF).

3.2.6.12 Using Markers

Use the "Marker" parameters to activate markers and to modify their position. The following "Marker" hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Ref. Marker ..."	Enable or disable the reference marker, select a trace and the marker position on that trace.
"Marker 1 /2 ..."	Enable or disable marker 1 or 2 and define the marker position (absolute or relative to the reference marker). Depending on the trace mode, a trace can also be selected.
"Select Trace Mode"	Define whether all markers are collectively set to the same trace or to individual traces.

See also: "Markers" in the R&S CMW user manual, chapter "System Overview"

3.2.6.13 Common View Elements

Below the title bar, all views show the most important RF and analyzer settings as shown below.

For configuration see chapter 3.3.2.1, "Signal Routing and Analyzer Settings", on page 129.

Tables

Most detailed views show tables providing a statistical evaluation of results measured in a selected slot (or half-slot). For multislot measurements (e.g. "CDE vs Slot") the "Slot Number Table" is used while for single slot measurements (e.g. "Emission Mask", "EVM vs Chip") the "Preselected Slot" is used.

The selected slot number is displayed in most tables. For half-slot measurements also the selected half-slot is displayed. Modify the (half-) slot to display the results of another (half-) slot. A restart of the measurement is not required.

The statistical values in the tables are calculated as follows:

- **Current**: Value of the result obtained in the last measurement interval. For some modulation results the current RMS value (the average over all samples in the selected (half-) slot except the guard period) and the current peak value (the peak of all samples in the selected (half-) slot except the guard period) are available.
- **Average**: Average of all "Current" values referenced to the last statistics cycle.
- **Max**: Largest or smallest "Current" value that the R&S CMW obtained since the start of the measurement.
- **StdDev**: Standard deviation of all "Current" values since the start of the measurement.

All statistical results (statistical tables and "Average" or "Max" traces) are calculated according to the general rules for statistical results.

See also: "Statistical Results" in the R&S CMW user manual, chapter "System Overview"

1st Measured Slot Number

Number of the first slot measured in the current measurement interval. For most detailed views this number is displayed above the table of statistical values.

Statistic Count

Progress bar for the measurement, displayed in all detailed views. During the first single shot after the start of the measurement, the bar shows the number of elapsed measurement intervals relative to the "Statistic Count". A filled progress bar indicates that the first shot is complete and the statistical depth has been reached.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

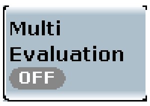
3.3 GUI Reference

The following sections provide detailed reference information on the Graphical User Interface (GUI) and the parameters of the WCDMA multi evaluation measurement.

3.3.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"



Multi Evaluation (Softkey)
The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:
INITiate:WCDMa:MEAS<i>:MEValuation
ABORt:WCDMa:MEAS<i>:MEValuation
STOP:WCDMa:MEAS<i>:MEValuation
FETCh:WCDMa:MEAS<i>:MEValuation:STATe?
FETCh:WCDMa:MEAS<i>:MEValuation:STATe:ALL?

3.3.2 Parameters and Settings

The most important settings of the WCDMA multi evaluation measurement are displayed in the measurement dialog.

All settings are defined via softkeys and hotkeys or using the "WCDMA Multi Evaluation Configuration" dialog. The configuration dialog is described in the following sections. To open the dialog, select the "Multi Evaluation" tab and press the "Config" hotkey.

3.3.2.1 Signal Routing and Analyzer Settings

The following parameters configure the RF input path.

All parameters are common measurement settings, i.e. they have the same value in all WCDMA measurements (multi evaluation measurement, TPC measurement and PRACH measurement).

See also: "Connection Control (Measurements)" in the R&S CMW user manual, chapter "System Overview"

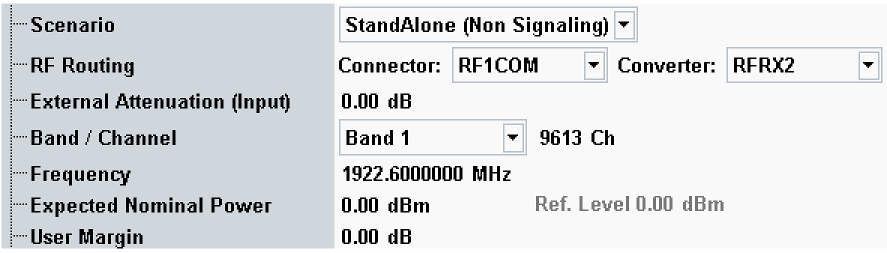


Fig. 3-22: Signal routing and analyzer settings

Scenario = StandAlone
The measurements are used standalone.

Remote command:
```
ROUTe:WCDMa:MEAS<i>:SCENario:SALone
ROUTe:WCDMa:MEAS<i>:SCENario?
ROUTe:WCDMa:MEAS<i>?
```

Scenario = Combined Signal Path
Allows to use a WCDMA signaling application (option R&S CMW-KS400) in parallel to the WCDMA measurements. The signaling application is selected by the additional parameter "Controlled by".

The parameters described in this section display values determined by the signaling application. The corresponding measurement settings are remembered in the background and displayed again when switching back to the standalone scenario. The same applies to some other parameters (see parameter descriptions).

The additional parameter "UL Target Power" is a signaling parameter added to the measurement dialog for fast access.

Connection status information of the signaling application is displayed at the bottom of the measurement views. Softkeys and hotkeys provide access to the settings of the signaling application and allow to switch the downlink signal on or off, see chapter 3.3.2.6, "Additional Softkeys and Hotkeys", on page 143.

For additional information see:

- multi evaluation measurement: chapter 3.2.1.4, "Parallel Signaling and Measurement", on page 95
- TPC measurement: chapter 4.2.3, "Parallel Signaling and Measurement", on page 290
- PRACH measurement: chapter 5.2.4, "Parallel Signaling and Measurement", on page 354

Remote command:

`ROUTe:WCDMa:MEAS<i>:SCENario:CSPath`

`ROUTe:WCDMa:MEAS<i>:SCENario?`

`ROUTe:WCDMa:MEAS<i>?`

Scenario = Measure@ProtocolTest

Allows to use a WCDMA protocol test application in parallel to the WCDMA measurements. The protocol test application is selected by the additional parameter "Controlled by".

The signal routing and analyzer settings described in this section are ignored. For the other settings you must configure values compatible with the settings of the protocol test application.

Protocol test applications are available for R&S CMW500, but not for R&S CMW270 and R&S CMW280.

Remote command:

`ROUTe:WCDMa:MEAS<i>:SCENario:MAPRotocol`

`ROUTe:WCDMa:MEAS<i>:SCENario?`

RF Routing

Selects the input path for the measured RF signal, i.e. the input connector and the RX module to be used.

Depending on your hardware configuration there may be dependencies between both parameters. Select the RF connector first. The "Converter" parameter offers only values compatible with the selected RF connector.

While the combined signal path scenario is active, these parameters are controlled by the signaling application.

Remote command:

`ROUTe:WCDMa:MEAS<i>:SCENario:SALone`

External Attenuation (Input)

Defines the value of an external attenuation (or gain, if the value is negative) in the input path. The power readings of the R&S CMW are corrected by the external attenuation value.

The external attenuation value is also used in the calculation of the maximum input power that the R&S CMW can measure.

If a correction table for frequency-dependent attenuation is active for the chosen connector, then the table's name and a button are displayed. Press the button to display the table entries.

While the combined signal path scenario is active, this parameter is controlled by the signaling application.

Remote command:
`CONFigure:WCDMa:MEAS<i>:RFSettings:EATTenuation`

Band / Channel / Frequency
Center frequency of the RF analyzer. Set this frequency to the frequency of the measured RF signal to obtain a meaningful measurement result. The relation between operating band, frequency and channel number is defined by 3GPP (see chapter 3.2.4.3, "Operating Bands", on page 102).

You can specify the RF frequency in two ways:
- Enter the frequency directly. The band and channel settings can be ignored or used for validation of the entered frequency. For validation select the designated band. The channel number resulting from the selected band and frequency is displayed. For an invalid combination no channel number is displayed.
- Select a band and enter a channel number valid for this band. The R&S CMW calculates the resulting frequency.

While the combined signal path scenario is active, this parameter is controlled by the signaling application.

Remote command:
`CONFigure:WCDMa:MEAS<i>:BAND`
`CONFigure:WCDMa:MEAS<i>:RFSettings:FREQuency`

Expected Nominal Power
Defines the nominal power of the RF signal to be measured.

Configure it as follows:
- multi evaluation measurement: peak output power at the DUT expected during the measurement interval
- TPC measurement: peak output power at the DUT expected during the measurement. Even if you start the measurement with minimum UE power, consider the maximum power expected at a later stage of the measurement.
- PRACH measurement: peak output power at the DUT expected for the first preamble. For subsequent preambles the expected power is calculated automatically from this value and a power steps limit setting, see also chapter 5.2.6.5, "Power Step Limits", on page 358.

While the combined signal path scenario is active, this parameter is controlled by the signaling application. Configure the signaling application, so that it calculates the expected nominal power from the UL power control settings (expected nominal power mode = "According to UL Power Control Settings"). Do not use the manual mode.

The "Ref. Level" is calculated as follows: *Reference Level = Expected Nominal Power + User Margin*

Note: The actual input power at the connectors (i.e. the "Reference Level" minus the "External Attenuation (Input)" value, if all power settings are configured correctly) must be within the level range of the selected RF input connector; refer to the data sheet.

Remote command:
`CONFigure:WCDMa:MEAS<i>:RFSettings:ENPower`

User Margin

Margin that the R&S CMW adds to the "Expected Nominal Power" in order to determine its reference power ("Ref. Level"). The "User Margin" is typically used to account for the known variations of the RF input signal power, e.g. the variations due to a specific channel configuration.

The appropriate values depend on the configuration of the UL WCDMA signal, e.g. on the active channels and gain factors. For a 12.2 kbps Reference Measurement Channel (RMC), a value of 5 dB is appropriate.

While the combined signal path scenario is active, this parameter is controlled by the signaling application.

Remote command:
`CONFigure:WCDMa:MEAS<i>:RFSettings:UMARgin`

3.3.2.2 UE Signal Info

The "UE Signal Info" parameters describe properties of the measured uplink WCDMA signal that the R&S CMW needs for synchronization and decoding. The parameters are common measurement settings, i.e. a parameter has the same value in all WCDMA measurements for which it is relevant (e.g. PRACH measurement and multi evaluation measurement).

While the combined signal path scenario is active, these parameters are automatically set to suitable values, compatible with the WCDMA signaling application. See also parameter "Scenario = Combined Signal Path" on page 129.

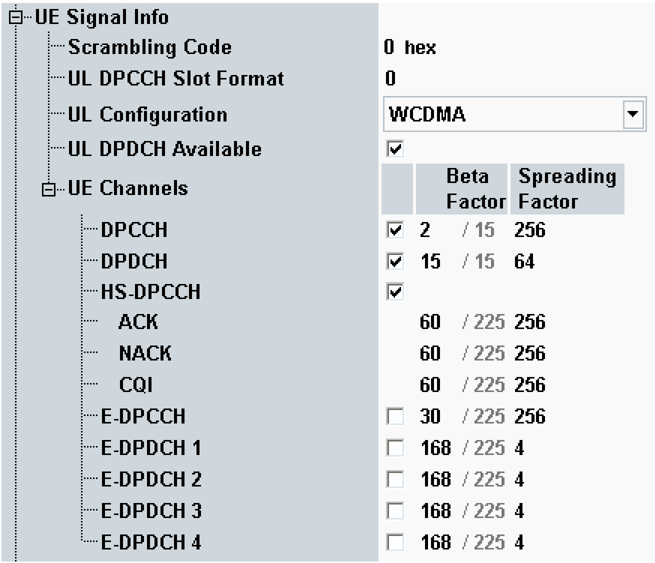


Fig. 3-23: UE Signal Info settings

Scrambling Code

Number of the long code that is used to scramble the uplink WCDMA signal. The scrambling code number must be in the range 0 to FFFFFF (hex) corresponding to 0 to 16777215 decimal.

Remote command:

CONFigure:WCDMa:MEAS<i>:UESignal:SCODe

UL DPCCH Slot Format

Uplink DPCCH slot format in the range between 0 and 5. The slot format defines the length of the individual data fields in the DPCCH. The multi evaluation measurement can be performed with arbitrary UL slot formats, including the slot formats with variable transport format (1, 3, 4).

Remote command:

CONFigure:WCDMa:MEAS<i>:UESignal:SFORmat

UL Configuration

The following uplink signal configurations can be selected:

- **QPSK**: QPSK signal (one DPCCH and one DPDCH with the same gain factor). Measurements related to the code domain (CD Monitor, CDP vs. Slot, CDE vs. Slot) are not performed in this mode.
- **WCDMA**: R99 signal carrying a single DPCH according to standard 3GPP/FDD
- **HSDPA**: R6 signal with HSDPA related channels (HS-DPCCH)
- **HSUPA**: R6 signal with HSUPA channels (E-DPCH consisting of an E-DPCCH and up to four E-DPDCHs)
- **HSDPA+HSUPA**: R6 signal with HSDPA related channels and HSUPA channels
- **HSDPA Plus**: R7 signal with HSDPA+ related channels, 16QAM supported
- **HSDPA Plus+HSUPA**: R7 signal with HSDPA+ related channels and HSUPA channels

The following values cannot be selected but may be displayed while the combined signal path scenario is active:

- **DC-HSDPA Plus**: R8 signal, dual carrier and HSDPA+ test mode active
- **DC-HSDPA Plus + HSUPA**: R8 signal, dual carrier and HSDPA+ and HSUPA test mode active

For more information concerning the listed channels refer to chapter 3.2.4.1, "Dedicated Physical Channels", on page 101.

The high speed signal configurations ("WCDMA + HS...") require option R&S CMW-KM401. HSPA+ requires additionally option R&S CMW-KM403.

Remote command:

`CONFigure:WCDMa:MEAS<i>:UESignal:ULConfig`

UL DPDCH Available

Indicates whether a DPDCH is configured for the UL DPCH signal or not. This parameter is ignored for UL Configuration = QPSK.

Remote command:

`CONFigure:WCDMa:MEAS<i>:UESignal:DPDCh`

UE Channels

Indicates which physical channels are contained in the measured signal and which beta factors and spreading factors are used for these channels.

For the HS-DPCCH three sets of values can be configured, depending on whether it transports an ACK, NACK or CQI.

The settings are required to determine the Effective Code Domain Power (ECDP). They can also be configured as part of the limit settings. The limit settings and the "UE Channels" settings are synchronized. See also chapter 3.2.5.2, "Code Domain Limits", on page 105.

While the combined signal path scenario is active, the displayed parameters are automatically set to suitable values. Please note that:

- For call types containing an RMC, the displayed beta factors for DPCCH and DPDCH may be so-called "computed gain factors" for the Transport Format Combination (TFC) used during the TX tests. These values can slightly differ from the values signaled to the UE by the signaling application.
- The HS- and E-channels in general may have variable power, or even be off from time to time. In that case the displayed beta factors reflect the actual UL signal properties only temporarily.

Remote command:

```
CONFigure:WCDMa:MEAS<i>:UECHannels:DPCCh
CONFigure:WCDMa:MEAS<i>:UECHannels:DPDCh
CONFigure:WCDMa:MEAS<i>:UECHannels:HSDPcch
CONFigure:WCDMa:MEAS<i>:UECHannels:HSDPcch:CONFig
CONFigure:WCDMa:MEAS<i>:UECHannels:EDPCch
CONFigure:WCDMa:MEAS<i>:UECHannels:EDPDch<no>
```

3.3.2.3 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the WCDMA multi evaluation measurement.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

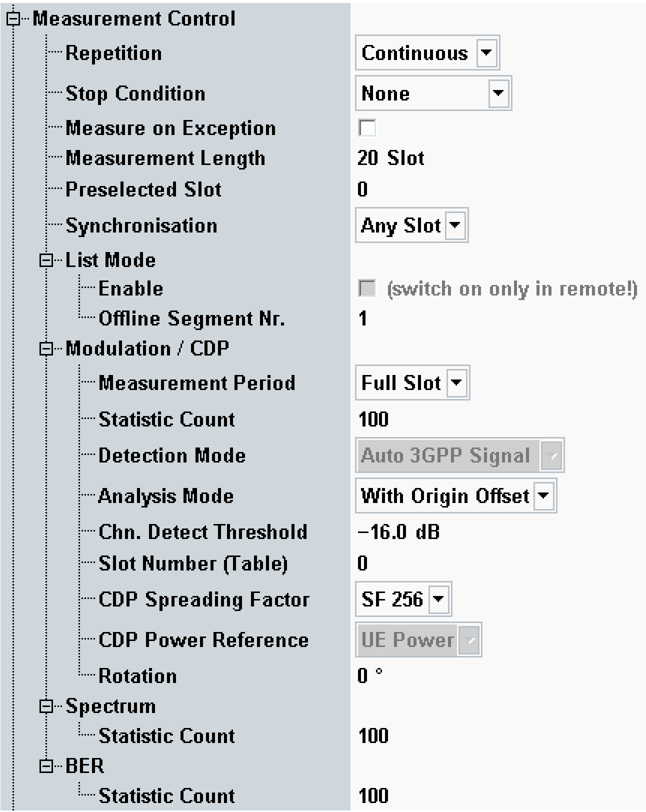


Fig. 3-24: Measurement control settings

Assign Views (Hotkey)

The hotkey "Assign Views" selects the view types to be displayed in the overview. The R&S CMW does not evaluate the results for disabled views. Therefore, limiting the number of assigned views can speed up the measurement. Press the softkey "Multi Evaluation" to activate the hotkey.

Remote command:

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult[:ALL]
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:EVMagnitude
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:MERRor
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:PERRor
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:ACLR
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:EMASk
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CDPMonitor
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CDPower
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CDERror
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CHIP:EVM
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CHIP:MERRor
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CHIP:PERRor
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:UEPower
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:FERRor
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:PHD
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:PSTeps
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:BER
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:IQ
CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:RCDerror

Repetition

Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:

CONFigure:WCDMa:MEAS<i>:MEValuation:REPetition

Stop Condition

Specifies the conditions for an early termination of the measurement:

- **None:** The measurement is performed according to its "Repetition" mode and "Statistic Count", irrespective of the limit check results.
- **On Limit Failure:** The measurement is stopped as soon as one of the limits is exceeded, irrespective of the repetition mode set. If no limit failure occurs, it is per-

formed according to its "Repetition" mode and "Statistic Count". Use this setting for measurements that are essentially intended for checking limits, e.g. production tests.

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:SCONdition`

Measure on Exception

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected. A faulty result occurs e.g. when an overload is detected. In remote control, the cause of the error is indicated by the "reliability indicator".

- **Off:** Faulty results are rejected. The measurement is continued; the statistical counters are not re-set. Use this mode to ensure that a single faulty result does not affect the entire measurement.
- **On:** Results are never rejected. Use this mode e.g. for development purposes, if you want to analyze the reason for occasional wrong transmissions.

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:MOEXception`

Measurement Length

Defines the number of consecutive slots that form a single measurement interval. The measured slots are displayed in all multislot diagrams, e.g. "Error Vector Magnitude", "CDP vs. Slot" and "UE Power".

See also chapter 3.2.1.3, "Defining the Scope of the Measurement", on page 94

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount`

Preselected Slot

Selects the slot to be used for all single slot measurements,e.g. "Error Vector Magnitude vs Chip", "CD Monitor", "ACLR", "Emission Mask". The preselected slot must not be confused with the slot used for tables of statistical values for multislot measurements, see parameter "Modulation / CDP > Slot Number (Table)" on page 139.

See also chapter 3.2.1.3, "Defining the Scope of the Measurement", on page 94

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot`

Synchronization

Selects a slot number (0 to 14) that the R&S CMW will display as the first slot in the measurement interval. "Any" means that the measurement will start as fast as possible, beginning with the first captured slot. "Free Run" measurements use always "Any".

Selecting a synchronization slot number can speed up the synchronization process. The trigger settings must be configured according to the selected slot. Example: To use an external frame trigger with synchronization slot number 5, a trigger delay corresponding to 5 slots has to be entered. Omitting the trigger delay results in a synchronization error because slot number 5 is expected but slot number 0 is found after the measurement has been triggered.

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:SYNCh`

List Mode > Enable
Shows whether the list mode is enabled and disables an enabled list mode. Enabling the list mode is only possible via the remote control command below. The list mode is essentially a remote control feature; for an introduction see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

Option R&S CMW-KM012 required.

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:LIST`

List Mode > Offline Segment Nr.
For future extensions.

Modulation / CDP > Measurement Period
Selects a half-slot or a full-slot measurement.

- **Full-Slot:**
  The modulation and code domain measurement results are based on the entire WCDMA slots (667 µs), excluding a 25 µs guard period at the beginning and at the end. The diagrams/traces contain one value per slot. This measurement mode is appropriate for signal configurations where the UE power is not expected to change within the slot (e.g. a pure DPCH without HSDPA channels).
  The BER measurement is only supported as full-slot measurement.
- **Half-Slot:**
  The modulation and code domain measurement results are based on half the WCDMA slot (333 µs), excluding a 25 µs guard period at the beginning and at the end of each half-slot. The diagrams/traces contain two values per slot. This measurement is appropriate for signal configurations where the UE power changes within the slot (e.g. a DPCH + HSDPA channel configuration with appropriate timing offset).
  Half-slot measurements require option R&S CMW-KM401.

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation`

Modulation / CDP / Spectrum / BER > Statistic Count
Defines the number of measurement intervals (for BER transport blocks) per measurement cycle (statistics cycle, single-shot measurement). This value is also relevant for continuous measurements, because the averaging procedures depend on the statistic count.

In the WCDMA multi evaluation measurement, the measurement interval is completed when the R&S CMW has measured the full sequence of "Measured Slots". The measurement provides two independent statistic lengths for the modulation and spectrum results. In single-shot mode and with a shorter spectrum statistic length, the ACLR evaluation is stopped while the R&S CMW still continues providing new modulation results.

See also: "Statistical Results" in the R&S CMW user manual, chapter "System Overview"

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:SCOunt:MODulation`
`CONFigure:WCDMa:MEAS<i>:MEValuation:SCOunt:SPECtrum`
`CONFigure:WCDMa:MEAS<i>:MEValuation:SCOunt:BER`

Modulation / CDP > Detection Mode

In the "3GPP Signal Auto" detection mode, the R&S CMW uses the scrambling code and slot format information to synchronize to the received signal, irrespective of the channel configuration.

Remote command:

`CONFigure:WCDMa:MEAS<i>:MEValuation:DMODe:MODulation`

Modulation / CDP > Analysis Mode

Defines whether a possible origin offset is included in the measurement results (modulation and code domain) or subtracted out.

See also: "I/Q Offset, I/Q Imbalance, Waveform Quality" in the R&S CMW user manual, chapter "System Overview"

- **With Origin Offset:**
  The results include a possible origin offset. This mode conforms to 3GPP specifications.
- **No Origin Offset:**
  The origin offset is subtracted out.

Remote command:

`CONFigure:WCDMa:MEAS<i>:MEValuation:AMODe:MODulation`

Modulation / CDP > Chn. Detect Threshold

Minimum signal strength of the DPDCH and the E-DPDCHs in the WCDMA signal (if present) to be detected and evaluated. The threshold corresponds to the ratio of the (E-)DPDCH power to the (E-)DPCCH power in dB. Channels with a power below the threshold are not considered for the calculation of modulation and CDP results.

The channel detection threshold is important to distinguish the (E-)DPDCH from unwanted signals, e.g. noise or non-orthogonal components that may be detected as fictitious (E-)DPDCHs. A low threshold value represents a weaker selection criterion and increases the risk of detecting unwanted signals. On the other hand a high threshold may prevent the detection of real (E-)DPDCH signals.

Remote command:

`CONFigure:WCDMa:MEAS<i>:MEValuation:CDTHreshold:MODulation`

Modulation / CDP > Slot Number (Table)

Selects a particular slot within the "Measurement Length" where the R&S CMW displays a table of statistical measurement results for the multislot measurements. These results are measured for all slots and can be displayed for one slot at a time.

See also chapter 3.2.1.3, "Defining the Scope of the Measurement", on page 94

Remote command:

`CONFigure:WCDMa:MEAS<i>:MEValuation:SSCalar:MODulation`

Modulation / CDP > CDP Spreading Factor
Selects the spreading factor used for display of the code domain monitor results. The values range from 4 to 256 in powers of 2. For a PCDE measurement conform to 3GPP TS 34.121 the spreading factor must be set to 4.

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:DSFactor:MODulation`

Modulation / CDP > CDP Power Reference
Selects the reference for the code domain power (CDP vs. Slot and CDP in CD Monitor). In the current software version the CDP is defined relative to the total power of the signal, i.e. to the UE Power.

Modulation / CDP > Rotation
Defines the initial phase reference (φ=0) for I/Q constellation diagrams of QPSK signals (see parameter "UL Configuration" on page 133).

For QPSK signals the symbol mapping between the logic data and the constellation points cannot be evaluated. As a consequence the overall phase of the diagram is random. This is important because the I/Q imbalance results depend on this random overall phase.

In order to get correct I/Q imbalance results, select the rotation as follows:

- **0°**: Suitable for QPSK signals with constellation points located on the I and Q axes (e.g DPCCH plus DPDCH).
- **45°**: Suitable for QPSK signals with constellation points located on the angle bisectors between the I and Q axes (e.g. DPCCH only).

For WCDMA signals (UL Configuration ≠ QPSK) the rotation setting is irrelevant. The symbol mapping can be evaluated and the position of the constellation points is fixed.

Remote command:
`CONFigure:WCDMa:MEAS<i>:MEValuation:ROTation:MODulation`

3.3.2.4 Trigger Settings

The "Trigger" parameters configure the trigger system for the WCDMA multi evaluation measurement.

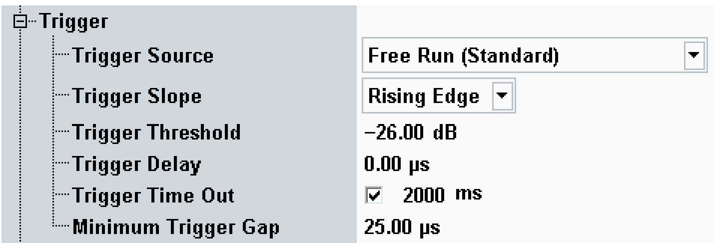


Fig. 3-25: Trigger settings

Trigger Source
Selects the source of the trigger event. Some of the trigger sources require additional options.

- **Free Run (Standard):**

The measurement starts immediately after it is initiated. The R&S CMW decodes the signal to derive its slot and frame timing. This procedure is repeated after each measurement cycle.

- **Free Run (Fast Sync):**
  Similar to "Free Run (Standard)", however, the R&S CMW assumes that the frame period of the detected signal is close to the nominal 10 ms WCDMA frame length. The timing is only corrected after each measurement cycle using a faster algorithm, which results in faster continuous measurements.
  If you experience problems with this trigger mode, use Free Run (Standard) instead.
- **IF Power:**
  The measurement is triggered by the power of the received signal, converted into an IF signal. The trigger event coincides with the rising or falling edge of the detected WCDMA power step. This setting can be used to measure short signal bursts when no continuous WCDMA signal is available.
- **IF Power (Sync):**
  Similar to "IF Power", however the R&S CMW tries to synchronize to the signal during a full slot after the trigger event. This setting can be used to measure short signal bursts where the beginning of the burst does not exactly coincide with a slot boundary. The start of the measurement takes longer than with "IF Power".
- **…External…:**
  External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument.

Remote command:

`TRIGger:WCDMa:MEAS<i>:MEValuation:SOURce`

`TRIGger:WCDMa:MEAS<i>:MEValuation:CATalog:SOURce?`

Trigger Slope

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse. This setting has no influence on "Free Run" measurements and for evaluation of trigger pulses provided by other firmware applications.

Remote command:

`TRIGger:WCDMa:MEAS<i>:MEValuation:SLOPe`

Trigger Threshold

Defines the input signal power where the trigger condition is satisfied and a trigger event is generated. The trigger threshold is valid for power trigger sources. It is a dB value, relative to the reference level minus the external attenuation (<Ref. Level> – <External Attenuation (Input)> – <Frequency Dependent External Attenuation>). If the reference level is set to the actual maximum output power of the DUT, and the external attenuation settings are in accordance with the test setup, then the trigger threshold is referenced to the actual maximum RF input power at the R&S CMW.

A low threshold may be required to ensure that the R&S CMW can always detect the input signal. A higher threshold can prevent unintended trigger events.

Remote command:

`TRIGger:WCDMa:MEAS<i>:MEValuation:THReshold`

Trigger Delay
Defines a time delaying the start of the measurement relative to the trigger event. This is useful if the trigger event and the uplink DPCH slot border are not synchronous. A measurement starts always at an uplink DPCH slot border. Triggering a measurement at another time may yield a synchronization error.

For internal trigger sources aligned to the downlink DPCH an additional delay of 1024 chips is automatically applied. It corresponds to the assumed delay between downlink and uplink slot.

This setting has no influence on "Free Run" measurements.

Remote command:
`TRIGger:WCDMa:MEAS<i>:MEValuation:DELay`

Trigger Time Out
Sets a time after which an initiated measurement must have received a trigger event. If no trigger event is received, a trigger timeout is indicated in manual operation mode. In remote control mode the measurement is automatically stopped. The parameter can be disabled so that no timeout occurs.

This setting has no influence on "Free Run" measurements.

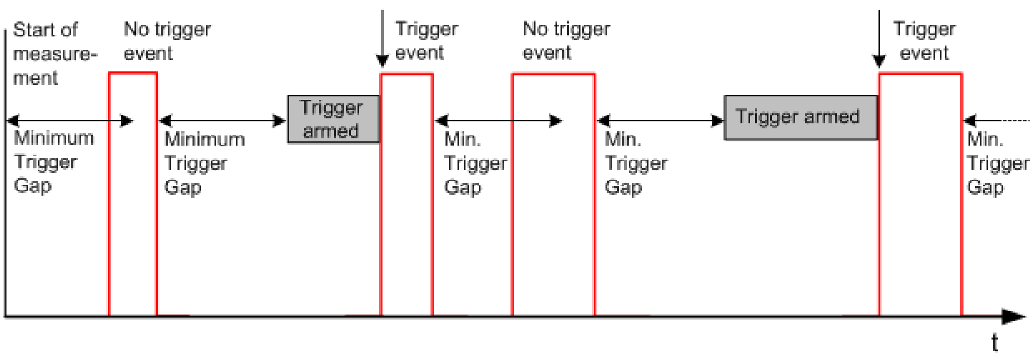
Remote command:
`TRIGger:WCDMa:MEAS<i>:MEValuation:TOUT`

Minimum Trigger Gap
Defines a minimum duration of the power-down periods (gaps) between two triggered power pulses. This setting is valid for an "(IF) Power" trigger source.

The trigger system is controlled by means of a timer which is reset to zero in the following instances:

- At the IF power-down ramp of each triggered or untriggered pulse, even though the previous counter may not have elapsed yet. A power-down ramp is detected when the signal power falls below the trigger threshold.
- At the beginning of each measurement: The minimum gap defines the minimum time between the start of the measurement and the first trigger event.

The trigger system is re-armed as soon as the timer has reached the specified minimum gap.



This parameter can be used to prevent unwanted trigger events due to fast power variations.

Remote command:
TRIGger:WCDMa:MEAS<i>:MEValuation:MGAP

3.3.2.5 Limit Settings

The "Limits" in the "Multi Evaluation Configuration" dialog define upper limits for the modulation, power and spectrum results including the spectrum emission mask.

For details see chapter 3.2.5, "Limit Settings and Conformance Requirements", on page 103.

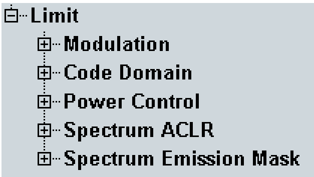


Fig. 3-26: Limit settings

Limits
The limits can be configured via the remote commands described in the following sections:

- chapter 3.5.3.9, "Limits (Modulation)", on page 195
- chapter 3.5.3.10, "Limits (Code Domain)", on page 198
- chapter 3.5.3.11, "Limits (Power Control)", on page 204
- chapter 3.5.3.12, "Limits (Spectrum)", on page 205

Some examples are listed below.

Remote command:
CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:MERRor
CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:ECDP
CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PCONtrol:HSDPcch
CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:ACLR:ABSolute
CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:EMASk:RELative

3.3.2.6 Additional Softkeys and Hotkeys

The WCDMA multi evaluation measurement provides some softkey/hotkey combinations which have no equivalent in the configuration dialog. Most of these hotkeys provide display configurations (like diagram scaling). They are self-explanatory and do not have any remote-control commands assigned.

The remaining softkeys > hotkeys are described below. They are displayed only while the combined signal path scenario is active and are provided by the "WCDMA Signaling" application selected as master application. See also "Scenario = Combined Signal Path" on page 129.

The measurement provides no remote-control commands corresponding to these hotkeys. Use the remote-control commands of the signaling application instead.

While one of these softkeys is selected, the "Config" hotkey opens the configuration dialog of the signaling application, not the configuration dialog of the measurement.

Signaling Parameter > ...
Provides access to the most essential settings of the "WCDMA Signaling" application.

WCDMA-UE Signaling
Select this softkey and press ON | OFF to turn the downlink signal transmission on or off.

Press the softkey two times (select it and press it again) to switch to the signaling application.

3.3.3 Measurement Results

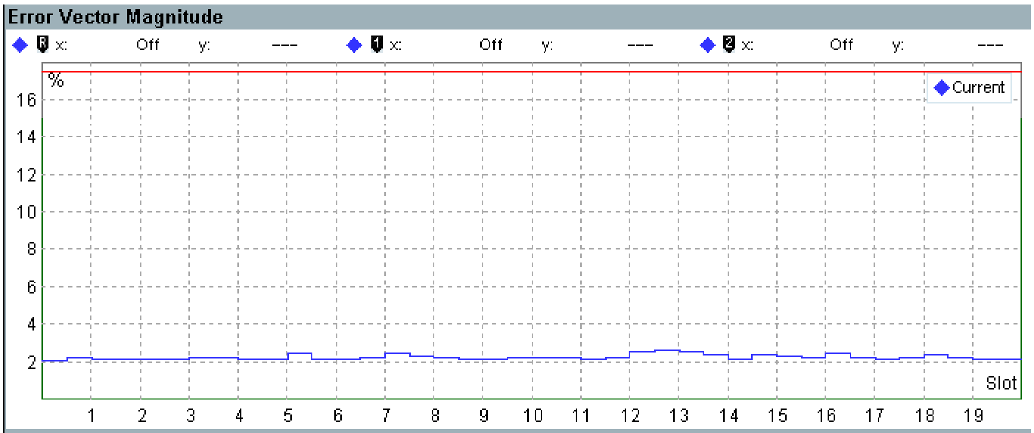
The results of the WCDMA multi evaluation measurement are displayed in several different views.

For detailed description see chapter 3.2.6, "Measurement Results", on page 112.

The multi evaluation measurement provides an overview dialog and a detailed view for each diagram in the overview. The overview dialog shows the modulation, power, spectrum and code domain power results as traces or bar graphs. A selection of statistical results of TX and RX measurements is also shown.

Fig. 3-27: WCDMA Multi Evaluation: Overview

Most of the detailed views show a diagram and a statistical overview of single-slot results.



Statistic Count
100 / 100

1st Measured Slot...	9			
Statistics @ Slot 0	**Current**	**Average**	**Max**	**StdDev**
Power [dBm]	–11.40	–14.01	–11.30	1.16
EVM RMS [%]	2.02	2.24	2.63	0.13
EVM Peak [%]	4.64	5.12	7.17	0.60
IQ Origin Offset [dB]	–68.90	–67.00	–60.78	5.91
IQ Imbalance [dB]	–80.06	–70.75	–63.62	5.86
CF Error [Hz]	–95065.16	–234412.67	306192.21	–625782.04
Trans. Time Error [Chip]	---	---	---	---

Fig. 3-28: WCDMA Multi Evaluation: EVM

Traces and Bar Graphs

The results can be retrieved via the following remote commands.

Remote command:

`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PHD:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:CHIP:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:CHIP:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:IQ:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPMonitor:QSIGnal:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDEMonitor:QSIGnal:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:SPECtrum:CURRent?` etc.
`FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFLeft:CURRent?` etc.

Statistical Overviews

The results can be retrieved via the following remote commands.

Remote command:
FETCh:WCDMa:MEAS<i>:MEValuation:MODulation:CURRent? etc.
FETCh:WCDMa:MEAS<i>:MEValuation:CDPower:CURRent? etc.
FETCh:WCDMa:MEAS<i>:MEValuation:CDERror:CURRent? etc.
FETCh:WCDMa:MEAS<i>:MEValuation:RCDerror:CURRent? etc.
FETCh:WCDMa:MEAS<i>:MEValuation:PCDE:CURRent? etc.
FETCh:WCDMa:MEAS<i>:MEValuation:BER? etc.

3.4 Programming

The following sections provide programming examples for the WCDMA multi evaluation measurement.

The examples have been tested with the aid of a simple software tool.

See also: "Remote Control" in the R&S CMW user manual

3.4.1 General Examples

The WCDMA multi evaluation measurement is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: ...WCDMa:MEAS:MEValuation...
- Use general commands of the type ...:WCDMa:MEAS... (no :MEValuation mnemonic) to define the signal routing and perform RF and analyzer settings.
- Use general commands of the type ...:WCDMa:MEAS:UESignal... (no :MEValuation mnemonic) to inform the R&S CMW about the basic properties of the measured WCDMA signal.
- After a *RST, the measurement is switched off. Use READ:WCDMa:MEAS:MEValuation...? to initiate a single-shot measurement and retrieve the results. You can also start the measurement using INIT:WCDMa:MEAS:MEValuation and retrieve the results using FETCh:WCDMa:MEAS:MEValuation...?.
- For synchronization and proper decoding, some UE signal settings must be in accordance with the measured signal; see chapter 3.4.1.2, "Specifying Required Settings", on page 147.

3.4.1.1 Specifying General Measurement Settings

```
// *****************************************************************************
// System-Reset
```

```
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define signal routing, perform RF and analyzer settings
// for a WCDMA uplink signal (operating band I, channel no. 9815,
// corresponding to a carrier frequency of 1963 MHz) with a
// peak power of 7 dBm, allowing for a 5 dB user margin
// *****************************************************************************
ROUTe:WCDMa:MEAS:SCENario:SALone RF1C, RX1
CONFigure:WCDMA:MEAS:RFSettings:EATTenuation 2
CONFigure:WCDMA:MEAS:RFSettings:ENPower 7
CONFigure:WCDMA:MEAS:RFSettings:UMARgin 5
CONFigure:WCDMA:MEAS:RFSettings:FREQuency 1963E+6

// *****************************************************************************
// Alternatively set the frequency indirectly via band and channel.
// *****************************************************************************
CONFigure:WCDMa:MEAS:BAND OB3
CONFigure:WCDMa:MEAS:RFSettings:FREQuency 1162 CH
```

3.4.1.2 Specifying Required Settings

```
// *****************************************************************************
// Specify required UE signal settings: presence of a DPDCH, slot format 1,
// scrambling code 5, channel configuration with HSUPA channels
// *****************************************************************************
CONFigure:WCDMa:MEAS:UESignal:DPDCh ON
CONFigure:WCDMa:MEAS:UESignal:SFORmat 1
CONFigure:WCDMa:MEAS:UESignal:SCODe 5
CONFigure:WCDMa:MEAS:UESignal:ULConfig HSUPa
```

3.4.1.3 Specifying Additional Measurement-Specific Settings

```
// *****************************************************************************
// Define stop condition (stop on limit failure) and error handling,
// select a measurement length of 30 slots (2 WCDMA frames),
// starting with slot 0 and using slot no. 3 as the preselected slot.
// Display slot 0 of the frame as first slot.
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:SCONdition SLFail
CONFigure:WCDMa:MEAS:MEValuation:MOEXception ON
CONFigure:WCDMa:MEAS:MEValuation:MSCount 30
CONFigure:WCDMa:MEAS:MEValuation:PSLot 3
CONFigure:WCDMa:MEAS:MEValuation:SYNCh SL0

// *****************************************************************************
// Specifiy modulation/CDP settings:
```

```
// Full-slot measurement over 20 statistics cycles,
// analysis without origin offset, channel detection threshold -5 dB,
// statistical results in slot 4, spreading factor 16, query detection mode,
// set offset 45° for I/Q constellation diagram.
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:MPERiod:MODulation FULL
CONFigure:WCDMa:MEAS:MEValuation:SCOunt:MODulation 20
CONFigure:WCDMa:MEAS:MEValuation:AMODe:MODulation NOOF
CONFigure:WCDMa:MEAS:MEValuation:CDTHreshold:MODulation -5
CONFigure:WCDMa:MEAS:MEValuation:SSCalar:MODulation 4
CONFigure:WCDMa:MEAS:MEValuation:DSFactor:MODulation SF16
CONFigure:WCDMa:MEAS:MEValuation:DMODe:MODulation?
CONFigure:WCDMa:MEAS:MEValuation:ROTation:MODulation 45

// *****************************************************************************
// Specify spectrum settings:
// select a measurement length of 30 slots (2 WCDMA frames)
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:SCOunt:SPECtrum 30

// *****************************************************************************
// Specify BER settings:
// select a measurement length of 30 slots (2 WCDMA frames)
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:SCOunt:BER 30
```

3.4.1.4 Configuring the Trigger System

```
// *****************************************************************************
// Set trigger source, timeout, trigger level, slope, delay
// and minimum trigger gap.
// *****************************************************************************
TRIGger:WCDMa:MEAS:MEValuation:SOURce 'IF Power'
TRIGger:WCDMa:MEAS:MEValuation:TOUT 1
TRIGger:WCDMa:MEAS:MEValuation:THReshold -30
TRIGger:WCDMa:MEAS:MEValuation:SLOPe FEDGe
TRIGger:WCDMa:MEAS:MEValuation:DELay 0.001
TRIGger:WCDMa:MEAS:MEValuation:MGAP 0.00002
```

3.4.1.5 Specifying Limits

```
// *****************************************************************************
// Define all modulation limits
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:LIMit:MERRor 20, OFF
CONFigure:WCDMa:MEAS:MEValuation:LIMit:EVMagnitude 20, 40
CONFigure:WCDMa:MEAS:MEValuation:LIMit:PERRor 20, OFF
CONFigure:WCDMa:MEAS:MEValuation:LIMit:PHD ON, 70, 40
CONFigure:WCDMa:MEAS:MEValuation:LIMit:PHSDpcch ON, 5.5, 20, 40
```

```
CONFigure:WCDMa:MEAS:MEValuation:LIMit:IQOFfset -20
CONFigure:WCDMa:MEAS:MEValuation:LIMit:IQIMbalance ON
CONFigure:WCDMa:MEAS:MEValuation:LIMit:CFERror 150

// *****************************************************************************
// Define relative CDE limits and specify the uplink channel configuration
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEV:LIMit:RCDerror:ECDP -20,-30,-15,-36,-25,-30,-17,-43
CONFigure:WCDMa:MEAS:MEValuation:LIMit:RCDerror:EECDp:DPCCh ON,4,256
CONFigure:WCDMa:MEAS:MEValuation:LIMit:RCDerror:EECDp:DPDCh ON,14,64
CONFigure:WCDMa:MEAS:MEValuation:LIMit:RCDerror:EECDp:HSDPcch:CONFig ACK
CONFigure:WCDMa:MEAS:MEValuation:LIMit:RCDerror:EECDp:HSDPcch ON,50,256
CONFigure:WCDMa:MEAS:MEValuation:LIMit:RCDerror:EECDp:EDPCch ON,20,256
CONFigure:WCDMa:MEAS:MEValuation:LIMit:RCDerror:EECDp:EDPDch2 ON,160,4

// *****************************************************************************
// Define all power control limits
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:LIMit:PCONtrol:EPSTep 0.5, 0.5, 1, 1.5, 2.5
CONFigure:WCDMa:MEAS:MEValuation:LIMit:PCONtrol:HSDPcch ON, 6, -2, -5

// *****************************************************************************
// Define all ACLR limits
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:LIMit:ACLR:ABSolute ON
CONFigure:WCDMa:MEAS:MEValuation:LIMit:ACLR:RELative -35, -47

// *****************************************************************************
// Define spectrum emission mask
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:LIMit:EMASk:ABSolute -50, -13, -15, A
CONF:WCDMa:MEAS:MEV:LIMit:EMASk:RELative -50.5,-47.5,-37.5,-33.5,-48.275,-33.725
```

3.4.1.6 Performing Single-Shot Measurements

```
// *****************************************************************************
// Enable measurements
// *****************************************************************************
CONF:WCDM:MEAS:MEV:RES:ALL ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON

// *****************************************************************************
// Start single-shot measurement, return an EVM trace.
// Query the measurement state (should be "RDY").
// *****************************************************************************
READ:WCDMa:MEAS:MEValuation:TRACe:EVMagnitude:RMS:AVERage?
FETCh:WCDMa:MEAS:MEValuation:STATe?

// *****************************************************************************
// Read CDP and CDE traces obtained in the last measurement
```

```
// without re-starting the measurement.
// ******************************************************************************
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPower:DPCCh:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPower:DPCCh:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPower:HSDPcch:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPower:HSDPcch:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPower:EDPDch1:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPower:EDPDch2:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDERror:DPCCh:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDERror:DPCCh:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDERror:HSDPcch:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDERror:HSDPcch:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDERror:EDPDch1:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDERror:EDPDch2:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPMonitor:QSIGnal:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDPMonitor:ISIGnal:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDEMonitor:QSIGnal:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:CDEMonitor:ISIGnal:CURRent?

// ******************************************************************************
// Read relative CDE traces obtained in the last measurement
// without re-starting the measurement.
// ******************************************************************************
FETCh:WCDMa:MEAS:MEValuation:TRACe:RCDerror:DPCCh:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:RCDerror:HSDPcch:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:RCDerror:EDPDch2:AVERage?
FETCh:WCDMa:MEAS:MEValuation:TRACe:RCDerror:SF:DPDCh?
FETCh:WCDMa:MEAS:MEValuation:TRACe:RCDerror:SF:HSDPcch?
FETCh:WCDMa:MEAS:MEValuation:TRACe:RCDerror:SF:EDPDch2?

// ******************************************************************************
// Read spectrum traces obtained in the last
// measurement without re-starting the measurement.
// ******************************************************************************
FETCh:WCDMa:MEAS:MEValuation:TRACe:EMASk:MFLeft:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:EMASk:MFRight:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:EMASk:HKFLeft:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:EMASk:HKFRight:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:EMASk:KFILter:CURRent?

// ******************************************************************************
// Read modulation and power traces obtained in the last
// measurement without re-starting the measurement.
// ******************************************************************************
FETCh:WCDMa:MEAS:MEValuation:TRACe:EVMagnitude:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:EVMagnitude:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:EVMagnitude:CHIP:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:MERRor:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:MERRor:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:MERRor:CHIP:CURRent?
```

```
FETCh:WCDMa:MEAS:MEValuation:TRACe:PERRor:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:PERRor:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:PERRor:CHIP:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:PHD:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:FERRor:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:FERRor:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:UEPower:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:UEPower:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:PSTeps:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:PSTeps:SDEViation?
FETCh:WCDMa:MEAS:MEValuation:TRACe:IQ:CURRent?

// *****************************************************************************
// Read statistical results obtained in the last measurement
// without re-starting the measurement
// *****************************************************************************
FETCh:WCDMa:MEAS:MEValuation:CDPower:CURRent?
FETCh:WCDMa:MEAS:MEValuation:CDERror:CURRent?
FETCh:WCDMa:MEAS:MEValuation:RCDerror:CURRent?
FETCh:WCDMa:MEAS:MEValuation:RCDerror:SF?
FETCh:WCDMa:MEAS:MEValuation:RCDerror:OCINfo?
FETCh:WCDMa:MEAS:MEValuation:PCDE:CURRent?
FETCh:WCDMa:MEAS:MEValuation:SPECtrum:CURRent?
FETCh:WCDMa:MEAS:MEValuation:MODulation:CURRent?
FETCh:WCDMa:MEAS:MEValuation:MODulation:UEPHd?
FETCh:WCDMa:MEAS:MEValuation:MODulation:PHDHsdpcch?
FETCh:WCDMa:MEAS:MEValuation:BER?

// *****************************************************************************
// Read limit check results obtained in the last measurement
// without re-starting the measurement
// *****************************************************************************
CALCulate:WCDMa:MEAS:MEValuation:MODulation:CURRent?
CALCulate:WCDMa:MEAS:MEValuation:MODulation:UEPHd?
CALCulate:WCDMa:MEAS:MEValuation:MODulation:PHDHsdpcch?
CALCulate:WCDMa:MEAS:MEValuation:RCDerror:AVERage?
CALCulate:WCDMa:MEAS:MEValuation:SPECtrum:CURRent?
```

3.4.1.7 Single-Shot and Continuous Measurements

```
// *****************************************************************************
// Start single-shot measurement, return magnitude error trace.
// Return maximum magnitude error trace and maximum phase (without repeating
// the measurement. Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:WCDMA:MEAS:MEValuation
FETCh:WCDMa:MEAS:MEValuation:TRACe:MERRor:CURRent?
FETCh:WCDMa:MEAS:MEValuation:TRACe:MERRor:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:TRACe:PERRor:MAXimum?
```

```
FETCh:WCDMa:MEAS:MEValuation:STATe?

// ******************************************************************************
// Start continuous measurement; wait for 5 ms and return average result.
// Query measurement state and substates (should be "RUN,ADJ,ACT").
// ******************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:REPetition CONTinuous
INIT:WCDMA:MEAS:MEValuation
Pause 5000
FETCh:WCDMa:MEAS:MEValuation:TRACe:EVMagnitude:AVERage?
FETCh:WCDMa:MEAS:MEValuation:STATe:ALL?
```

3.4.2 Using WCDMA List Mode

The WCDMA multi evaluation list mode is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: `...WCDMa:MEAS:MEValuation:LIST...`
- Use general commands of the type `...:WCDMa:MEAS...` (no `:MEValuation` mnemonic) to define the signal routing and perform RF and analyzer settings.
- After a `*RST`, the measurement is switched off and list mode is disabled. Use `CONFigure:WCDMa:MEAS:MEValuation:LIST ON` to enable the list mode and `INIT:WCDMa:MEAS:MEValuation` to initiate a single-shot measurement.
- Use `FETCh:WCDMa:MEAS:MEValuation:LIST:...?` commands to retrieve the results.

Speed considerations

The following measurement settings have an impact on the measurement speed:

- The number and size of the segments and the number of measured slots in each segment
- The number and type of results that the R&S CMW needs to calculate

3.4.2.1 Specifying Global Measurement Settings

```
// ******************************************************************************
// System-Reset
// ******************************************************************************
*RST; *OPC?
*CLS; *OPC?

// ******************************************************************************
// Define signal routing and external attenuation
// (Note: The general RF frequency and expected power settings are
// not used in list mode)
// ******************************************************************************
```

```
ROUTe:WCDMa:MEAS:SCENario:SALone RF1C, RX1
CONFigure:WCDMa:MEAS:RFSettings:EATTenuation 2
```

3.4.2.2 Specifying List Mode Settings

```
// *****************************************************************************
// Define 2 segments with a length of 20 timeslots each
// and different analyzer settings.
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:LIST:COUNt 2
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent1:SETup 20, 1, 19.41E+8, OFF
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent2:SETup 20, -10, 19.42E+8, OFF

// *****************************************************************************
// Enable code domain results, UE power results and phase discontinuity results
// for all segments, modulation and spectrum results for segment 2 only.
// Select an averaging length of 20 (all measured slots in the segment).
// Set the evaluation offset to 0 slots.
// Enable the list mode.
// *****************************************************************************
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent1:CDPower 20,ON,ON,ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent2:CDPower 20,ON,ON,ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent1:UEPower ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent2:UEPower ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent1:PHD ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent2:PHD ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent2:MODulation 20,ON,ON,ON,ON,ON,ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:SEGMent2:SPECtrum 20,ON,ON,ON
CONFigure:WCDMa:MEAS:MEValuation:LIST:EOFFset 0
CONFigure:WCDMa:MEAS:MEValuation:LIST ON

// *****************************************************************************
// Use a power trigger without retriggering to start the measurement.
// *****************************************************************************
TRIGger:WCDMa:MEAS:MEValuation:LIST:MODE ONCE
TRIGger:WCDMa:MEAS:MEValuation:SOURce 'IF POWer'
```

3.4.2.3 Performing Single-Shot Measurements

```
// *****************************************************************************
// Start single-shot measurement, return current CDP results
// (average CDP in the last slot in segment 1).
// Return results of segment 2: average CDP and CDE results,
// maximum PCDE results, current and average modulation results,
// average spectrum results
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:WCDMa:MEAS:MEValuation
FETCh:WCDMa:MEAS:MEValuation:LIST:SEGMent1:CDPower:CURRent?
```

```
FETCh:WCDMa:MEAS:MEValuation:LIST:SEGMent2:CDPower:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:SEGMent2:CDERror:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:SEGMent2:PCDE:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:SEGMent2:MODulation:CURRent?
FETCh:WCDMa:MEAS:MEValuation:LIST:SEGMent2:MODulation:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:SEGMent2:SPECtrum:AVERage?
FETCh:WCDMa:MEAS:MEValuation:STATe?

// *****************************************************************************
// Alternatively use segment-independent commands
// to retrieve the results for all segments.
// *****************************************************************************
FETCh:WCDMa:MEAS:MEValuation:LIST:CDPower:CURRent?
FETCh:WCDMa:MEAS:MEValuation:LIST:CDPower:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:CDERror:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:PCDE:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:CURRent?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:UEPower:CURRent?
FETCh:WCDMa:MEAS:MEValuation:LIST:PHD:CURRent?
```

3.4.2.4 Retrieving Single Results for All Segments

```
// *****************************************************************************
// Return selected peak code domain error results.
// *****************************************************************************
FETCh:WCDMa:MEAS:MEValuation:LIST:PCDE:ERRor:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:PCDE:PHASe:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:PCDE:CODE:MAXimum?

// *****************************************************************************
// Return selected code domain power and code domain error results.
// *****************************************************************************
FETCh:WCDMa:MEAS:MEValuation:LIST:CDPower:DPCCh:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:CDERror:DPDCh:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:CDPower:HSDPcch:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:CDERror:EDPCch:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:CDPower:EDPDch2:MAXimum?

// *****************************************************************************
// Return selected spectrum emission and ACLR results.
// *****************************************************************************
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:CPOWer:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:UEPower:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:ACLR:M1:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:ACLR:P2:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:OBW:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:EMASk:EF:MAXimum?
```

```
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:EMASk:FE:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:SPECtrum:EMASk:HAD:MAXimum?

// *****************************************************************************
// Return selected modulation results.
// *****************************************************************************
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:EVM:RMS:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:EVM:PEAK:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:MERRor:RMS:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:MERRor:PEAK:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:PERRor:RMS:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:PERRor:PEAK:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:IQOFfset:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:IQIMbalance:AVERage?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:FERRor:MAXimum?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:TTERror:CURRent?
FETCh:WCDMa:MEAS:MEValuation:LIST:MODulation:UEPower:AVERage?

// *****************************************************************************
// Return the individual segment reliability indicators
// *****************************************************************************
FETCh:WCDMa:MEAS:MEValuation:LIST:SRELiability?
```

3.5 Command Reference

The following sections provide detailed reference information on the remote control commands of the WCDMA multi evaluation measurement and the general commands applicable to all WCDMA measurements.

3.5.1 Conventions and General Information

The following sections describe the most important conventions and general informations concerning the command reference.

3.5.1.1 MEAS<i>

MEAS<i> is used as abbreviation of "MEASurement<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW user manual, chapter "Remote Control"

3.5.1.2 FETCh, READ and CALCulate Commands

All commands are used to retrieve measurement results:

- `FETCh...` returns the results of the current measurement cycle (single-shot measurement) after they are valid. `FETCh...` must be used after the measurement has been started (`INITiate...`, measurement states RUN or RDY).
- `READ...` starts a new single-shot measurement and returns the results.
- `CALCulate...` returns one limit check result per `FETCh` result:
  - **OK**: The `FETCh` result is located within the limits or no limit has been defined/ enabled for this result.
  - **ULEU** (User limit exceeded upper): An upper limit is violated. The `FETCh` result is located above the limit.
  - **ULEL** (User limit exceeded lower): A lower limit is violated. The `FETCh` result is located below the limit.

See also: "Retrieving Measurement Results" in the R&S CMW user manual, chapter "Remote Control"

3.5.1.3 Current and Statistical Results

The R&S CMW repeats measurements according to the selected statistic count and repetition mode. Consecutive measurement values are stored and used to calculate statistical results, e.g. average, minimum, maximum and standard deviation.

See also: "Statistical Results" in the R&S CMW user manual, chapter "System Overview"

3.5.1.4 Reliability Indicator

The first value in the output arrays of `FETCh...?, READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 (OK)**:
  Measurement values available, no error detected.
- **1 (Measurement Timeout)**:
  The measurement has been stopped after the (configurable) measurement timeout. Measurement results may be available, however, at least a part of the measurement provides only INValid results or has not completed the full statistic count.
- **2 (Capture Buffer Overflow)**:
  The measurement configuration results in a capture length exceeding the available memory.
- **3 (Overdriven) / 4 (Underdriven)**:

The accuracy of measurement results may be impaired because the input signal level was too high / too low.

- **6 (Trigger Timeout)**:
  The measurement could not be started or continued because no trigger event was detected.
- **7 (Acquisition Error)**:
  The R&S CMW could not properly decode the RF input signal.
- **8 (Sync Error)**:
  The R&S CMW could not synchronize to the RF input signal.
- **9 (Uncal)**:
  Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 (Reference Frequency Error)**:
  The instrument has been configured to use an external reference signal but the reference oscillator could not be phase locked to the external signal (e.g. signal level too low, frequency out of range or reference signal not available at all).
- **16 (RF Not Available)**:
  The measurement could not be started because the configured RF input path was not active. This problem may occur e.g. when a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 (RF Level not Settled) / 18 (RF Frequency not Settled)**:
  The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.
- **19 (Call not Established)**:
  For measurements: The measurement could not be started because no signaling connection to the DUT was established.
  For DAU IMS service: Establishing a voice over IMS call failed.
- **20 (Call Type not Usable)**:
  For measurements: The measurement could not be started because the established signaling connection had wrong properties.
  For DAU IMS service: The voice over IMS settings could not be applied.
- **21 (Call Lost)**:
  For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
  For DAU IMS service: The voice over IMS call was lost.
- **23 (Missing Option)**:
  The ARB file can not be played by the GPRF generator due to a missing option.
- **26 (Resource Conflict)**:
  The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
  Please stop the application that has allocated the conflicting resources and try again.
- **27 (No Sensor Connected)**:
  The GPRF External Power Sensor measurement could not be started due to missing power sensor.

- **40 (ARB File CRC Error)**:
  The ARB file CRC check failed. The ARB file is corrupt and not reliable.
- **42 (ARB Header Tag Invalid)**:
  The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 (ARB Segment Overflow)**:
  The number of segments in the multi-segment ARB file is higher than the allowed maximum.
- **44 (ARB File not Found)**:
  The selected ARB file could not be found.
- **50 (Startup Error)**:
  The Data Application Unit (DAU), a DAU service or a DAU measurement could not be started. Please execute a DAU selftest.
- **51 (No Reply)**:
  The DAU has received no response, for example for a ping request.
- **52 (Connection Error)**:
  The DAU could not establish a connection to internal components. Please restart the instrument.
- **53 (Configuration Error)**:
  The current DAU configuration by the user is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 (Filesystem Error)**:
  The hard disk of the DAU is full or corrupt. Please execute a DAU selftest.
- **101 (Firmware Error)**:
  Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.
  If the error occurs again, consider the following hints:
  – Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.
  – If a software package (update) has not been properly installed this is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".
  – A software update correcting the error may be available. Updates are e.g. provided in the "CMW Customer Web" on GLORIS (registration required): https://extranet.rohde-schwarz.com.

  If you get firmware errors even with the properly installed latest software version, please send a problem report including log files to Rohde & Schwarz.
- **102 (Unidentified Error)**:
  Indicates an error not covered by other reliability values. For troubleshooting please follow the steps described for "101 (Firmware Error)".
- **103 (Parameter Error)**:
  Indicates that the measurement could not be performed due to internal conflicting parameter settings.
  A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.

If you need assistance to localize the conflicting parameter settings please contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).

3.5.2 General Measurement Settings

The commands valid for all WCDMA measurements are divided into the groups listed below.

3.5.2.1 Signal Routing

The following commands configure the scenario, select the input path for the measured signal and define an external attenuation value.

ROUTe:WCDMa:MEAS<i>:SCENario:SALone <RXConnector>, <RFConverter>

Activates the standalone scenario and selects the RF input path for the measured RF signal, i.e. the RF connector and the RX module.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<RXConnector> RF1C | RF2C | RF3C | RF4C | RFAC | RFBC

RF1C, RF2C, RF3C, RF4C:
RF 1 COM to RF 4 COM front panel connectors

RFAC, RFBC:
Virtual names for the RF COM connectors

*RST: Depends on active sub-instrument and instance <i>

<RFConverter> RX1 | RX2 | RX3 | RX4

RX module for the input path

*RST: Depends on active sub-instrument and instance <i>

Example: See Specifying General Measurement Settings

Firmware/Software: V1.0.15.20
V2.0.10: additional RF and RX values

Manual operation: See "Scenario = StandAlone" on page 129

ROUTe:WCDMa:MEAS<i>:SCENario:CSPath <Master>

Activates the combined signal path scenario and selects a master. The master controls the signal routing settings, analyzer settings and UE signal info settings while the combined signal path scenario is active.

Parameters:

<Master> String parameter selecting the master application
e.g. `'WCDMA Sig1'` or `'WCDMA Sig2'`

Firmware/Software: V1.0.15.20

Manual operation: See "Scenario = Combined Signal Path" on page 129

ROUTe:WCDMa:MEAS<i>:SCENario:MAPRotocol [<Controler>]

Activates the Measure@ProtocolTest scenario and optionally selects the controlling protocol test application.

The signal routing and analyzer settings are ignored by the measurement application. The corresponding settings have to be configured within the protocol test application used in parallel.

Setting parameters:

<Controler> String parameter selecting the protocol test application
e.g. `'Protocol Test1'`

Usage: Event

Firmware/Software: V1.0.15.20
V2.1.30: added <Controler>

Manual operation: See "Scenario = Measure@ProtocolTest" on page 130

ROUTe:WCDMa:MEAS<i>:SCENario?

Returns the active scenario.

Return values:

<Scenario> SALone | CSPath | MAPRotocol

SALone: Standalone (Non Signaling)
CSPath: Combined Signal Path
MAPRotocol: Measure@Protocol Test

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Scenario = StandAlone" on page 129

ROUTe:WCDMa:MEAS<i>?

Returns the configured routing settings.

Return values:

<Scenario> SALone | CSPath | MAPRotocol

SALone: Standalone (Non Signaling)
CSPath: Combined Signal Path
MAPRotocol: Measure@Protocol Test

<Controller> Controlling application for scenario CSPath or MAPRotocol

<RXConnector> RF1C | RF2C | RF3C | RF4C

RF 1 COM to RF 4 COM front panel connectors

<RXConverter> RX1 | RX2 | RX3 | RX4

RX module for the input path

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Scenario = StandAlone" on page 129

CONFigure:WCDMa:MEAS<i>:RFSettings:EATTenuation <RFInputExtAtt>

Defines an external attenuation (or gain, if the value is negative), to be applied to the RF input connector.

Parameters:

<RFInputExtAtt> Range: -50 dB to 90 dB
*RST: 0 dB
Default unit: dB

Example: See Specifying General Measurement Settings

Firmware/Software: V1.0.0.4

Manual operation: See "External Attenuation (Input)" on page 130

3.5.2.2 Analyzer Settings

The following commands configure the RF input path.

CONFigure:WCDMa:MEAS<i>:RFSettings:ENPower <ExpNomPower>

Sets the expected nominal power of the measured RF signal.

Parameters:

<ExpNomPower> The range of the expected nominal power can be calculated as follows:

Range (Expected Nominal Power) = Range (Input Power) + External Attenuation - User Margin

Range: –47 dBm to 55 dBm for the input power at the RF COM connectors (please notice also the ranges quoted in the data sheet).
*RST: 0 dBm
Default unit: dBm

Example: See Specifying General Measurement Settings

Firmware/Software: V1.0.0.4
V3.0.10: enhanced range

Manual operation: See "Expected Nominal Power" on page 131

CONFigure:WCDMa:MEAS<i>:RFSettings:UMARgin <UserMargin>

Sets the margin that the R&S CMW adds to the expected nominal power in order to determine its reference power. The reference power minus the external input attenuation must be within the power range of the selected input connector; refer to the data sheet.

Parameters:

<UserMargin> Range: 0 dB to (55 dB + External Attenuation - Expected Nominal Power)
*RST: 0 dB
Default unit: dB

Example: See Specifying General Measurement Settings

Firmware/Software: V1.0.0.4
V3.0.10: enhanced range

Manual operation: See "User Margin" on page 132

CONFigure:WCDMa:MEAS<i>:RFSettings:FREQuency <Frequency>

Selects the center frequency of the RF analyzer.

Parameters:

<Frequency> Range: 70E+6 Hz to 6E+9 Hz
*RST: 1.9226E+9 Hz
Default unit: Hz
Using the unit CH the frequency can be set via the channel number. The allowed channel number range depends on the operating band, see chapter 3.2.4.3, "Operating Bands", on page 102.

Example: See Specifying General Measurement Settings

Firmware/Software: V1.0.0.4
V3.0.10: Minimum value decreased to 70 MHz

Manual operation: See "Band / Channel / Frequency" on page 131

CONFigure:WCDMa:MEAS<i>:BAND <Band>

Selects the Operating Band (OB).

Parameters:

<Band> OB1 | ... | OB14 | OB19 | ... | OB21 | OBS1 | ... | OBS3 | OBL1

OB1, ..., **OB14**: Operating Band I to XIV
OB19, ..., **OB21**: Operating Band XIX to XXI
OBS1: Operating Band S
OBS2: Operating Band S 170 MHz
OBS3: Operating Band S 190 MHz
OBL1: Operating Band L

*RST: OB1

Example: See Specifying General Measurement Settings

Firmware/Software: V1.0.4.11
OBS...: V1.0.15.0
OB19 to OB21: V2.0.10
OBL1: V2.1.20

Manual operation: See "Band / Channel / Frequency" on page 131

3.5.2.3 UE Signal Info

The following commands define expected properties of the UE signal.

CONFigure:WCDMa:MEAS<i>:UESignal:SCODe <Code>

Selects the number of the long code that is used to scramble the received uplink WCDMA signal.

Parameters:

<Code> Range: #H0 to #HFFFFFF
*RST: #H0

Example: See Specifying Required Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Scrambling Code" on page 133

CONFigure:WCDMa:MEAS<i>:CELL:SCODe <Code>

Specifies index i for calculation of the primary downlink scrambling code number by multiplication with 16.

Parameters:

<Code> Range: #H0 to #H1FF
*RST: #H0

Example: See Specifying Required PRACH Settings

Firmware/Software: V3.0.20

Manual operation: See "DL Scrambling Code" on page 366

CONFigure:WCDMa:MEAS<i>:UESignal:SFORmat <SlotFormat>

Selects the slot format for the UL DPCCH.

Parameters:

<SlotFormat> Range: 0 to 5
*RST: 0

Example: See Specifying Required Settings

Firmware/Software: V1.0.0.4

Manual operation: See "UL DPCCH Slot Format" on page 133

CONFigure:WCDMa:MEAS<i>:UESignal:ULConfig <ULConfiguration>

Selects the uplink signal configuration.

Parameters:

<ULConfiguration> QPSK | WCDMa | HSDPa | HSUPa | HSPA | HSPLus | DCHS | HDUPlus | DDUPlus

QPSK: QPSK signal
WCDMa: WCDMA R99 signal
HSDPa: signal with HSDPA related channels
HSUPa: signal with HSUPA channels
HSPA: HSDPA related and HSUPA channels
HSPLus: HSDPA+ related channels
HDUPlus: HSDPA+ related and HSUPA channels
The following values can not be set, but may be returned while the combined signal path scenario is active:
DCHS: dual carrier and HSDPA+ active
DDUPlus: dual carrier and HSDPA+ and HSUPA active

*RST: WCDM

Example: See Specifying Required Settings

Firmware/Software: V1.0.10.1
V3.0.20: added HDUPlus, DCHS and DDUPlus

Options: R&S CMW-KM401 for all HS... values
HSPLus needs additionally R&S CMW-KM403

Manual operation: See "UL Configuration" on page 133

CONFigure:WCDMa:MEAS<i>:UESignal:DPDCh <DPDCH>

Defines whether the UL DPCH contains a DPDCH.

Parameters:

<DPDCH> OFF | ON

OFF: DPCCH only
ON: DPCCH plus DPDCH

*RST: ON

Example: See Specifying Required Settings

Firmware/Software: V1.0.0.4

Manual operation: See "UL DPDCH Available" on page 134

CONFigure:WCDMa:MEAS<i>:UECHannels:DPCCh <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a DPCCH in the uplink signal and the beta factor and spreading factor of the channel.

Parameters:

<Enable> OFF | ON

Channel not present | present

*RST: ON

<BetaFactor> Range: 1 to 15
*RST: 2

<SpreadingFactor> Range: 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
*RST: 256

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "UE Channels" on page 134

CONFigure:WCDMa:MEAS<i>:UECHannels:DPDCh <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a DPDCH in the uplink signal and the beta factor and spreading factor of the channel.

Parameters:

<Enable>	OFF | ON	
	Channel not present | present	
	*RST:	ON
<BetaFactor>	Range:	0 to 15
	*RST:	15
<SpreadingFactor>	Range:	2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
	*RST:	64

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "UE Channels" on page 134

CONFigure:WCDMa:MEAS<i>:UEChannels:HSDPcch <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of an HS-DPCCH in the uplink signal and the beta factor and spreading factor of the channel.

For the HS-DPCCH three sets of beta factor and spreading factor can be configured, depending on whether it transports an ACK, NACK or CQI. This command configures/returns the values related to the currently active set.

For selection of the active set see `CONFigure:WCDMa:MEAS<i>:UEChannels:HSDPcch:CONFig` on page 166.

Parameters:

<Enable>	OFF | ON	
	Channel not present | present	
	*RST:	ON
<BetaFactor>	Range:	5 to 570
	*RST:	60
<SpreadingFactor>	Range:	2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
	*RST:	256

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "UE Channels" on page 134

CONFigure:WCDMa:MEAS<i>:UEChannels:HSDPcch:CONFig <Type>

Selects whether the HS-DPCCH transports an ACK, NACK or CQI and thus which set of beta factor and spreading factor values shall be used.

Parameters:

<Type> ACK | NACK | CQI

*RST: ACK

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "UE Channels" on page 134

CONFigure:WCDMa:MEAS<i>:UECHannels:EDPCch <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of an E-DPCCH in the uplink signal and the beta factor and spreading factor of the channel.

Parameters:

<Enable> OFF | ON

Channel not present | present

*RST: OFF

<BetaFactor> Range: 5 to 3585
*RST: 30

<SpreadingFactor> Range: 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
*RST: 256

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "UE Channels" on page 134

CONFigure:WCDMa:MEAS<i>:UECHannels:EDPDch<no> <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a selected E-DPDCH (1 to 4) in the uplink signal and the beta factor and spreading factor of the channel.

Suffix:

<no> 1..4
Selects the E-DPDCH

Parameters:

<Enable> OFF | ON

Channel not present | present

*RST: OFF

<BetaFactor> Range: 5 to 5655
*RST: 168

<SpreadingFactor> Range: 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
*RST: 4

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "UE Channels" on page 134

3.5.3 Multi Evaluation Measurement Commands

The commands for the WCDMA multi evaluation measurement are divided into the groups listed below. The general measurement settings also affect the measurement, see chapter 3.5.2, "General Measurement Settings", on page 159.

3.5.3.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:MEAS<i>:MEValuation
STOP:WCDMa:MEAS<i>:MEValuation
ABORt:WCDMa:MEAS<i>:MEValuation

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.
- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See Performing Single-Shot Measurements

Usage: Event

Firmware/Software: V1.0.0.4

Manual operation: See "Multi Evaluation (Softkey)" on page 128

FETCh:WCDMa:MEAS<i>:MEValuation:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RUN | RDY

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued
RDY: measurement has been terminated, valid results may be available

*RST: OFF

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.0.4

Manual operation: See "Multi Evaluation (Softkey)" on page 128

FETCh:WCDMa:MEAS<i>:MEValuation:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <MainState>: OFF or RDY ("invalid")

<RessourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable because <MainState>: OFF or RDY ("invalid")

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.0.4

Manual operation: See "Multi Evaluation (Softkey)" on page 128

3.5.3.2 Enabling Results and Views

The following commands select the evaluated results and the displayed views.

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult[:ALL] <EnableEVM>, <EnableMagError>, <EnablePhaseErr>, <EnableACLR>, <EnableEMask>, <EnableCDmonitor>, <EnableCDP>, <EnableCDE>, <EnableEVMchip>, <EnableMErrChip>, <EnablePhErrChip>, <EnableUEpower>, <EnableFreqError>, <EnablePhaseDisc>, <EnablePowSteps>, <EnableBER>[, <EnableIQ>, <EnableRCDE>]

Enables or disables the evaluation of results and shows or hides the views in the multi evaluation measurement. This command combines all other `CONFigure:WCDMa:MEAS<i>:MEValuation:RESult...` commands.

Parameters:

<EnableEVM> OFF | ON

Error Vector Magnitude
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

<EnableMagError> OFF | ON

Magnitude Error

*RST: OFF

<EnablePhaseErr> OFF | ON

Phase Error

*RST: OFF

<EnableACLR> OFF | ON

Adjacent Channel Leakage Power Ratio

*RST: ON

<EnableEMask> OFF | ON

Spectrum Emission Mask

*RST: ON

<EnableCDmonitor>	OFF | ON Code Domain Monitor *RST: ON
<EnableCDP>	OFF | ON Code Domain Power *RST: ON
<EnableCDE>	OFF | ON Code Domain Error *RST: OFF
<EnableEVMchip>	OFF | ON EVM vs. Chip *RST: ON
<EnableMErrChip>	OFF | ON Magnitude Error vs. Chip *RST: OFF
<EnablePhErrChip>	OFF | ON Phase Error vs. Chip *RST: OFF
<EnableUEpower>	OFF | ON UE Power *RST: ON
<EnableFreqError>	OFF | ON Frequency Error *RST: ON
<EnablePhaseDisc>	OFF | ON Phase Discontinuity *RST: OFF
<EnablePowSteps>	OFF | ON Power Steps *RST: ON
<EnableBER>	OFF | ON Bit Error Rate *RST: OFF
<EnableIQ>	OFF | ON I/Q Constellation Diagram *RST: OFF

<EnableRCDE> OFF | ON
Relative CDE
*RST: OFF

Example: See Performing Single-Shot Measurements

Firmware/Software: V1.0.3.6
V1.0.4.11: <EnableEVMchip> to <EnableBER>
V1.0.10.1: <EnableIQ>
V1.0.15.0: <EnableRCDE>

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:EVMagnitude <EnableEVM>

Enables or disables the evaluation of results and shows or hides the Error Vector Magnitude view in the multi evaluation measurement.

Parameters:
<EnableEVM> OFF | ON
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view
*RST: ON

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:MERRor <EnableMagError>

Enables or disables the evaluation of results and shows or hides the Magnitude Error view in the multi evaluation measurement.

Parameters:
<EnableMagError> OFF | ON
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view
*RST: OFF

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:PERRor <EnablePhaseErr>

Enables or disables the evaluation of results and shows or hides the Phase Error view in the multi evaluation measurement.

Parameters:

<EnablePhaseErr> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:ACLR <EnableACLR>

Enables or disables the evaluation of results and shows or hides the Adjacent Channel Leakage Power Ratio view in the multi evaluation measurement.

Parameters:

<EnableACLR> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:EMASk <EnableEMask>

Enables or disables the evaluation of results and shows or hides the Spectrum Emission Mask view in the multi evaluation measurement.

Parameters:

<EnableEMask> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CDPMonitor <EnableCDmonitor>

Enables or disables the evaluation of results and shows or hides the Code Domain Monitor view in the multi evaluation measurement.

Parameters:

<EnableCDmonitor> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CDPower <EnableCDP>

Enables or disables the evaluation of results and shows or hides the Code Domain Power view in the multi evaluation measurement.

Parameters:

<EnableCDP> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CDERror <EnableCDE>

Enables or disables the evaluation of results and shows or hides the Code Domain Error view in the multi evaluation measurement.

Parameters:

<EnableCDE> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.3.6

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CHIP:EVM <EnableEVMchip>

Enables or disables the evaluation of results and shows or hides the EVM vs. Chip view in the multi evaluation measurement.

Parameters:

<EnableEVMchip> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CHIP:MERRor <EnableMErrChip>

Enables or disables the evaluation of results and shows or hides the Magnitude Error vs. Chip view in the multi evaluation measurement.

Parameters:

<EnableMErrChip> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:CHIP:PERRor <EnablePhErrChip>

Enables or disables the evaluation of results and shows or hides the Phase Error vs. Chip view in the multi evaluation measurement.

Parameters:

<EnablePhErrChip> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:UEPower <EnableUEpower>

Enables or disables the evaluation of results and shows or hides the UE Power view in the multi evaluation measurement.

Parameters:

<EnableUEpower> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:FERRor <EnableFreqError>

Enables or disables the evaluation of results and shows or hides the Frequency Error view in the multi evaluation measurement.

Parameters:

<EnableFreqError> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:PHD <EnablePhaseDisc>

Enables or disables the evaluation of results and shows or hides the Phase Discontinuity view in the multi evaluation measurement.

Parameters:

<EnablePhaseDisc> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:PSTeps <EnablePowSteps>

Enables or disables the evaluation of results and shows or hides the Power Steps view in the multi evaluation measurement.

Parameters:

<EnablePowSteps> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:BER <EnableBER>

Enables or disables the evaluation of results and shows or hides the Bit Error Rate view in the multi evaluation measurement.

Parameters:

<EnableBER> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.4.11

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:IQ <EnableIQ>

Enables or disables the evaluation of results and shows or hides the I/Q constellation diagram view in the multi evaluation measurement.

Parameters:

<EnableIQ> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.10.1

Manual operation: See "Assign Views (Hotkey)" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:RESult:RCDerror <EnableRCDE>

Enables or disables the evaluation of results and shows or hides the Relative CDE view in the multi evaluation measurement.

Parameters:

<EnableRCDE> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: OFF

Firmware/Software: V1.0.15.0

Manual operation: See "Assign Views (Hotkey)" on page 136

3.5.3.3 Measurement Parameters

The following commands define general settings for the multi evaluation measurement.

CONFigure:WCDMa:MEAS<i>:MEValuation:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY` and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout>	*RST:	0 s
	Default unit:	s

Firmware/Software: V2.0.10

CONFigure:WCDMa:MEAS<i>:MEValuation:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:..:MEAS<i>:...:SCOunt` to determine the number of measurement intervals per single shot.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Single-Shot and Continuous Measurements

Firmware/Software: V1.0.0.4

Manual operation: See "Repetition" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:SCONdition <StopCondition>

Qualifies whether the measurement is stopped after a failed limit check or continued. `SLFail` means that the measurement is stopped and reaches the `RDY` state as soon as one of the results exceeds the limits.

Parameters:

<StopCondition> NONE | SLFail

NONE: Continue measurement irrespective of the limit check
SLFail: Stop measurement on limit failure

*RST: NONE

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Stop Condition" on page 136

CONFigure:WCDMa:MEAS<i>:MEValuation:MOEXception <MeasOnException>

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected.

Parameters:

<MeasOnException> OFF | ON

OFF: Faulty results are rejected.
ON: Results are never rejected.

*RST: OFF

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Measure on Exception" on page 137

CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount <SlotCount>

Selects the total number of measured slots.

Parameters:

<SlotCount> Range: 1 slot to 120 slots
*RST: 1 slot

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Measurement Length" on page 137

CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot <SlotNumber>

Selects the slot where the R&S CMW calculates the results of single slot measurements: ACLR, emission mask, EVM vs. chip, CD monitor. The number of the preselected slot must be smaller than the number of measured slots (`CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount`).

Parameters:

<SlotNumber> Range: 0 to 119
*RST: 0

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Preselected Slot" on page 137

CONFigure:WCDMa:MEAS<i>:MEValuation:SYNCh <SlotNumber>

Selects a slot number within the UL WCDMA frames (0 to 14) that the R&S CMW will display as the first slot in the measurement interval.

Parameters:

<SlotNumber> ANY | SL1 | SL2 | SL3 | SL4 | SL5 | SL6 | SL7 | SL8 | SL9 | SL10 | SL11 | SL12 | SL13 | SL14 | SL0

ANY: No frame synchronization
SL0 ... **SL14**: First slot = slot 0 ... slot 14

*RST: ANY

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.10.1

Manual operation: See "Synchronization" on page 137

3.5.3.4 List Mode Settings

The following commands configure the list mode. For retrieving list mode results see chapter 3.5.3.32, "List Mode Results (One Segment)", on page 247 and subsequent sections.

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST <Enable>

Enables or disables the list mode.

Parameters:

<Enable> OFF | ON

OFF: Disable list mode
ON: Enable list mode

*RST: OFF

Example: See Using WCDMA List Mode

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012

Manual operation: See "List Mode > Enable" on page 138

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt <Segments>

Defines the number of segments in the entire measurement interval, including active and inactive segments.

Parameters:

<Segments>	Range:	1 to 120
	*RST:	10

Example: See Using WCDMA List Mode

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:EOFFset <Offset>

Defines the evaluation offset. The specified number of slots at the beginning of each segment is excluded from the evaluation.

Set the trigger delay to 0 when using an evaluation offset (see `TRIGger:WCDMa:MEAS<i>:MEValuation:DELay` on page 194).

Parameters:

<Offset>	Range:	0 slots to 1024 slots
	*RST:	0 slots

Example: See Using WCDMA List Mode

Firmware/Software: V2.0.11

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup <SegmentLength>, <Level>, <Frequency>[, <Retrigger>]

Defines the length and analyzer settings of a selected segment. In general this command must be sent for all segments measured.

Suffix:

<no> 1..120
The segment number must not exceed the total number of segments measured (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt` on page 182).

Parameters:

<SegmentLength>
Number of measured timeslots in the segment.
The sum of the length of all active segments must not exceed 6000. Ignoring this limit results in NCAPs for the remaining slots.
The statistical length for result calculation covers at most the first 1000 slots of a segment.
The sum of the length of all segments (active plus inactive) must not exceed 192000. "Inactive" means that no measurement at all is enabled for the segment.

Range: 1 to 192000
*RST: 1

<Level>
Expected nominal power in the segment. The range of the expected nominal power can be calculated as follows:
Range (Expected Nominal Power) = Range (Input Power) + External Attenuation - User Margin

Range: –47 dBm to 55 dBm for the input power at the RF COM connectors (please notice also the ranges quoted in the data sheet)
*RST: 0 dBm
Default unit: dBm

<Frequency>
Range: 100E+6 Hz to 6E+9 Hz
*RST: 1.9226E+9 Hz
Default unit: Hz

<Retrigger>
OFF | ON | IFPower | IFPSync

Specifies whether a trigger event is required for the segment or not. The setting is ignored for the first segment of a measurement and for trigger mode ONCE (see `TRIGger:WCDMa:MEAS<i>:MEValuation:LIST:MODE` on page 187).
OFF: measure the segment without retrigger
ON: trigger event required, trigger source configured via `TRIGger:WCDMa:MEAS<i>:MEValuation:SOURce`
IFPower: trigger event required, "IF Power" trigger
IFPSync: trigger event required, "IF Power (Sync)" trigger

*RST: OFF

Example: See Using WCDMA List Mode

Firmware/Software: V1.0.5.3
V2.0.11: <Retrigger> added
V2.1.10: <SegmentLength> enhanced for inactive segments
V3.0.30: new <Retrigger> values IFPower and IFPSync

Options: R&S CMW-KM012

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation
<ModStatistics>, <EnableUEpower>, <EnableEVM>, <EnableMagError>, <EnablePhaseErr>, <EnableFreqError>, <EnableIQ>

Defines the statistical length for the `AVERage`, `MAXimum`, and `SDEViation` calculation and enables the calculation of the different modulation results in segment no. <no>; see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

The statistical length for CDP, CDE and modulation results is identical (see also `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDPower` on page 185).

Suffix:

<no> 1..120
The segment number must not exceed the total number of segments measured (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt` on page 182).

Parameters:

<ModStatistics> The statistical length is limited by the length of the segment (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup` on page 182).

Range: 1 to 1000
*RST: 10

<EnableUEpower> OFF | ON

OFF: Disable measurement
ON: Enable measurement of UE Power

*RST: OFF

<EnableEVM> OFF | ON

Disable or enable measurement of EVM

*RST: OFF

<EnableMagError> OFF | ON

Disable or enable measurement of magnitude error

*RST: OFF

<EnablePhaseErr> OFF | ON

Disable or enable measurement of phase error

*RST: OFF

<EnableFreqError> OFF | ON

Disable or enable measurement of frequency error

*RST: OFF

<EnableIQ> OFF | ON

Disable or enable measurement of I/Q origin offset and imbalance

*RST: OFF

Example: See Using WCDMA List Mode

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SPECtrum <SpecStatistics>, <EnableACLR>, <EnableEMask>, <EnableOBW>

Defines the statistical length for the `AVERage` and `MAXimum` calculation and enables the calculation of the different spectrum results in segment no. <no>; see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

Suffix:

<no> 1..120
The segment number must not exceed the total number of segments measured (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt` on page 182).

Parameters:

<SpecStatistics> The statistical length is limited by the length of the segment (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup` on page 182).

Range: 1 to 1000
*RST: 10

<EnableACLR> OFF | ON

OFF: Disable measurement
ON: Enable measurement of ACLR

*RST: OFF

<EnableEMask> OFF | ON

Disable or enable measurement of spectrum emission mask

*RST: OFF

<EnableOBW> OFF | ON

Disable or enable measurement of occupied bandwidth

*RST: OFF

Example: See Using WCDMA List Mode

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDPower <ModStatistics>, <EnableCDP>, <EnableCDE>[, <EnablePCDE>]

Defines the statistical length for the `AVERage`, `MINimum`, `MAXimum` and `SDEViation` calculation and enables the calculation of the different code domain results in segment no. <no>; see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

The statistical length for CDP, CDE, PCDE and modulation results is identical (see also CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation on page 184).

Suffix:

<no> 1..120
The segment number must not exceed the total number of segments measured (see CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt on page 182).

Parameters:

<ModStatistics> The statistical length is limited by the length of the segment (see CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup on page 182).
Range: 1 to 1000
*RST: 10

<EnableCDP> OFF | ON
OFF: Disable measurement
ON: Enable measurement of code domain power
*RST: OFF

<EnableCDE> OFF | ON
Disable or enable measurement of code domain error
*RST: OFF

<EnablePCDE> OFF | ON
Disable or enable measurement of peak code domain error
*RST: OFF

Example: See Using WCDMA List Mode

Firmware/Software: V1.0.5.3 (PCDE V1.0.15.0)

Options: R&S CMW-KM012

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:UEPower <EnableUEpower>

Enables the calculation of the current UE power vs. slot results in segment no. <no>; see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

Suffix:

<no> 1..120
The segment number must not exceed the total number of segments measured (see CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt on page 182).

Parameters:

<EnableUEpower>	OFF | ON **OFF:** Disable measurement **ON:** Enable measurement of UE power *RST: OFF
Example:	See Using WCDMA List Mode
Firmware/Software:	V2.1.10
Options:	R&S CMW-KM012

CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:PHD <EnablePhD>

Enables the calculation of the phase discontinuity vs. slot results in segment no. <no>; see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

Suffix:

<no>	1..120 The segment number must not exceed the total number of segments measured (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt` on page 182).

Parameters:

<EnablePhD>	OFF | ON **OFF:** Disable measurement **ON:** Enable measurement of phase discontinuity *RST: OFF
Example:	See Using WCDMA List Mode
Firmware/Software:	V3.0.20
Options:	R&S CMW-KM012

TRIGger:WCDMa:MEAS<i>:MEValuation:LIST:MODE <Mode>

Specifies the trigger mode for list mode measurements. For configuration of retrigger flags see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SETup` on page 182.

Parameters:

<Mode>	ONCE | SEGMent **ONCE:** A trigger event is only required to start the measurement. As a result the entire range of segments to be measured is captured without additional trigger event. The retrigger flags of the segments are ignored. **SEGMent:** The retrigger flag of each segment is evaluated. It defines whether the measurement waits for a trigger event before capturing the segment, or not. *RST: ONCE
Example:	See Using WCDMA List Mode
Firmware/Software:	V2.0.11
Options:	R&S CMW-KM012

3.5.3.5 Modulation Settings

The following commands specify settings relevant for the modulation and code domain measurements.

CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation <MeasPeriod>

Selects the width of the basic measurement period within each measured slot. To define the number of measured slots see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180.

Parameters:

<MeasPeriod>	FULLslot | HALFslot **FULLslot**: Full-slot measurement **HALFslot**: Half-slot measurement *RST: FULL
Example:	See Specifying Additional Measurement-Specific Settings
Firmware/Software:	V1.0.4.11
Options:	R&S CMW-KM401 for HALFslot
Manual operation:	See "Modulation / CDP > Measurement Period" on page 138

CONFigure:WCDMa:MEAS<i>:MEValuation:SCOunt:MODulation <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of measurement intervals

Range: 1 to 1000
*RST: 10

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Modulation / CDP / Spectrum / BER > Statistic Count" on page 138

CONFigure:WCDMa:MEAS<i>:MEValuation:DMODe:MODulation <DetectionMode>

Selects the detection mode for uplink WCDMA signals.

Parameters:

<DetectionMode> A3G

A3G: 3GPP Signal Auto

*RST: A3G

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Modulation / CDP > Detection Mode" on page 139

CONFigure:WCDMa:MEAS<i>:MEValuation:AMODe:MODulation <AnalysisMode>

Defines whether a possible origin offset is included in the measurement results (WOOFfset) or subtracted out (NOOFfset).

Parameters:

<AnalysisMode> WOOFfset | NOOFfset

WOOFfset: With origin offset
NOOFfset: No origin offset

*RST: WOOF

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Modulation / CDP > Analysis Mode" on page 139

CONFigure:WCDMa:MEAS<i>:MEValuation:CDTHreshold:MODulation <Threshold>

Defines the minimum relative signal strength of the (E-)DPDCH in the WCDMA signal (if present) to be detected and evaluated.

Parameters:

<Threshold> Range: -25 dB to 10 dB
*RST: -16 dB
Default unit: dB

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Modulation / CDP > Chn. Detect Threshold" on page 139

CONFigure:WCDMa:MEAS<i>:MEValuation:SSCalar:MODulation <SlotNumber>

Selects a particular slot or half-slot within the "Measurement Length" where the R&S CMW evaluates the statistical measurement results for multislot measurements. The slot number must be smaller than the number of measured slots (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

Parameters:

<SlotNumber> Range: 0 to 119.5
Increment: 0.5
*RST: 0

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Modulation / CDP > Slot Number (Table)" on page 139

CONFigure:WCDMa:MEAS<i>:MEValuation:DSFactor:MODulation <SpreadingFactor>

Selects the spreading factor for the displayed code domain monitor results.

Parameters:

<SpreadingFactor> SF4 | SF8 | SF16 | SF32 | SF64 | SF128 | SF256
Spreading factor 4 to 256
*RST: SF4

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Modulation / CDP > CDP Spreading Factor" on page 140

CONFigure:WCDMa:MEAS<i>:MEValuation:ROTation:MODulation <Rotation>

Defines the initial phase reference (φ=0) for I/Q constellation diagrams of QPSK signals.

Parameters:

<Rotation> The entered value is rounded to 0 deg or 45 deg.
0 deg: constellation points on I and Q axes
45 deg: constellation points on angle bisectors between I and Q axes

Range: 0 deg to 45 deg
*RST: 0 deg
Default unit: deg

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Modulation / CDP > Rotation" on page 140

3.5.3.6 Spectrum Settings

The following commands specify the scope of the spectrum measurement.

CONFigure:WCDMa:MEAS<i>:MEValuation:SCOunt:SPECtrum <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of measurement intervals

Range: 1 to 1000
*RST: 10

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.0.4

Manual operation: See "Modulation / CDP / Spectrum / BER > Statistic Count" on page 138

3.5.3.7 BER Settings

The following commands specify the scope of the bit error rate (BER) measurement.

CONFigure:WCDMa:MEAS<i>:MEValuation:SCOunt:BER <StatisticCount>

Specifies the statistic count of the measurement. The statistic count is equal to the number of measurement intervals per single shot. Use `CONFigure:...:MEAS<i>:...:REPetition SINGleshot | CONTinuous` to select either single-shot or continuous measurements.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<StatisticCount> Number of transport blocks

Range: 1 to 1000
*RST: 100

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V1.0.4.11

Manual operation: See "Modulation / CDP / Spectrum / BER > Statistic Count" on page 138

3.5.3.8 Trigger Settings

The following commands define the trigger parameters.

TRIGger:WCDMa:MEAS<i>:MEValuation:CATalog:SOURce?

Lists all trigger source values that can be set using `TRIGger:WCDMa:MEAS<i>:MEValuation:SOURce`.

Return values:

<TriggerList> Comma separated list of all supported values. Each value is represented as a string.

Usage: Query only

Firmware/Software: V1.0.4.11

Manual operation: See "Trigger Source" on page 140

TRIGger:WCDMa:MEAS<i>:MEValuation:SOURce <Source>

Selects the source of the trigger events. Some values are always available in this firmware application. They are listed below. Depending on the installed options additional values may be available. A complete list of all supported values can be displayed using `TRIGger:...:CATalog:SOURce?`.

Parameters:

<Source>
'Free Run (Standard)': Free Run (standard synchronization)
'Free Run (Fast Sync)': Free Run (fast synchronization)
'IF Power': Power trigger (normal synchronization)
'IF Power (Sync)': Power trigger (extended synchronization)
'Base1: External TRIG A': External trigger fed in at TRIG A connector
'Base1: External TRIG B': External trigger fed in at TRIG B connector
*RST: 'Free Run (Standard)'

Example: See Configuring the Trigger System

Firmware/Software: V1.0.4.11
V2.0.11: 'IF Power (Sync)' added

Manual operation: See "Trigger Source" on page 140

TRIGger:WCDMa:MEAS<i>:MEValuation:SLOPe <Slope>

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse (valid for external and power trigger sources).

Parameters:

<Slope>
REDGe | FEDGe
REDGe: Rising edge
FEDGe: Falling edge
*RST: REDG

Example: See Configuring the Trigger System

Firmware/Software: V1.0.4.11

Manual operation: See "Trigger Slope" on page 141

TRIGger:WCDMa:MEAS<i>:MEValuation:THReshold <Level>

Defines the trigger threshold for power trigger sources.

Parameters:

<Level>
Range: -47 dB to 0 dB
*RST: -26 dB
Default unit: dB (full scale, i.e. relative to reference level minus external attenuation)

Example: See Configuring the Trigger System

Firmware/Software: V1.0.5.3

Manual operation: See "Trigger Threshold" on page 141

TRIGger:WCDMa:MEAS<i>:MEValuation:TOUT <TimeOut>

Selects the maximum time that the R&S CMW will wait for a trigger event before it stops the measurement in remote control mode or indicates a trigger timeout in manual operation mode. This setting has no influence on "Free Run" measurements.

Parameters:

<TimeOut> Range: 0.01 s to 10 s
*RST: 2 s
Default unit: s
Additional parameters: OFF | ON (disables | enables the timeout)

Example: See Configuring the Trigger System

Firmware/Software: V1.0.4.11
V3.0.10: OFF | ON added

Manual operation: See "Trigger Time Out" on page 142

TRIGger:WCDMa:MEAS<i>:MEValuation:DELay <Delay>

Defines a time delaying the start of the measurement relative to the trigger event. This is useful if the trigger event and the uplink DPCH slot border are not synchronous. A measurement starts always at an uplink DPCH slot border. Triggering a measurement at another time may yield a synchronization error.

For internal trigger sources aligned to the downlink DPCH an additional delay of 1024 chips is automatically applied. It corresponds to the assumed delay between downlink and uplink slot.

This setting has no influence on "Free Run" measurements.

Parameters:

<Delay> Range: -666.7E-6 s to 0.24 s
*RST: 0 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V1.0.5.3

Manual operation: See "Trigger Delay" on page 142

TRIGger:WCDMa:MEAS<i>:MEValuation:MGAP <MinimumGap>

Sets a minimum time during which the IF signal must be below the trigger threshold before the trigger is armed so that an IF power trigger event can be generated.

Parameters:

<MinimumGap> Range: 0 s to 0.01 s
*RST: 25E-6 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V1.0.5.3

Manual operation: See "Minimum Trigger Gap" on page 142

3.5.3.9 Limits (Modulation)

The following commands define limits for results which characterize the modulation accuracy.

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:MERRor <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the magnitude error.

Parameters:

<RMS>
Range: 0 % to 100 %
*RST: 17.5 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak>
Range: 0 % to 100 %
*RST: 50 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.0.4

Manual operation: See "Limits" on page 143

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:EVMagnitude <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the error vector magnitude (EVM).

Parameters:

<RMS>
Range: 0 % to 100 %
*RST: 17.5 %, ON
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak>	Range: 0 % to 100 % *RST: 50 %, OFF Default unit: % Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)
Example:	See Specifying Limits
Firmware/Software:	V1.0.0.4

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PERRor <RMS>, <Peak>

Defines symmetric limits for the RMS and peak values of the phase error. The limit check fails the UE if the absolute value of the measured phase error exceeds the specified values.

Parameters:

<RMS>	Range: 0 deg to 45 deg *RST: 10 deg, OFF Default unit: deg Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)
<Peak>	Range: 0 deg to 45 deg *RST: 45 deg, OFF Default unit: deg Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)
Example:	See Specifying Limits
Firmware/Software:	V1.0.0.4

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PHD <Enable>, <Upper>, <Dynamic>

Defines upper and dynamic limits for the phase discontinuity determined by full-slot measurements (signals without HSPA channels).

Parameters:

<Enable>	OFF | ON Disables | enables the limit check *RST: ON
<Upper>	Range: 0 deg to 90 deg *RST: 66 deg Default unit: deg
<Dynamic>	Range: 0 deg to 90 deg *RST: 36 deg Default unit: deg
Example:	See Specifying Limits

Firmware/Software: V1.0.4.11

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PHSDpcch <Enable>, <MeasurePointA>, <MeasurePointB>, <Dynamic>

Defines a dynamic limit for the phase discontinuity determined by half-slot measurements (signals with HS-DPCCH). The limit is checked at point A and point B. As the phase discontinuity is measured at half-slot boundaries (x.5, not x.0) point A and point B should be set to half-slot positions.

Parameters:

<Enable> OFF | ON

Disables | enables the limit check

*RST: ON

<MeasurePointA> Range: 0.5 slots to 119.5 slots
Increment: 0.5 slots
*RST: 0.5 slots
Default unit: slots

<MeasurePointB> Range: 0.5 slots to 119.5 slots
Increment: 0.5 slots
*RST: 10.5 slots
Default unit: slots

<Dynamic> Range: 0 deg to 90 deg
*RST: 36 deg
Default unit: deg

Example: See Specifying Limits

Firmware/Software: V1.0.4.11

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:IQOFfset <IQoffset>

Defines an upper limit for the I/Q origin offset.

Parameters:

<IQoffset> Range: -80 dB to 0 dB
*RST: -25 dB, OFF
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.0.4

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:IQIMbalance <IQimbalance>

Defines an upper limit for the I/Q imbalance.

Parameters:

<IQimbalance>	Range:	-99 dB to 0 dB
	*RST:	-15 dB, OFF
	Default unit: dB	
	Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)	

Example: See Specifying Limits

Firmware/Software: V1.0.0.4

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:CFERror <FrequencyError>

Defines an upper limit for the carrier frequency error.

Parameters:

<FrequencyError>	Range:	0 Hz to 4000 Hz
	*RST:	200 Hz
	Default unit: Hz	
	Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)	

Example: See Specifying Limits

Firmware/Software: V1.0.0.4

3.5.3.10 Limits (Code Domain)

The following commands define limits for relative Code Domain Error (CDE) results and specify the channel configuration of the uplink signal. Knowledge of the channel configuration is required for relative CDE limit checks.

The channel configuration can also be specified via the general commands `CONFigure:WCDMa:MEAS:UEChannels:...`, see chapter 3.5.2.3, " UE Signal Info", on page 163.

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:DPCCh <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a DPCCH in the uplink signal and the beta factor and spreading factor of the channel. A query returns additionally the nominal CDP and effective CDP resulting from these settings.

Parameters:

<Enable>	OFF | ON	
	Channel not present | present	
	*RST:	ON
<BetaFactor>	Range:	1 to 15
	*RST:	2
<SpreadingFactor>	Range:	2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
	*RST:	256

Return values:

<NominalCDP>	Range:	-60 dB to 0 dB
	*RST:	-17.9 dB
	Default unit:	dB
<EffectiveCDP>	Range:	-80 dB to 0 dB
	*RST:	-17.9 dB
	Default unit:	dB

Example: See Specifying Limits

Firmware/Software: V1.0.15.0

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:DPDCh <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a DPDCH in the uplink signal and the beta factor and spreading factor of the channel. A query returns additionally the nominal CDP and effective CDP resulting from these settings.

Parameters:

<Enable>	OFF | ON	
	Channel not present | present	
	*RST:	ON
<BetaFactor>	Range:	0 to 15
	*RST:	15
<SpreadingFactor>	Range:	2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
	*RST:	64

Return values:

<NominalCDP>	Range:	-60 dB to 0 dB
	*RST:	-0.4 dB
	Default unit:	dB
<EffectiveCDP>	Range:	-80 dB to 0 dB
	*RST:	-6.4 dB
	Default unit:	dB

Example: See Specifying Limits

Firmware/Software: V1.0.15.0

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:HSDPcch <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a HS-DPCCH in the uplink signal and the beta factor and spreading factor of the channel. A query returns additionally the nominal CDP and effective CDP resulting from these settings.

For the HS-DPCCH three sets of beta factor and spreading factor can be configured, depending on whether it transports an ACK, NACK or CQI. This command configures/returns the values related to the currently active set.

For selection of the active set see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:HSDPcch:CONFig` on page 200.

Parameters:

<Enable> OFF | ON
Channel not present | present
*RST: ON

<BetaFactor> Range: 5 to 570
*RST: 60

<SpreadingFactor> Range: 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
*RST: 256

Return values:

<NominalCDP> Range: -70 dB to 0 dB
*RST: -11.9 dB
Default unit: dB

<EffectiveCDP> Range: -90 dB to 0 dB
*RST: -11.9 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V1.0.15.0

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:HSDPcch:CONFig <Type>

Selects whether the HS-DPCCH transports an ACK, NACK or CQI and thus which set of beta factor and spreading factor values shall be used.

Parameters:

<Type> ACK | NACK | CQI
*RST: ACK

Example: See Specifying Limits

Firmware/Software: V2.1.20

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:EDPCch <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a E-DPCCH in the uplink signal and the beta factor and spreading factor of the channel. A query returns additionally the nominal CDP and effective CDP resulting from these settings.

Parameters:

<Enable> OFF | ON
Channel not present | present
*RST: OFF

<BetaFactor> Range: 5 to 3585
*RST: 30

<SpreadingFactor> Range: 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
*RST: 256

Return values:

<NominalCDP> Range: -70 dB to 0 dB
*RST: NAV
Default unit: dB

<EffectiveCDP> Range: -90 dB to 0 dB
*RST: NAV
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V1.0.15.0

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:EDPDch<no> <Enable>, <BetaFactor>, <SpreadingFactor>

Specifies the presence of a selected E-DPDCH (1 to 4) in the uplink signal and the beta factor and spreading factor of the channel. A query returns additionally the nominal CDP and effective CDP resulting from these settings.

Suffix:

<no> 1..4
Selects the E-DPDCH

Parameters:

<Enable> OFF | ON
Channel not present | present
*RST: OFF

<BetaFactor> Range: 5 to 5655
*RST: 168

<SpreadingFactor> Range: 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
*RST: 4

Return values:

<NominalCDP>	Range:	-70 dB to 0 dB
	*RST:	NAV
	Default unit:	dB
<EffectiveCDP>	Range:	-90 dB to 0 dB
	*RST:	NAV
	Default unit:	dB

Example: See Specifying Limits

Firmware/Software: V1.0.15.0

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp {<Enable>, <BetaFactor>, <SpreadingFactor>}*8

Specifies the channel configuration in the uplink signal. This command has the same effect as the sum of the following commands:

- `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:DPCCh`
- `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:DPDCh`
- `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:HSDPcch`
- `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:EDPCch`
- `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:EECDp:EDPDch<no>`

Please refer to these commands for additional information (ranges and *RST values).

The parameter array described below is repeated for each channel (8 times) in the following order: DPCCH, DPDCH, HS-DPCCH, E-DPCCH, E-DPDCH 1, ..., E-DPDCH 4.

Thus a setting requires 3*8 values and a query returns 5*8 values.

Parameters:

<Enable>	OFF | ON Channel not present | present
<BetaFactor>	Beta value of the channel
<SpreadingFactor>	2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 Spreading factor of the channel

Return values:

<NominalCDP>
<EffectiveCDP> Values calculated from the settings, returned additionally for information

Firmware/Software: V1.0.15.0

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:RCDerror:ECDP
<ThresholdBPSK1>, <ThresholdBPSK2>, <LimitBPSK1>, <LimitBPKS2>, <Threshold4PAM1>, <Threshold4PAM2>, <Limit4PAM1>, <Limit4PAM2>

Defines upper limits for the relative CDE (RCDE) of BPSK and 4PAM modulated channels. For each modulation type two requirements are defined.

Parameters:

<ThresholdBPSK1> Lower ECDP threshold for BPSK requirement 1

Range: -50 dB to 0 dB
*RST: -21 dB
Default unit: dB

<ThresholdBPSK2> Lower ECDP threshold for BPSK requirement 2

Range: -50 dB to 0 dB
*RST: -30 dB
Default unit: dB

<LimitBPSK1> RCDE limit for BPSK requirement 1

Range: -50 dB to 0 dB
*RST: -15.5 dB
Default unit: dB

<LimitBPKS2> RCDE limit for BPSK requirement 2 (limit = this value minus ECDP)

Range: -50 dB to 0 dB
*RST: -36.5 dB
Default unit: dB

<Threshold4PAM1> Lower ECDP threshold for 4PAM requirement 1

Range: -50 dB to 0 dB
*RST: -25.5 dB
Default unit: dB

<Threshold4PAM2> Lower ECDP threshold for 4PAM requirement 2

Range: -50 dB to 0 dB
*RST: -30 dB
Default unit: dB

<Limit4PAM1> RCDE limit for 4PAM requirement 1

Range: -50 dB to 0 dB
*RST: -17.5 dB
Default unit: dB

<Limit4PAM2> RCDE limit for 4PAM requirement 2 (limit = this value minus ECDP)

Range: -50 dB to 0 dB
*RST: -43 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V1.0.15.0

Manual operation: See "Limits" on page 143

3.5.3.11 Limits (Power Control)

The following commands define limits related to transmit power control.

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PCONtrol:EPSTep <Expected0dB>, <Expected1dB>, <Expected2dB>, <Expected3dB>, <Expected4to7dB>

Defines tolerance values ("Expected Power Step Limits") depending on the nominal power step size.

Parameters:

<Expected0dB> Tolerance value for power step size 0 dB
Range: 0 dB to 5 dB
*RST: 0.5 dB
Default unit: dB

<Expected1dB> Tolerance value for power step size 1 dB
Range: 0 dB to 5 dB
*RST: 0.5 dB
Default unit: dB

<Expected2dB> Tolerance value for power step size 2 dB
Range: 0 dB to 5 dB
*RST: 1.0 dB
Default unit: dB

<Expected3dB> Tolerance value for power step size 3 dB
Range: 0 dB to 5 dB
*RST: 1.5 dB
Default unit: dB

<Expected4to7dB> Tolerance value for power step size 4 dB to 7 dB
Range: 0 dB to 5 dB
*RST: 2.0 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V1.0.4.11

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PCONtrol:HSDPcch <Enable>, <DTXtoNACK>, <NACKtoCQI>, <CQItoDTX>

Defines nominal power steps for the HS-DPCCH limit set. Separate values can be defined for the boundaries DTX > (N)ACK, (N)ACK > CQI and CQI > DTX. Additionally the limit check can be enabled or disabled.

See also chapter 3.2.5.3, "Power Control Limits", on page 108

Parameters:

<Enable>	OFF | ON disables | enables the limit check *RST: ON
<DTXtoNACK>	Range: -10 dB to 10 dB *RST: 6.14 dB Default unit: dB
<NACKtoCQI>	Range: -10 dB to 10 dB *RST: -1.38 dB Default unit: dB
<CQItoDTX>	Range: -10 dB to 10 dB *RST: -4.76 dB Default unit: dB

Example: See Specifying Limits

Firmware/Software: V1.0.4.11

Manual operation: See "Limits" on page 143

3.5.3.12 Limits (Spectrum)

The following commands define limits for the Adjacent Channel Leakage Power Ratio (ACLR) and the spectrum emission mask.

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:ACLR:ABSolute <Limit3M84>

Defines an absolute upper limit for the ACLR. If the absolute upper limit is exceeded, relative limits are evaluated (`CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:ACLR:RELative`).

Parameters:

<Limit3M84>	Range: -80 dBm to 33 dBm *RST: -50 dBm Default unit: dBm Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.0.4

Manual operation: See "Limits" on page 143

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:ACLR:RELative <ChannelFirst>, <ChannelSecond>

Defines upper limits for the ACLR in channels 1 (at ±5 MHz from the carrier) and 2 (at ±10 MHz from the carrier) relative to the carrier power. Relative limits are only evaluated when the absolute limit is exceeded (CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:ACLR:ABSolute).

Parameters:

<ChannelFirst>
Range: -80 dB to 0 dB
*RST: -32.2 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<ChannelSecond>
Range: -80 dB to 0 dB
*RST: -42.2 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.0.4

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:EMASk:ABSolute <LimitG3M84>, <LimitH1MHz>, <LimitH30kHz>, <LimitHmode>

Defines absolute limits for the spectrum emission curves.

Parameters:

<LimitG3M84>
Absolute limit line G referenced to a 3.84 MHz filter
Range: -80 dBm to 33 dBm
*RST: -48.5 dBm
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<LimitH1MHz>
Absolute limit line H referenced to a 1 MHz or 100 kHz filter, depending on the Line H mode
Range: -80 dBm to 33 dBm
*RST: -13 dBm, OFF
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<LimitH30kHz>
Absolute limit line H referenced to a 30 kHz filter
Range: -80 dBm to 33 dBm
*RST: -15 dBm, OFF
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<LimitHmode> A | B | C
Line H mode
*RST: A

Example: See Specifying Limits

Firmware/Software: V1.0.10.1

CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:EMASk:RELative <PointA>, <PointB>, <PointC>, <PointD>, <PointE>, <PointF>

Defines relative limits for the spectrum emission curves.

Parameters:

<PointA>
Range: -90 dB to 0 dB
*RST: -47.5 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<PointB>
Range: -90 dB to 0 dB
*RST: -47.5 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<PointC>
Range: -90 dB to 0 dB
*RST: -37.5 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<PointD>
Range: -90 dB to 0 dB
*RST: -33.5 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<PointE>
Range: -90 dB to 0 dB
*RST: -48.5 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<PointF>
Range: -90 dB to 0 dB
*RST: -33.5 dB
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V1.0.0.4

Manual operation: See "Limits" on page 143

3.5.3.13 EVM Results (Traces)

The following commands return the EVM trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude[:RMS]:SDEViaton?

Returns the values of the RMS EVM traces for up to 120 slots.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<EVM_1> ... <EVM_n>	RMS EVM trace results, one result per measured slot or half-slot Range: 0 % to 100 % (SDEViation: 0 % to 50 %) Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:PEAK:SDEViaton?

Returns the values of the peak EVM traces for up to 120 slots.

Each current value is determined for a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<EVM_1> ... <EVM_n>	Peak EVM trace results, one result per measured slot or half-slot Range: 0 % to 100 % (SDEViation: 0 % to 50 %) Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:CHIP:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:CHIP:AVERage?

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:CHIP:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:CHIP:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:CHIP:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EVMagnitude:CHIP:MAXimum?

Returns the values of the RMS EVM vs. chip traces, measured in the preselected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot` on page 180). One value per chip is returned. The results of the current, average and maximum traces can be retrieved.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability> Reliability Indicator

<EVM1> ... <EVM2560> Range: 0 % to 100 %
Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.4.11

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.14 Magnitude Error Results (Traces)

The following commands return the magnitude error trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor[:RMS]:SDEViation?

Returns the values of the RMS magnitude error traces for up to 120 slots.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<MagErr_1> ... <MagErr_n>	RMS magnitude error trace results, one result per measured slot or half-slot Range: 0 % to 100 % (SDEViation: 0 % to 50 %) Default unit: %
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:PEAK:SDEViation?

Returns the values of the peak magnitude error traces for up to 120 slots.

Each current value is determined for a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<MagErr_1> ... <MagErr_n>	Peak magnitude error trace results, one result per measured slot or half-slot Range: -100 % to 100 % (AVERage: 0% to 100 %, SDEViation: 0 % to 50 %) Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:CHIP:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:CHIP:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:CHIP:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:CHIP:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:CHIP:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:MERRor:CHIP:MAXimum?

Returns the values of the magnitude error vs. chip traces, measured in the preselected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot` on page 180). One value per chip is returned. The results of the current, average and maximum traces can be retrieved.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<MagErr1> ... <MagErr2560>	Range: -100 % to 100 % Default unit: %

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.4.11

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.15 Phase Error Results (Traces)

The following commands return the phase error trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor[:RMS]:SDEViation?

Returns the values of the RMS phase error traces for up to 120 slots.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability> Reliability Indicator

<PhaseErr_1> ... <PhaseErr_n>
RMS phase error trace results, one result per measured slot or half-slot
Range: 0 deg to 180 deg (SDEViation: 0 deg to 90 deg)
Default unit: deg

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:PEAK:SDEViation?

Returns the values of the peak phase error traces for up to 120 slots.

Each current value is determined for a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>
Reliability Indicator

<PhaseErr_1> ... <PhaseErr_n>
Peak phase error trace results, one result per measured slot or half-slot
Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg)
Default unit: deg

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:CHIP:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:CHIP:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:CHIP:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:CHIP:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:CHIP:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PERRor:CHIP:MAXimum?

Returns the values of the RMS phase error vs. chip traces, measured in the preselected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot` on page 180). One value per chip is returned. The results of the current, average and maximum traces can be retrieved.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<PhaseErr1> ... <PhaseErr2560>	Range: -180 deg to 180 deg Default unit: deg

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.4.11

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.16 I/Q Constellation Results (Traces)

The following commands return the results in the I/Q constellation diagram.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:IQ:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:IQ:CURRent?

Returns the results in the I/Q constellation diagram. Every fourth value corresponds to a constellation point. The other values are located on the path between two constellation points.

Return values:

<Reliability>	Reliability Indicator
<I_1> <Q_1> ... <I_10240> <Q_10240>	10240 pairs of normalized I and Q amplitudes, four values per symbol period Range: -2.0 to 2.0

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.17 Phase Discontinuity Results (Traces)

The following commands return the phase discontinuity trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PHD:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PHD:CURRent?

Returns the values of the phase discontinuity traces for up to 120 slots. One value per measured slot is returned (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The meaning of the value depends on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188):

- For full-slot measurements each value indicates the phase discontinuity at the boundary between a slot and the previous slot. As there is no previous slot for slot 0, the first returned phase discontinuity value equals NCAP.
- For half-slot measurements each value indicates the phase discontinuity at the boundary between the first and second half-slot of a slot. This value can be measured for all slots, including slot 0.

See also chapter 3.2.6.6, "Detailed Views: Phase Discontinuity", on page 119

Return values:

<Reliability> Reliability Indicator

<PhaseDisc_1> ... <PhaseDisc_n> One value per measured slot
Range: -180 deg to 180 deg
Default unit: deg

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.18 Frequency Error Results (Traces)

The following commands return the frequency error trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:AVERage?

READ:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:FERRor:SDEViation?

Returns the values of the carrier frequency error traces for up to 120 slots.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability> Reliability Indicator

<FreqErr_1> ... <FreqErr_n> Carrier frequency error trace results, one result per measured slot or half-slot

Range: -60000 Hz to 60000 Hz (SDEViation: 0 Hz to 60000 Hz)
Default unit: Hz

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.19 Power Results (Traces)

The following commands return the UE power and UE power steps trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:MINimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:UEPower:SDEViation?

Returns the values of the UE power traces for up to 120 slots.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, minimum, maximum and standard deviation traces can be retrieved. The minimum and standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.5, "Detailed Views: UE Power and Power Steps", on page 118

Return values:

<Reliability>	Reliability Indicator
<UEpower_1> ... <UEpower_n>	One result per measured slot or half-slot Range: -100 dBm to 55 dBm (SDEViation: 0 dB to 77 dB) Default unit: dBm (SDEViation: dB)
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:MINimum?

READ:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:PSTeps:SDEViation?

Returns the values of the UE power step traces for up to 120 slots.

Each power step is calculated as the difference between the UE power of a half-slot or full-slot and the preceding half-slot or full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188).

As there is no previous (half-)slot for slot 0, the first returned power step value equals NCAP. The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, minimum, maximum and standard deviation traces can be retrieved. The minimum and standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.5, "Detailed Views: UE Power and Power Steps", on page 118

Return values:

<Reliability> Reliability Indicator

<PowStep_1> ... <PowStep_n> One result per measured slot or half-slot
Range: -50 dB to 50 dB (SDEViation: 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.20 Spectrum Emission Results (Traces)

The following commands return the spectrum emission trace results of the multi evaluation measurement, measured in the preselected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot` on page 180).

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFLeft:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFLeft:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFLeft:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFRight:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFRight:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFRight:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFLeft:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFLeft:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFLeft:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFRight:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFRight:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:MFRight:MAXimum?

Returns the values of the spectrum emission 1 MHz traces. The left section and the right section of each trace are retrieved by separate commands (dinstinguished by the terms MFLeft and MFRight). The results of the current, average and maximum traces can be retrieved.

See also chapter 3.2.6.9, "Detailed Views: Spectrum Emission Mask", on page 123

Return values:

<Reliability> — Reliability Indicator

<Value1> ... <Value89> — These values correspond to test points that are separated by 90 kHz. The covered frequency ranges are:
Left section: -11970 kHz to -4050 kHz from the carrier
Right section: 4050 kHz to 11970 kHz from the carrier

Range: -100 dB to 0 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFLeft:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFLeft:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFLeft:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFRight:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFRight:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFRight:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFLeft:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFLeft:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFLeft:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFRight:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFRight:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:HKFRight:MAXimum?

Returns the values of the spectrum emission 100 kHz traces. The left section and the right section of each trace are retrieved by separate commands (dinstinguished by the terms HKFLeft and HKFRight). The results of the current, average and maximum traces can be retrieved.

The covered frequency range depends on the limit line H mode (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:EMASk:ABSolute` on page 206).

See also chapter 3.2.6.9, "Detailed Views: Spectrum Emission Mask", on page 123

Return values:

<Reliability> Reliability Indicator

<Value1> ... <Value297/327> These values correspond to test points that are separated by 30 kHz. The covered frequency ranges are:
Left section, line H mode B/C: -12450 kHz to -3570 kHz/-2670 kHz from the carrier
Right section, line H mode B/C: 3570 kHz/2670 kHz to 12450 kHz from the carrier
Line H mode A is not used for 100 kHz traces (NCAPs returned)

Range: -100 dB to 0 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:KFILter:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:KFILter:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:KFILter:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:KFILter:CURRent?

READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:KFILter:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:EMASk:KFILter:MAXimum?

Returns the values of the spectrum emission 30 kHz traces. The results of the current, average and maximum traces can be retrieved.

See also chapter 3.2.6.9, "Detailed Views: Spectrum Emission Mask", on page 123

Return values:

<Reliability> Reliability Indicator

<Value1> ... <Value1665> These values correspond to test points that are separated by 15 kHz and cover the frequency range between -12480 kHz and 12480 kHz from the carrier.

Range: -100 dB to 0 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.21 CDP vs Slot Results (Traces)

The following commands return the code domain power (CDP) vs. slot trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:MINimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPCCh:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:MINimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:DPDCh:SDEViation?

Returns the values of the RMS CDP vs. slot traces for the DPCCH and the DPDCH.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation on page 188). The number of results depends on the measurement length (see CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount on page 180).

The results of the current, average, minimum, maximum and standard deviation traces can be retrieved. The standard deviation traces cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<CDP_1> ... <CDP_n>	RMS CDP trace results, one result per measured slot or half-slot Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB) Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:MINimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:HSDPcch:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:MINimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPCch:SDEViation?

Returns the values of the RMS CDP vs. slot traces for the HS-DPCCH and the E-DPCCH.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation on page 188). The number of results depends on the measurement length (see CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount on page 180).

The results of the current, average, minimum, maximum and standard deviation traces can be retrieved. The standard deviation traces cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<CDP_1> ... <CDP_n>	RMS CDP trace results, one result per measured slot or half-slot Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB) Default unit: dB
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.10.1
Options:	R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:MINimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPower:EDPDch<no>:SDEViation?

Returns the values of the RMS CDP vs. slot traces for the E-DPDCH 1 to 4.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, minimum, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Suffix:

<no>	1..4 selects the E-DPDCH for which the results shall be retrieved

Return values:

<Reliability>	Reliability Indicator
<CDP_1> ... <CDP_n>	RMS CDP trace results, one result per measured slot or half-slot Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB) Default unit: dB

Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.10.1
Options:	R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.22 CDE vs Slot Results (Traces)

The following commands return the code domain error (CDE) vs. slot trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPCCh:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:DPDCh:SDEViation?

Returns the values of the RMS CDE vs. slot traces for the DPCCH and the DPDCH.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation traces cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability>	Reliability Indicator
<CDE_1> ... <CDE_n>	RMS CDE trace results, one result per measured slot or half-slot Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB) Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:HSDPcch:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPCch:SDEViation?

Returns the values of the RMS CDE vs. slot traces for the HS-DPCCH and the E-DPCCH.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation traces cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Return values:

<Reliability> Reliability Indicator

<CDE_1> ... <CDE_n> RMS CDE trace results, one result per measured slot or half-slot

Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

Options: R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDERror:EDPDch<no>:SDEViation?

Returns the values of the RMS CDE vs. slot traces for the E-DPDCH 1 to 4.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.2, "Detailed Views: Modulation, CDP and CDE", on page 114

Suffix:

<no> 1..4
selects the E-DPDCH for which the results shall be retrieved

Return values:

<Reliability> Reliability Indicator

<EDPDCH> RMS CDE trace results, one result per measured slot or half-slot
Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

Options: R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.23 RCDE vs Slot Results (Traces)

The following commands return the Relative Code Domain Error (RCDE) vs. slot trace results of the multi evaluation measurement.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPCCh:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:DPDCh:SDEViation?

Returns the values of the relative CDE vs. slot traces for the DPCCH and the DPDCH.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation traces cannot be displayed at the GUI.

See also chapter 3.2.6.3, "Detailed Views: Relative CDE", on page 115

Return values:

<Reliability>	Reliability Indicator
<RCDE_1> ... <RCDE_n>	Relative CDE trace results, one result per measured slot or half-slot Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB) Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:MAXimum?

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:HSDPcch:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPCch:SDEViation?

Returns the values of the relative CDE vs. slot traces for the HS-DPCCH and the E-DPCCH.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation traces cannot be displayed at the GUI.

See also chapter 3.2.6.3, "Detailed Views: Relative CDE", on page 115

Return values:

<Reliability> Reliability Indicator

<RCDE_1> ... <RCDE_n> Relative CDE trace results, one result per measured slot or half-slot
Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

Options: R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:AVERage?

READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:EDPDch<no>:SDEViation?

Returns the values of the relative CDE vs. slot traces for the E-DPDCH 1 to 4.

Each current value is averaged over a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

The results of the current, average, maximum and standard deviation traces can be retrieved. The standard deviation trace cannot be displayed at the GUI.

See also chapter 3.2.6.3, "Detailed Views: Relative CDE", on page 115

Suffix:

<no> 1..4
selects the E-DPDCH for which the results shall be retrieved

Return values:

<Reliability> Reliability Indicator

<RCDE_1> ... <RCDE_n> Relative CDE trace results, one result per measured slot or half-slot
Range: -100 dB to 0 dB (SDEViation: 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

Options: R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:DPCCh?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:DPDCh?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:DPCCh?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:DPDCh?

Returns the current spreading factors for the DPCCH and the DPDCH. Each value refers to a half-slot or a full-slot, depending on the measurement period (`CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation`). The number of results depends on the measurement length (`CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount`).

Return values:

<Reliability> Reliability Indicator

<SF_1> ... <SF_n> 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
Spreading factors, one result per measured slot or half-slot

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:EDPCch?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:HSDPcch?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:EDPCch?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:HSDPcch?

Returns the current spreading factors for the E-DPCCH and the HS-DPCCH.

Each value refers to a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

Return values:

<Reliability> Reliability Indicator

<SF_1> ... <SF_n> 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
Spreading factors, one result per measured slot or half-slot

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

Options: R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:EDPDch<no>?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:RCDerror:SF:EDPDch<no>?

Returns the spreading factors for the E-DPDCH 1 to 4.

Each current value refers to a half-slot or a full-slot, depending on the measurement period (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MPERiod:MODulation` on page 188). The number of results depends on the measurement length (see `CONFigure:WCDMa:MEAS<i>:MEValuation:MSCount` on page 180).

Suffix:

<no> 1..4
selects the E-DPDCH for which the results shall be retrieved

Return values:

<Reliability>	Reliability Indicator
<SF_1> ... <SF_n>	2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 Spreading factors, one result per measured slot or half-slot

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

Options: R&S CMW-KM401

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.24 CD Monitor Results (Traces)

The following commands return the code domain monitor trace results of the multi evaluation measurement, measured in the preselected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot` on page 180).

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPMonitor:QSIGnal:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDPMonitor:ISIGnal:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPMonitor:QSIGnal:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDPMonitor:ISIGnal:CURRent?

Returns the values of the code domain power traces of the code domain monitor. The results of the I-Signal and Q-Signal traces can be retrieved.

See also chapter 3.2.6.7, "Detailed Views: CD Monitor", on page 121

Return values:

<Reliability>	Reliability Indicator
<CDP_1> ... <CDP_SF>	One value per code channel. The number of values/channels corresponds to the spreading factor (e.g. 8 values/channels for SF8). Range: -100 dB to 0 dB Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.2.7

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDEMonitor:QSIGnal:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:TRACe:CDEMonitor:ISIGnal:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDEMonitor:QSIGnal:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:TRACe:CDEMonitor:ISIGnal:CURRent?

Returns the values of the code domain error traces of the code domain monitor. The results of the I-Signal and Q-Signal traces can be retrieved.

See also chapter 3.2.6.7, "Detailed Views: CD Monitor", on page 121

Return values:

<Reliability> Reliability Indicator

<CDE_1> ... <CDE_SF> One value per code channel. The number of values/channels corresponds to the spreading factor (e.g. 8 values/channels for SF8).

Range: -100 dB to 0 dB
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.2.7

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.25 Spectrum Results

The following commands return the results of the spectrum multi evaluation measurement, measured in the preselected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot` on page 180).

FETCh:WCDMa:MEAS<i>:MEValuation:SPECtrum:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:SPECtrum:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:SPECtrum:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:SPECtrum:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:SPECtrum:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:SPECtrum:MAXimum?
CALCulate:WCDMa:MEAS<i>:MEValuation:SPECtrum:CURRent?
CALCulate:WCDMa:MEAS<i>:MEValuation:SPECtrum:AVERage?
CALCulate:WCDMa:MEAS<i>:MEValuation:SPECtrum:MAXimum?

Returns the ACLR power and spectrum emission single value results of the multi evaluation measurement. The current, average and maximum values can be retrieved.

See also chapter 3.2.6.8, "Detailed Views: ACLR", on page 122 and chapter 3.2.6.9, "Detailed Views: Spectrum Emission Mask", on page 123

The values described below are returned by FETCh and READ commands. CALCulate commands return limit check results instead, one value for each of the first 18 results listed below. The frequency positions are only returned by FETCh and READ commands.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_CarrierPower> Power at the nominal carrier frequency (UL Frequency)
Range: -100 dBm to 55 dBm
Default unit: dBm

<3_ACLRminus2>
<4_ACLRminus1>
<5_ACLRplus1>
<6_ACLRplus2>
Power of the adjacent channels (±1st adjacent channels at ±5 MHz from the UL frequency, ±2nd adjacent channels at ±10 MHz from the UL frequency)
Range: -100 dBm to 55 dBm
Default unit: dBm

<7_OBW> Occupied bandwidth
Range: 0 MHz to 10 MHz
Default unit: Hz

<8_MarginAB>
<9_MarginBC>
<10_MarginCD>
<11_MarginEF>
<12_MarginFE>
<13_MarginDC>
<14_MarginCB>
<15_MarginBA>
Limit line margin values in the 8 emission mask areas. A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded.
Range: -100 dB to 90 dB
Default unit: dB

<16_UEpower> User equipment power
Range: -100 dBm to 55 dBm
Default unit: dBm

<17_MarginHAD>
<18_MarginHDA>
Limit line margin values for limit line H. A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded.
Range: -130 dB to 130 dB
Default unit: dB

<19_FreqAB>
<20_FreqBC>
<21_FreqCD>
<22_FreqEF>
<23_FreqFE>
<24_FreqDC>
<25_FreqCB>
<26_FreqBA>
Frequency offsets at which the limit line margin values in the 8 emission mask areas have been found.
Range: - 12.5E+6 Hz to 12.5E+6 Hz
Default unit: Hz

<27_FreqHAD> <28_FreqHDA>	Frequency offsets at which the limit line margin values for limit line H have been found. Range: - 12.5E+6 Hz to 12.5E+6 Hz Default unit: Hz
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.10.1 V3.0.20: added result <19_FreqAB> to <28_FreqHDA>

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.26 Modulation Results (Single Values)

The following commands return the modulation results of the multi evaluation measurement, measured in a selected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:SSCalar:MODulation` on page 190).

FETCh:WCDMa:MEAS<i>:MEValuation:MODulation:UEPHd?
READ:WCDMa:MEAS<i>:MEValuation:MODulation:UEPHd?
CALCulate:WCDMa:MEAS<i>:MEValuation:MODulation:UEPHd?

Returns the UE phase discontinuity single value results for signals without HSPA channels. The results depend on the upper limit and the dynamic limit, see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PHD` on page 196.

See also chapter 3.2.6.6, "Detailed Views: Phase Discontinuity", on page 119

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability>	Reliability Indicator
<OverallMaxPhD>	Overall maximum phase discontinuity Range: -180 deg to 180 deg Default unit: deg
<OverallMinDist>	Overall minimum slot distance between two results exceeding the dynamic limit Default unit: slots
<CountUpperLimit>	Number of results exceeding the upper limit Range: 0 to 99999999
<CountDynLimit>	Number of results exceeding the dynamic limit Range: 0 to 99999999

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:MODulation:PHDHsdpcch?
READ:WCDMa:MEAS<i>:MEValuation:MODulation:PHDHsdpcch?
CALCulate:WCDMa:MEAS<i>:MEValuation:MODulation:PHDHsdpcch?

Returns the phase discontinuity HS-DPCCH single value results for signals with HS-DPCCH. The results depend on the dynamic limit and points A and B (see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIMit:PHSDpcch` on page 197).

See also chapter 3.2.6.6, "Detailed Views: Phase Discontinuity", on page 119

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability>	Reliability Indicator
<2_MaxPhD>	Overall maximum phase discontinuity Range: -180 deg to 180 deg Default unit: deg
<3_MeasPoints>	Total number of results measured since the start of the measurement (point A + point B) Range: 0 to 99999999
<4_CountDynLimit>	Number of results exceeding the limit Range: 0 to 99999999

<5_RatioDynLimit>	Percentage of results exceeding the limit Range: 0 % to 100 % Default unit: %
<6_PointAcurr>	Current phase discontinuity at point A Range: -180 deg to 180 deg Default unit: deg
<7_PointAmax>	Maximum phase discontinuity at point A Range: -180 deg to 180 deg Default unit: deg
<8_PointBcurr>	Current phase discontinuity at point B Range: -180 deg to 180 deg Default unit: deg
<9_PointBmax>	Maximum phase discontinuity at point B Range: -180 deg to 180 deg Default unit: deg
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:MODulation:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:MODulation:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:MODulation:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:MODulation:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:MODulation:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:MODulation:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:MODulation:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:MODulation:SDEViation?
CALCulate:WCDMa:MEAS<i>:MEValuation:MODulation:CURRent?
CALCulate:WCDMa:MEAS<i>:MEValuation:MODulation:AVERage?
CALCulate:WCDMa:MEAS<i>:MEValuation:MODulation:MAXimum?
CALCulate:WCDMa:MEAS<i>:MEValuation:MODulation:SDEViation?

Return the current, average, maximum and standard deviation single value results.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The ranges indicated below apply to all results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_EVMrms>
<3_EVMpeak>
Error vector magnitude RMS and peak value
Range: 0 % to 100 %
Default unit: %

<4_MagErrorRMS>
Magnitude error RMS value
Range: 0 % to 100 %
Default unit: %

<5_MagErrorPeak>
Magnitude error peak value
Range: -100 % to 100 % (AVERage: 0% to 100 %, SDEViation: 0 % to 50 %)
Default unit: %

<6_PhErrorRMS>
Phase error RMS value
Range: 0 deg to 180 deg
Default unit: deg

<7_PhErrorPeak>
Phase error peak value
Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg)
Default unit: deg

<8_IQoffset>
I/Q origin offset
Range: -100 dB to 0 dB
Default unit: dB

<9_IQimbalance>
I/Q imbalance
Range: -100 dB to 0 dB
Default unit: dB

<10_CarrFreqErr>
Carrier frequency error
Range: -60000 Hz to 60000 Hz
Default unit: Hz

<11_TransTimeErr>
Transmit time error
Range: -250 chips to 250 chips
Default unit: chips

<12_UEpower>
User equipment power
Range: -100 dBm to 55 dBm
Default unit: dBm

<13_PowerSteps>
User equipment power step
Range: -50 dB to 50 dB
Default unit: dB

<14_PhaseDisc>
Phase Discontinuity
Range: -180 deg to 180 deg
Default unit: deg

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.10.1

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.27 CDP vs Slot Results (Single Values)

The following commands return the results of the code domain power (CDP) vs. slot measurement, measured in a selected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:SSCalar:MODulation` on page 190).

FETCh:WCDMa:MEAS<i>:MEValuation:CDPower:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:CDPower:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:CDPower:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:CDPower:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:CDPower:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:CDPower:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:CDPower:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:CDPower:MINimum?
READ:WCDMa:MEAS<i>:MEValuation:CDPower:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:CDPower:SDEViation?

Returns the RMS CDP vs. slot values measured in a selected slot. In addition to the current values, average, minimum, maximum and standard deviation values can be retrieved.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_DPCCH>
<3_DPDCH>
<4_HSDPCCH>
<5_EDPCCH>
<6_EDPDCH1>
<7_EDPDCH2>
<8_EDPDCH3>
<9_EDPDCH4>

RMS CDP values for the indicated channels
Range: -100 dB to 0 dB (SDEViation 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.4.11

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.28 CDE vs Slot Results (Single Values)

The following commands return the results of the code domain error (CDE) vs. slot measurement, measured in a selected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:SSCalar:MODulation` on page 190).

FETCh:WCDMa:MEAS<i>:MEValuation:CDERror:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:CDERror:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:CDERror:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:CDERror:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:CDERror:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:CDERror:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:CDERror:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:CDERror:SDEViation?

Returns the RMS CDE vs. slot values measured in a selected slot. In addition to the current values, average, maximum and standard deviation values can be retrieved.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_DPCCH>
<3_DPDCH>
<4_HSDPCCH>
<5_EDPCCH>
<6_EDPDCH1>
<7_EDPDCH2>
<8_EDPDCH3>
<9_EDPDCH4>

RMS CDE values for the indicated channels

Range: -100 dB to 0 dB (SDEViation 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.4.11

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.29 RCDE vs Slot Results (Single Values)

The following commands return the results of the Relative Code Domain Error (RCDE) vs. slot measurement, measured in a selected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:SSCalar:MODulation` on page 190) or determined from all measured slots.

FETCh:WCDMa:MEAS<i>:MEValuation:RCDerror:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:RCDerror:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:RCDerror:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:RCDerror:SDEViation?
READ:WCDMa:MEAS<i>:MEValuation:RCDerror:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:RCDerror:AVERage?
READ:WCDMa:MEAS<i>:MEValuation:RCDerror:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:RCDerror:SDEViation?
CALCulate:WCDMa:MEAS<i>:MEValuation:RCDerror:CURRent?
CALCulate:WCDMa:MEAS<i>:MEValuation:RCDerror:AVERage?
CALCulate:WCDMa:MEAS<i>:MEValuation:RCDerror:MAXimum?
CALCulate:WCDMa:MEAS<i>:MEValuation:RCDerror:SDEViation?

Returns the RCDE vs. slot values measured in a selected slot. In addition to the current values, average, maximum and standard deviation values can be retrieved.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_DPCCH>
<3_DPDCH>
<4_HSDPCCH>
<5_EDPCCH>
<6_EDPDCH1>
<7_EDPDCH2>
<8_EDPDCH3>
<9_EDPDCH4>

RCDE values for the indicated channels
Range: -100 dB to 0 dB (SDEViation 0 dB to 50 dB)
Default unit: dB

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:RCDerror:SF?
READ:WCDMa:MEAS<i>:MEValuation:RCDerror:SF?

Returns the spreading factors of the dedicated physical channels determined from a selected slot.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_DPCCH>
<3_DPDCH>
<4_HSDPCCH>
<5_EDPCCH>
<6_EDPDCH1>
<7_EDPDCH2>
<8_EDPDCH3>
<9_EDPDCH4>
2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
Spreading factors for the indicated channels

Example: See Performing Single-Shot Measurements

Usage: Query only

Firmware/Software: V1.0.15.0

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:MEValuation:RCDerror:OCINfo?
READ:WCDMa:MEAS<i>:MEValuation:RCDerror:OCINfo?

Returns the overall channel information for the RCDE measurement. This information is determined from all measured slots.

The parameters <State>, <SpreadFactor> and <Modulation> are returned for the individual channels:

- Values 2 to 4: DPCCH
- Values 5 to 7: DPDCH
- Values 8 to 10: HSDPCCH
- Values 11 to 13: EDPCCH
- Values 14 to 16: EDPDCH1
- Values 17 to 19: EDPDCH2
- Values 20 to 22: EDPDCH3
- Values 23 to 25: EDPDCH4

Return values:

<Reliability> Reliability Indicator

<State>	OFF | VAR | ON State of the channel **OFF**: Channel off since start of measurement **VAR**: Channel has been on and off **ON**: Channel on since start of measurement
<SpreadFactor>	V2 | 2 | V4 | 4 | V8 | 8 | V16 | 16 | V32 | 32 | V64 | 64 | V128 | 128 | V256 | 256 Spreading factor of the channel **2 | 4 | 8 | 16 | 32 | 64 | 128 | 256**: constant spreading factor **V2 | V4 | V8 | V16 | V32 | V64 | V128 | V256**: varying spreading factor, indicates smallest occurred value
<Modulation>	BPSK | 4PAM | 4PVar Modulation type of the channel **BPSK**: Constantly BPSK modulated **4PAM**: Constantly 4PAM modulated **4PVar**: BPSK and 4PAM occurred
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.15.0

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.30 CD Monitor Results (Single Values)

The following commands return the PCDE results of the code domain monitor measurement, measured in the preselected slot (see `CONFigure:WCDMa:MEAS<i>:MEValuation:PSLot` on page 180).

FETCh:WCDMa:MEAS<i>:MEValuation:PCDE:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:PCDE:MAXimum?
READ:WCDMa:MEAS<i>:MEValuation:PCDE:CURRent?
READ:WCDMa:MEAS<i>:MEValuation:PCDE:MAXimum?

Returns the Peak Code Domain Error (PCDE) results. In addition to the current PCDE value the maximum PCDE value can be retrieved.

See also chapter 3.2.6.7, "Detailed Views: CD Monitor", on page 121

Return values:

<Reliability>	Reliability Indicator
<PCDError>	Peak code domain error Range: -100 dB to 0 dB Default unit: dB

<PCDErrorPhase>	IPHase | QPHase Phase where the peak code domain error was measured **IPHase**: I-Signal **QPHase**: Q-Signal
<PCDErrorCodeNo>	Code number for which the PCDE was measured Range: 0 to 255
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.2.7

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.31 RX Results (Single Values)

The following commands return the results of the RX measurements.

FETCh:WCDMa:MEAS<i>:MEValuation:BER?
READ:WCDMa:MEAS<i>:MEValuation:BER?

Returns the bit error rate and the block error ratio.

Return values:

<Reliability>	Reliability Indicator
<BER>	Percentage of received data bits that were erroneous Range: 0 % to 100 % Default unit: %
<BLER>	Percentage of received transport data blocks containing at least one erroneous bit Range: 0 % to 100 % Default unit: %
Example:	See Performing Single-Shot Measurements
Usage:	Query only
Firmware/Software:	V1.0.4.11

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

3.5.3.32 List Mode Results (One Segment)

The following commands return the list mode results for a selected segment.

To configure the list mode use the commands described in chapter 3.5.3.4, "List Mode Settings", on page 181.

For a description of the list mode see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

Indicated ranges apply to all statistical results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:PCDE:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:PCDE:MAXimum?

Returns the Peak Code Domain Error (PCDE) results for segment <no> in list mode.

Suffix:

<no>	1..120

Return values:

<Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<ReturnCode>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<PCDError>	Peak code domain error Range: -100 dB to 0 dB Default unit: dB
<PCDE_Phase>	IPHase | QPHase Phase where the peak code domain error was measured **IPHase**: I-Signal **QPHase**: Q-Signal

<PCDE_CodeNo>	Code number for which the PCDE was measured Range: 0 to 255
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V1.0.15.0
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDPower:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDPower:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDPower:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDPower:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDPower:SDEViation?

Returns the RMS CDP vs. slot results for segment <no> in list mode.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:

<no>	1..120

Return values:

<1_Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
<2_ReturnCode>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
<3_DPCCH> <4_DPDCH> <5_HSDPCCH> <6_EDPCCH> <7_EDPDCH1> <8_EDPDCH2> <9_EDPDCH3> <10_EDPDCH4>	RMS CDP values for the indicated channels Range: -100 dB to 0 dB (SDEViation 0 dB to 50 dB) Default unit: dB
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V1.0.5.3
Options:	R&S CMW-KM012 R&S CMW-KM401 for HS-DPCCH, E-DPCCH, E-DPDCH

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDERror:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDERror:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDERror:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:CDERror:SDEViation?

Returns the RMS CDE vs. slot results for segment <no> in list mode.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:

<no> 1..120

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<2_ReturnCode> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_DPCCH>
<4_DPDCH>
<5_HSDPCCH>
<6_EDPCCH>
<7_EDPDCH1>
<8_EDPDCH2>
<9_EDPDCH3>
<10_EDPDCH4>
RMS CDE values for the indicated channels
Range: -100 dB to 0 dB (SDEViation 0 dB to 50 dB)
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012
R&S CMW-KM401 for HS-DPCCH, E-DPCCH, E-DPDCH

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SPECtrum:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SPECtrum:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:SPECtrum:MAXimum?

Returns the ACLR power and spectrum emission single value results for segment <no> in list mode.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:

<no> 1..120

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<2_ReturnCode> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_CarrierPower> Power at the nominal carrier frequency (UL Frequency)
Range: -100 dBm to 55 dBm
Default unit: dBm

<4_ACLRminus2>
<5_ACLRminus1>
<6_ACLRplus1>
<7_ACLRplus2> Power of the adjacent channels (±1st adjacent channels at ±5 MHz from the UL frequency, ±2nd adjacent channels at ±10 MHz from the UL frequency)
Range: -100 dBm to 55 dBm
Default unit: dBm

<8_OBW> Occupied bandwidth
Range: 0 MHz to 10 MHz
Default unit: Hz

<9_MarginAB>
<10_MarginBC>
<11_MarginCD>
<12_MarginEF>
<13_MarginFE>
<14_MarginDC>
<15_MarginCB>
<16_MarginBA> Limit line margin values in the 8 emission mask areas. A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded.
Range: -100 dB to 90 dB
Default unit: dB

<17_UEpower> User equipment power
Range: -100 dBm to 55 dBm
Default unit: dBm

<18_MarginHAD>
<19_MarginHDA> Limit line margin values for limit line H. A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded.
Range: -130 dB to 130 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V1.0.10.1

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SEGMent<no>:MODulation:SDEViation?

Returns modulation single value results for segment <no> in list mode.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Suffix:

<no> 1..120

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<2_ReturnCode> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_EVMrms>
<4_EVMpeak> Error vector magnitude RMS and peak value
Range: 0 % to 100 %
Default unit: %

<5_MagErrorRMS> Magnitude error RMS value
Range: 0 % to 100 %
Default unit: %

<6_MagErrorPeak> Magnitude error peak value
Range: -100 % to 100 % (AVERage: 0% to 100 %, SDEViation: 0 % to 50 %)
Default unit: %

<7_PhErrorRMS> Phase error RMS value
Range: 0 deg to 180 deg
Default unit: deg

<8_PhErrorPeak> Phase error peak value
Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg)
Default unit: deg

<9_IQoffset> I/Q origin offset
Range: -100 dB to 0 dB
Default unit: dB

<10_IQimbalance>	I/Q imbalance Range: -100 dB to 0 dB Default unit: dB
<11_CarrFreqErr>	Carrier frequency error Range: -60000 Hz to 60000 Hz Default unit: Hz
<12_TransTimeErr>	Transmit time error (for future use) Range: -250 chips to 250 chips Default unit: chips
<13_UE Power>	User equipment power Range: -100 dBm to 55 dBm Default unit: dBm
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V1.0.5.3
Options:	R&S CMW-KM012

3.5.3.33 List Mode Results (All Segments, One Result)

Each of the following commands returns a selected list mode result for all measured segments. The number of returned results depends on the number of measured segments, see `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt` on page 182.

To configure the list mode use the commands described in chapter 3.5.3.4, "List Mode Settings", on page 181.

For a description of the list mode see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

Indicated ranges apply to all statistical results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SRELiability?

Returns the segment reliability for all measured list mode segments.

A common reliability indicator of zero indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments. If you get a non-zero common reliability indicator, you can use this command to retrieve the individual reliability values of all measured segments for further analysis.

Return values:

<Reliability>	Reliability Indicator

<SegReliability>	Comma separated list of values, one per measured segment The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V3.0.20
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:ERRor:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:ERRor:MAXimum?

Return peak code domain error values for all measured list mode segments.

Return values:

<Reliability>	Reliability Indicator
<PCDError>	Comma separated list of values, one per measured segment Range: -100 dB to 0 dB Default unit: dB
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V3.0.10
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:PHASe:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:PHASe:MAXimum?

Return the phase where the peak code domain error was measured, for all measured list mode segments.

Return values:

<Reliability>	Reliability Indicator
<PCDErrorPhase>	IPHase | QPHase Comma separated list of values, one per measured segment **IPHase**: I-Signal **QPHase**: Q-Signal
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V3.0.10
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:CODE:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:CODE:MAXimum?

Return the code number for which the peak code domain error was measured, for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<PCDErrorCodeNr> Comma separated list of values, one per measured segment
Range: 0 to 255

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPCCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPCCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPCCh:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPCCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPCCh:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPCCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPCCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPCCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPCCh:SDEViation?

Return RMS CDP and CDE vs. slot values for the DPCCH for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<DPCCH> Comma separated list of values, one per measured segment
Range: -100 dB to 0 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPDCh:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPDCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPDCh:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPDCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:DPDCh:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPDCh:CURRent?

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPDCh:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPDCh:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:DPDCh:SDEViation?

Return RMS CDP and CDE vs. slot values for the DPDCH for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<DPDCH> Comma separated list of values, one per measured segment
Range: -100 dB to 0 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:HSDPcch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:HSDPcch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:HSDPcch:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:HSDPcch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:HSDPcch:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:HSDPcch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:HSDPcch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:HSDPcch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:HSDPcch:SDEViation?

Return RMS CDP and CDE vs. slot values for the HS-DPCCH for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<HSDPCCH> Comma separated list of values, one per measured segment
Range: -100 dB to 0 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012, R&S CMW-KM401

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPCch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPCch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPCch:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPCch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPCch:SDEViation?

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPCch:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPCch:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPCch:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPCch:SDEViation?

Return RMS CDP and CDE vs. slot values for the E-DPCCH for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<EDPCCH> Comma separated list of values, one per measured segment
Range: -100 dB to 0 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012, R&S CMW-KM401

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPDch<no>:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPDch<no>:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPDch<no>:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPDch<no>:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:EDPDch<no>:SDEViation?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPDch<no>:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPDch<no>:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPDch<no>:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:EDPDch<no>:SDEViation?

Return RMS CDP and CDE vs. slot values for a selected E-DPDCH for all measured list mode segments.

Suffix:

<no> 1..4
selects the E-DPDCH

Return values:

<Reliability> Reliability Indicator

<EDPDCH> Comma separated list of values, one per measured segment
Range: -100 dB to 0 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012, R&S CMW-KM401

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:CPOWer:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:CPOWer:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:CPOWer:MAXimum?

Return the power at the nominal carrier frequency for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<CarrierPower> Comma separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:UEPower:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:UEPower:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:UEPower:MAXimum?

Return the UE power for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<UEpower> Comma separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:ACLR:M<no>:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:ACLR:M<no>:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:ACLR:M<no>:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:ACLR:P<no>:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:ACLR:P<no>:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:ACLR:P<no>:MAXimum?

Return the power of the adjacent channels for all measured list mode segments.

The adjacent channel selected via M<no>/P<no> is located at the following frequency relative to the carrier frequency:

- M1 = -5 MHz, M2 = -10 MHz

- P1 = +5 MHz, P2 = +10 MHz

Suffix:
<no> 1..2

Return values:
<Reliability> Reliability Indicator

<ACLR> Comma separated list of values, one per measured segment
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:OBW:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:OBW:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:OBW:MAXimum?

Return the occupied bandwidth for all measured list mode segments.

Return values:
<Reliability> Reliability Indicator

<OBW> Comma separated list of values, one per measured segment
Range: 0 MHz to 10 MHz
Default unit: Hz

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:AB:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:AB:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:AB:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:BC:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:BC:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:BC:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:CD:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:CD:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:CD:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:EF:CURRent?

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:EF:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:EF:MAXimum?

Return the limit line margin values in the 4 emission mask areas below the carrier frequency for all measured list mode segments.

A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded.

Return values:

<Reliability> Reliability Indicator

<EMaskMargin> Comma separated list of values, one per measured segment
Range: -100 dB to 90 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:FE:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:FE:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:FE:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:DC:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:DC:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:DC:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:CB:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:CB:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:CB:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:BA:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:BA:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:BA:MAXimum?

Return the limit line margin values in the 4 emission mask areas above the carrier frequency for all measured list mode segments.

A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded.

Return values:

<Reliability> Reliability Indicator

<EMaskMargin> Comma separated list of values, one per measured segment
Range: -100 dB to 90 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:HAD:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:HAD:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:HAD:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:HDA:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:HDA:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:EMASk:HDA:MAXimum?

Return the limit line margin values for limit line H for all measured list mode segments.

A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded.

Return values:

<Reliability> Reliability Indicator

<EMaskMargin> Comma separated list of values, one per measured segment

Range: -130 dB to 130 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:RMS:SDEViation?

Return error vector magnitude RMS values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<EVMrms> Comma separated list of values, one per measured segment

Range: 0 % to 100 %
Default unit: %

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:AVERage?

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:EVM:PEAK:SDEViation?

Return error vector magnitude peak values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<EVMpeak> Comma separated list of values, one per measured segment
Range: 0 % to 100 %
Default unit: %

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:RMS:SDEViation?

Return magnitude error RMS values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<MagErrorRMS> Comma separated list of values, one per measured segment
Range: 0 % to 100 %
Default unit: %

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:AVERage?

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MERRor:PEAK:SDEViation?

Return magnitude error peak values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<MagErrorPeak> Comma separated list of values, one per measured segment
Range: -100 % to 100 % (AVERage: 0% to 100 %, SDEViation: 0 % to 50 %)
Default unit: %

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:RMS:SDEViation?

Return phase error RMS values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<PhaseErrorRMS> Comma separated list of values, one per measured segment
Range: 0 deg to 180 deg
Default unit: deg

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:AVERage?

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:PERRor:PEAK:SDEViation?

Return phase error peak values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<PhaseErrorPeak> Comma separated list of values, one per measured segment
Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg)
Default unit: deg

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQOFfset:SDEViation?

Return I/Q origin offset values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<IQoffset> Comma separated list of values, one per measured segment
Range: -100 dB to 0 dB
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQIMbalance:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQIMbalance:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQIMbalance:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:IQIMbalance:SDEViation?

Return I/Q imbalance values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<IQimbalance>	Comma separated list of values, one per measured segment Range: -100 dB to 0 dB Default unit: dB
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V3.0.10
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:FERRor:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:FERRor:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:FERRor:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:FERRor:SDEViation?

Return carrier frequency error values for all measured list mode segments.

Return values:

<Reliability>	Reliability Indicator
<CarrierFreqErr>	Comma separated list of values, one per measured segment Range: -60000 Hz to 60000 Hz Default unit: Hz
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V3.0.10
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:TTERror:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:TTERror:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:TTERror:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:TTERror:SDEViation?

Return transmit time error values for all measured list mode segments.

Return values:

<Reliability>	Reliability Indicator
<TransmitTimeErr>	Comma separated list of values, one per measured segment Range: -250 chips to 250 chips Default unit: chips
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V3.0.10
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:UEPower:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:UEPower:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:UEPower:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:UEPower:SDEViation?

Return user equipment power values for all measured list mode segments.

Return values:

<Reliability> Reliability Indicator

<UEpower> Comma separated list of values, one per measured segment

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.10

Options: R&S CMW-KM012

3.5.3.34 List Mode Results (All Segments, Result Groups)

The following commands return groups of list mode results for all segments.

To configure the list mode use the commands described in chapter 3.5.3.4, "List Mode Settings", on page 181.

For a description of the list mode see chapter 3.2.3, "Multi Evaluation List Mode", on page 97.

Indicated ranges apply to all statistical results except standard deviation results. The minimum for standard deviation results equals 0. The maximum equals the width of the indicated range divided by two. Exceptions are explicitly stated.

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PCDE:MAXimum?

Return the Peak Code Domain Error (PCDE) results in list mode.

The values listed below in curly brackets {} are returned for the segments $\{...\}_{seg\ 1}$, $\{...\}_{seg\ 2}$, ..., $\{...\}_{seg\ n}$, with n determined by `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt`.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

{<2_ReturnCode> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_PCDError> Peak code domain error
Range: -100 dB to 0 dB
Default unit: dB

<4_PCDE_Phase> IPHase | QPHase
Phase where the peak code domain error was measured
IPHase: I-Signal
QPHase: Q-Signal

<5_PCDE_CodeNo>} Code number for which the PCDE was measured
Range: 0 to 255

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V1.0.15.0

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:MINimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDPower:SDEViation?

Return the RMS CDP vs. slot results in list mode.

The values listed below in curly brackets {} are returned for the segments $\{...\}_{seg\ 1}$, $\{...\}_{seg\ 2}$, ..., $\{...\}_{seg\ n}$, with n determined by CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

{<2_ReturnCode> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_DPCCH>
<4_DPDCH>
<5_HSDPCCH>
<6_EDPCCH>
<7_EDPDCH1>
<8_EDPDCH2>
<9_EDPDCH3>
<10_EDPDCH4>} RMS CDP values for the indicated channels
Range: -100 dB to 0 dB (SDEViation 0 dB to 50 dB)
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012
R&S CMW-KM401 for HS-DPCCH, E-DPCCH, E-DPDCH

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:CDERror:SDEViation?

Return the RMS CDE vs. slot results in list mode.

The values listed below in curly brackets {} are returned for the segments $\{...\}_{seg\ 1}$, $\{...\}_{seg\ 2}$, ..., $\{...\}_{seg\ n}$, with n determined by CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

{<2_ReturnCode> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_DPCCH>
<4_DPDCH>
<5_HSDPCCH>
<6_EDPCCH>
<7_EDPDCH1>
<8_EDPDCH2>
<9_EDPDCH3>
<10_EDPDCH4>}

RMS CDE values for the indicated channels

Range: -100 dB to 0 dB (SDEViation 0 dB to 50 dB)
Default unit: dB

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012
R&S CMW-KM401 for HS-DPCCH, E-DPCCH, E-DPDCH

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:SPECtrum:MAXimum?

Returns the ACLR power and spectrum emission single value results in list mode.

The values listed below in curly brackets {} are returned for the segments $\{...\}_{seg\ 1}$, $\{...\}_{seg\ 2}$, ..., $\{...\}_{seg\ n}$, with n determined by `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt`.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

{<2_ReturnCode> Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_CarrierPower> Power at the nominal carrier frequency (UL Frequency)

Range: -100 dBm to 55 dBm
Default unit: dBm

<4_ACLRminus2>
<5_ACLRminus1>
<6_ACLRplus1>
<7_ACLRplus2>

Power of the adjacent channels (±1st adjacent channels at ±5 MHz from the UL frequency, ±2nd adjacent channels at ±10 MHz from the UL frequency)

Range: -100 dBm to 55 dBm
Default unit: dBm

<8_OBW>	Occupied bandwidth Range: 0 MHz to 10 MHz Default unit: Hz
<9_MarginAB> <10_MarginBC> <11_MarginCD> <12_MarginEF> <13_MarginFE> <14_MarginDC> <15_MarginCB> <16_MarginBA>	Limit line margin values in the 8 emission mask areas. A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded. Range: -100 dB to 90 dB Default unit: dB
<17_UEpower>	User equipment power Range: -100 dBm to 55 dBm Default unit: dBm
<18_MarginHAD> <19_MarginHDA>}	Limit line margin values for limit line H. A positive result indicates that the trace is located above the limit line, i.e. the limit is exceeded. Range: -130 dB to 130 dB Default unit: dB
Example:	See Using WCDMA List Mode
Usage:	Query only
Firmware/Software:	V1.0.10.1
Options:	R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:CURRent?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:AVERage?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:MAXimum?
FETCh:WCDMa:MEAS<i>:MEValuation:LIST:MODulation:SDEViation?

Return modulation single value results in list mode.

The values listed below in curly brackets {} are returned for the segments $\{...\}_{seg\ 1}$, $\{...\}_{seg\ 2}$, ..., $\{...\}_{seg\ n}$, with n determined by `CONFigure:WCDMa:MEAS<i>:MEValuation:LIST:COUNt`.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability>	Reliability Indicator In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.
{<2_ReturnCode>	Reliability indicator for the segment. The meaning of the returned values is the same as for the common reliability indicator, see previous parameter.

<3_EVMrms> <4_EVMpeak>	Error vector magnitude RMS and peak value Range: 0 % to 100 % Default unit: %
<5_MagErrorRMS>	Magnitude error RMS value Range: 0 % to 100 % Default unit: %
<6_MagErrorPeak>	Magnitude error peak value Range: -100 % to 100 % (AVERage: 0% to 100 %, SDEViation: 0 % to 50 %) Default unit: %
<7_PhErrorRMS>	Phase error RMS value Range: 0 deg to 180 deg Default unit: deg
<8_PhErrorPeak>	Phase error peak value Range: -180 deg to 180 deg (AVERage: 0 deg to 180 deg, SDEViation: 0 deg to 90 deg Default unit: deg
<9_IQoffset>	I/Q origin offset Range: -100 dB to 0 dB Default unit: dB
<10_IQimbalance>	I/Q imbalance Range: -100 dB to 0 dB Default unit: dB
<11_CarrierFreqErr>	Carrier frequency error Range: -60000 Hz to 60000 Hz Default unit: Hz
<12_TransTimeErr>	Transmit time error (for future use) Range: -250 chips to 250 chips Default unit: chips
<13_UEpower>}	User equipment power Range: -100 dBm to 55 dBm Default unit: dBm

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V1.0.5.3

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:UEPower:CURRent?

Returns the UE power vs. slot results in list mode.

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

{<UEpower_1> ... <UEpower_m>} User equipment power, one value per slot. The list contains results for all active segments (segments for which any measurement has been enabled).
If another measurement has been enabled for a segment, but the UE power vs. slot measurement is disabled, NCAPs are returned for that segment.
Example: segment 1 with 10 slots active, segment 2 with 50 slots inactive, segment 3 with 12 slots active. 22 power results are returned.

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V1.0.10.1

Options: R&S CMW-KM012

FETCh:WCDMa:MEAS<i>:MEValuation:LIST:PHD:CURRent?

Returns the phase discontinuity vs. slot results in list mode.

Each value indicates the phase discontinuity at the boundary between the slot and the previous slot. If the slot or the previous slot is not measured, NCAP is returned.

Return values:

<Reliability> Reliability Indicator
In list mode, a zero reliability indicator indicates that the results in all measured segments are valid. A non-zero value indicates that an error occurred in at least one of the measured segments.

<PhD> Comma separated list of phase discontinuity results, one value per slot. The list contains results for all active segments (segments for which any measurement has been enabled).
If another measurement has been enabled for a segment, but the phase discontinuity measurement is disabled, NCAPs are returned for that segment.
Example: segment 1 with 10 slots active, segment 2 with 50 slots inactive, segment 3 with 12 slots active. 22 phase discontinuity results are returned.

Range: -180 deg to 180 deg
Default unit: deg

Example: See Using WCDMA List Mode

Usage: Query only

Firmware/Software: V3.0.20

Options: R&S CMW-KM012

3.6 List of Commands

4 WCDMA TPC Measurement

In CDMA networks, control of the UE transmit power is essential to ensure stable transmission and an efficient radio resource management within the system. An output power of the UE transmitter that is too low decreases the coverage area while an excess output power may cause interference to other channels or systems. Both effects decrease the system capacity.

For that reason the Node B controls the UE power via the transmission of Transmit Power Control (TPC) commands on the DL DPCH. The UE is expected to adjust its transmit power according to the received TPC commands.

The WCDMA TPC measurement included in option R&S CMW-KM400 determines the UE output power per timeslot of a WCDMA uplink signal and evaluates the power steps between adjacent timeslots. Thus it can evaluate the reaction of the UE to TPC commands. The TPC commands must be sent to the UE by another application, preferably by the WCDMA signaling application (option R&S CMW-KS400). The signaling application is compatible with all TPC measurement modes and cooperates with the measurement for comfortable operation.

The TPC measurement provides the following modes:

- The "Monitor" mode measures the UE output power and presents the results without performing any limit checks. It does not care about the TPC commands sent to the UE and does not verify whether the UE reacts to the commands correctly.
- The "Inner Loop Power Control" mode verifies the correct reaction of the UE to TPC commands received during test step A to H, defined in 3GPP TS 34.121, section 5.4.2 "Inner Loop Power Control".
  It evaluates the reaction to single TPC commands as well as to TPC command groups and checks whether the results are within the tolerances. Additionally it measures the minimum and maximum UE output power and checks the results against the limits.
- The "Max. Power E-DCH" mode measures the maximum UE power with active HS-DPCCH and E-DCH and checks whether the results are within the tolerances.
  It is designed as combined signal path measurement. The signaling application in combination with the TPC measurement allows to perform subtest 1 to 5 as defined in 3GPP TS 34.121, section 5.2B "Maximum Output Power with HS-DPCCH and E-DCH".
- The "Change of TFC" mode is designed for measuring the UE power steps caused by switching the DPDCH on or off, as defined in 3GPP TS 34.121, section 5.6 "Change of TFC". A limit check is performed for the measured step sizes.

4.1 What's New in this Revision

This revision describes version 3.0.30 and later of the WCDMA TPC measurement. Compared to version 3.0.20 it provides the following new features:

- "Change of TFC" measurement mode, see Change of TFC TPC Setup
- "Max. Power E-DCH" measurement mode, see Max Power E-DCH TPC Setup

Software Version

To check your R&S CMW software version, open the "Setup" dialog and click "HW/SW Equipment". The initial software version for each remote control command is quoted in the reference description.

4.2 General Description

The main purpose of the WCDMA TPC measurement included in option R&S CMW-KM400 is to verify the correct reaction of the UE to received TPC commands. The TPC commands must be sent to the UE by another application, e.g. the WCDMA signaling application (option R&S CMW-KS400) or the WCDMA generator (option R&S CMW-KG400).

The following sections describe how to perform a measurement, using the individual measurement modes.

4.2.1 Test Setup

The external RF signal source (mobile station, signal generator etc.) is connected to one of the RF input connectors (RF COM) at the front panel of the R&S CMW. No additional cabling and no external trigger is needed.

The input level ranges of all RF COM connectors are identical.

See also: "RF Connectors" in the R&S CMW user manual, chapter "Getting Started"

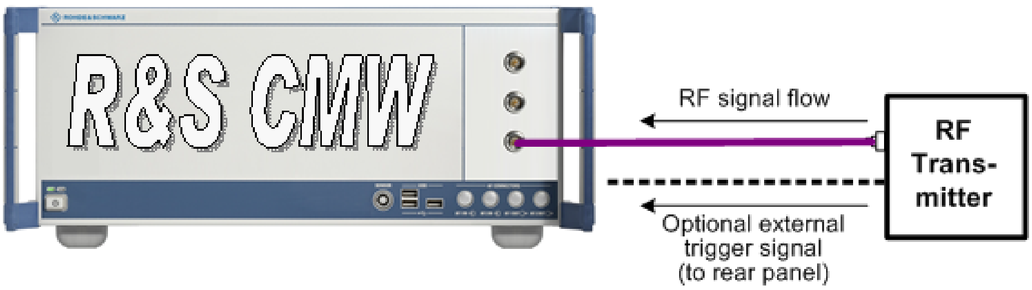


Fig. 4-1: Connecting an RF transmitter to the instrument

4.2.2 How to Perform a Measurement

In addition to the TPC measurement and the UE you need an application able to send TPC commands to the UE.

It is recommended to use the WCDMA signaling application for this purpose (option R&S CMW-KS400). The signaling application is compatible with all TPC measurement modes.

In "Monitor" mode and "Inner Loop Power Control" mode you can alternatively use the WCDMA generator (option R&S CMW-KG400) or a suitable waveform file together with the GPRF generator (option R&S CMW-KW400 required to use WCDMA R99 waveform files generated via R&S WinIQSIM2).

General measurement procedure

The steps to be performed in detail depend on the application used to send the TPC commands to the UE. The general procedure is as follows:

1. Connect your WCDMA UE to the R&S CMW (see chapter 4.2.1, "Test Setup", on page 288).
2. Configure the application used to send the TPC commands to the UE (do not yet start sending TPC commands).
   The required signal configuration depends on the TPC setup. For details see chapter 4.2.5, "TPC Setups", on page 292.
3. Configure the WCDMA TPC measurement (see mandatory settings below).
4. Start the WCDMA TPC measurement.
5. Start sending TPC commands to the UE.
   Auto execution is available for some combined signal path measurement modes. If auto execution is used, this step is performed automatically when the measurement is started.

Mandatory measurement settings

You must adjust at least the following measurement settings to the properties of the analyzed UL WCDMA signal and the TPC commands to be sent to the UE. For combined signal path measurements, most of these settings are controlled by the signaling application.

- Analyzer "Frequency"
- "Expected Nominal Power", "User Margin" and "External Attenuation (Input)"
  – For combined signal path measurements, let the signaling application calculate the expected nominal power from the UL power control settings (expected nominal power mode = "According to UL Power Control Settings"). Do not use the manual mode.
  – For standalone measurements, set the "Expected Nominal Power" to the expected peak power of the UE signal during the measurement. Even if you start the measurement with minimum UE power, consider the maximum power expected at a later stage of the measurement. Set the "User Margin" to 0 dB.
- "TPC Setup"

Select the TPC setup corresponding to the TPC pattern that will be sent to the UE. For details see chapter 4.2.5, "TPC Setups", on page 292.

- "Trigger Source"
  – For combined signal path measurements, the trigger source is configured automatically when you select the TPC setup.
  – For standalone measurements, select a suitable trigger signal provided by the application that sends the TPC commands to the UE.

  For details see chapter 4.2.4, "Trigger Modes", on page 291.

Furthermore, it is recommended to disable the sending of UE measurement reports, because they cause power steps. For combined signal path measurements, disable the reports in the "WCDMA Signaling Configuration" dialog, section "UE Measurement Report".

Detailed step-by-step instructions for combined signal path TPC measurements are provided in the documentation of the WCDMA signaling application, section "Application Sheets". The application sheets describe an inner loop power control measurement (step A to H) and a maximum power E-DCH measurement (subtest 1 to 5).

4.2.3 Parallel Signaling and Measurement

The WCDMA TPC measurement can be used in parallel to the WCDMA signaling application (option R&S CMW-KS400). The signaling application sends TPC commands to the UE and the TPC measurement evaluates the UE power and power steps.

To use both applications in parallel, the combined signal path scenario must be activated (see "Scenario = Combined Signal Path" on page 129). The signal routing and analyzer settings and some measurement control settings are then configured by the signaling application. The TPC measurement displays the corresponding signaling settings instead of its own settings. These signaling settings can be configured both in the measurement GUI and in the GUI of the signaling application. To configure the signaling settings via remote commands, the commands of the signaling application have to be used.

Additional signaling parameters, e.g. the TPC settings, can be accessed in the measurement GUI via hotkeys, see chapter 4.3.2.6, "Additional Softkeys and Hotkeys", on page 316.

For combined signal path measurements, a suitable trigger signal provided by the signaling application is selected automatically. This is done for example when the combined signal path scenario is activated, the controlling application is changed or the TPC setup is changed.

The TPC measurement provides several ways to trigger the execution of a TPC setup by the signaling application:

- Press the softkey "TPC Meas." and the hotkey "Execute".
- Press the softkey "Signaling Parameter", the hotkey "TPC" and the "Execute" button.
- Enable auto execution. The TPC setup execution is triggered automatically whenever the measurement is started.
  Auto execution is supported for the measurement modes "Inner Loop Power Control" and "Max. Power E-DCH". It can be enabled or disabled as part of the mode-

specific settings, see chapter 4.3.2.3, "Measurement Control Settings", on page 311.

4.2.4 Trigger Modes

It is recommended to always trigger the TPC measurement by the application that sends the TPC commands to the UE. This ensures that the measurement is aligned correctly relative to the executed TPC pattern. Triggering the measurement incorrectly results in erroneous measurement results or measurement failure.

Select the trigger signal (the trigger source) depending on the used application as follows:

- WCDMA signaling application:
  The appropriate trigger signal provided by the signaling application is selected automatically, depending on the measurement mode.
  For the "Change of TFC" mode, the "Change of TFC" trigger signal is used.
  For all other modes, the TPC trigger signal is used.
- WCDMA generator:
  Select the TPC trigger signal provided by the generator application.
  The WCDMA generator can be used in inner loop power control mode and in monitor mode.
- GPRF generator plus waveform file:
  Select a suitable waveform marker provided by the GPRF generator.
  The marker must be located one slot before the slot carrying the first TPC command.
  Example: If the first TPC bit is transferred in the first timeslot (slot 0) of a frame, set the marker at the beginning of the last timeslot (slot 14) of the previous frame.
  Waveform files can be used in inner loop power control mode and in monitor mode.
- Other customer-specific applications:
  Provide an external trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument and select this trigger source "…External TRIG A/B".
  For "Inner Loop Power Control" mode and "Monitor" mode, time the trigger event so that it occurs one slot before the UL slot reflecting the reaction of the UE to the first TPC command.
  Example: If the first TPC bit is transferred in the first timeslot (slot 0) of a DL radio frame, the reaction of the UE is expected in the first timeslot of the UL radio frame.
  In that case the trigger event must occur at the beginning of the last timeslot (slot 14) of the previous UL radio frame.
  For "Change of TFC" mode, align the trigger event to a slot or frame boundary.

For optimum measurement results and measurement speed, it is recommended to select the trigger source according to these rules, even when using the monitor mode. However, the "Free Run" and "IF Power" trigger sources can sometimes be suitable for measurements in monitor mode. The effect of these trigger sources is as follows:

- Free Run (Standard / Fast Sync):
  The measurement starts immediately after it is initiated. The R&S CMW decodes the signal to derive its slot timing so that the "Measurement Length" can start at a slot boundary of the UL WCDMA signal.
  The "Standard" and "Fast Sync" modes differ in the synchronization procedure performed after each measurement cycle. As the TPC measurement is a single shot

application and performs only one measurement cycle, there is no difference between the two modes.

- IF Power:
  With an internal IF power trigger, the measurement is triggered by the power ramp of the received bursts. This trigger can be used if no continuous WCDMA signal is available and a short signal burst has to be measured.
- IF Power (Sync):
  Similar to "IF Power", however, the R&S CMW tries to synchronize to the signal during a full slot after the trigger event. This setting can be used to measure short signal bursts where the beginning of the burst does not exactly coincide with a slot boundary. The start of the measurement takes longer than with "IF Power".

For configuration see chapter 4.3.2.4, "Trigger Settings", on page 313.

4.2.5 TPC Setups

The WCDMA generator and the WCDMA signaling application provide several predefined and partly configurable TPC setups with different TPC command patterns. This section provides an overview of these TPC setups from point of view of the TPC measurement. For more details concerning the individual TPC setups please refer to the description of the corresponding application.

The used measurement mode depends directly on the selected TPC setup.

4.2.5.1 Inner Loop Power Control TPC Setups

The conformance test specification 3GPP TS 34.121, section 5.4.2 "Inner Loop Power Control" defines the TPC test steps A to H inducing a power ramp of the following shape:

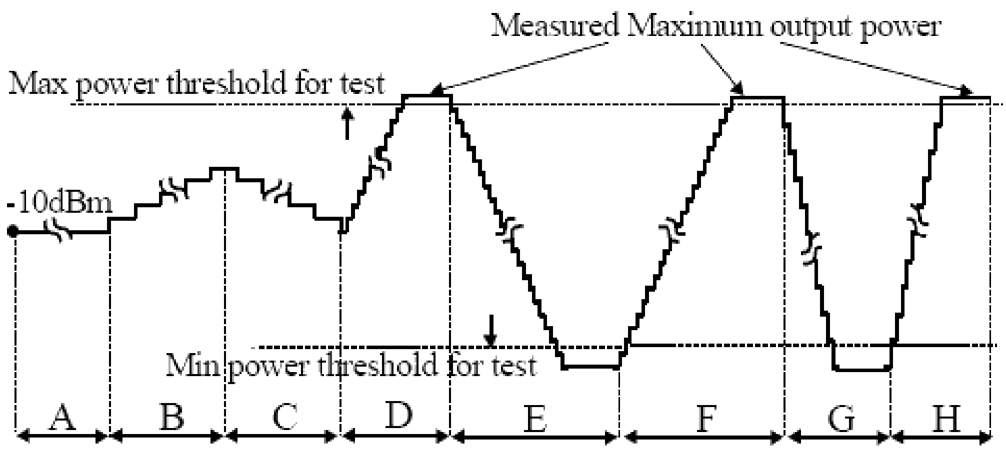


Fig. 4-2: TPC test steps A to H as defined by 3GPP

Most of these test steps can be selected as TPC setup. These TPC setups result in the measurement mode "Inner Loop Power Control".

The following table provides an overview of the test steps, the transferred bit patterns and the expected reaction of the UE, i.e. of the expected UE power steps. The algorithm and step size to be configured is also listed, for an explanation see "Algorithm and step size" on page 293.

TPC Setup Name	Transferred Pattern	Algorithm / Step Size	Expected Power Steps
TPC Test Step ABC	A: 60-bit 3GPP pattern B: 50 x 1 C: 50 x 0	2 / 1 dB	A: 60 x 0 dB B: (4 x 0 dB, 1 x +1 dB) x 10 C: (4 x 0 dB, 1 x -1 dB) x 10
TPC Test Step E	m x 0	1 / 1 dB	-1 dB until min power, then 0 dB
TPC Test Step F	n x 1	1 / 1 dB	+1 dB until max power, then 0 dB
TPC Test Step GH	G: p x 0 H: q x 1	1 / 2 dB	G: -2 dB until min power, then 0 dB H: +2 dB until max power, then 0 dB
m, n, p and q are configurable. 3GPP requests "at least 10 more than the number required to ensure that the UE reaches the relevant maximum or minimum power threshold". The additional setup "TPC Test Step EF" equals "TPC Test Step E" followed by "TPC Test Step F".			

Algorithm and step size

When the UE receives TPC bits, it shall adjust its transmit power depending on the configured algorithm and step size as defined in 3GPP TS 25.214.

Two algorithms are available:

- **Algorithm 1**:
  The UE receives one TPC bit per timeslot. If the received TPC bit equals 1 (0), then the power control parameter TPC_cmd for that timeslot is +1 (-1). This implies that the UE output power changes after each timeslot.
- **Algorithm 2**:
  The UE receives one TPC bit per timeslot. The slots are grouped into sets of 5 slots, aligned to the frame boundaries, so that there is no overlap between different sets of 5 slots.
  If the received TPC bit equals 1 (0) in all 5 slots of a set, then the power control parameter TPC_cmd for the 5th slot is +1 (-1). Otherwise the TPC_cmd for the 5th slot is 0. This implies that the UE transmitter output power always remains constant for 4 slots and may change for the 5th slot.

For both algorithms, the UE output power changes by TPC_cmd multiplied with the TPC step size of 1 dB or 2 dB.

Segmented TPC Test Patterns

To improve the accuracy of the measured power step values, it is possible to split the TPC patterns for test steps E, F, G, and H into segments.

Segmentation means that inverse TPC commands are inserted into each of the four test step patterns: A …1111…1111… pattern changes to …11011…11011…, a …0000… 0000… pattern changes to …00100…00100…

The positions of the inverse TPC commands (segment borders) are fixed and known both by the generator or signaling application and by the TPC measurement. The measurement uses the inverse TPC periods to adjust the instrument hardware to the next input power range. The two UE power steps before and after each segment border are assumed to be equal. A difference in the measured UE power steps is attributed to the changed hardware settings and subtracted off:

- For the falling TPC patterns (E, G), the power steps after the segment borders are corrected.
- For the rising TPC patterns (F, H), the power steps before the segment borders are corrected.

As a consequence, the correction in the segment near the maximum UE output power is zero, and the segment near the minimum UE output power contains the sum of all corrections in the test step.

Unsegmented TPC test patterns correspond to the unmodified patterns described in 3GPP TS 34.121. However, segmented test patterns still comply with 3GPP specifications. Use segmented TPC test patterns to measure all power steps with maximum accuracy. Note that the corrections may add up to a systematic error of the measured absolute powers, especially in the segments near the minimum UE output power.

If the UE power steps are systematically above or below the specified values, the UE power towards the end of a test step may get outside the linear analyzer range, causing the TPC measurement to generate an "Overflow" or "Underflow" message. This can be due to the fixed segment borders and the correction method. It does not necessarily mean that any of the single UE power steps are out of their specified range.

For a detailed example of an "Inner Loop Power Control" measurement comprising step A to step H, refer to the "Application Sheets" section of the signaling application chapter.

4.2.5.2 Change of TFC TPC Setup

The conformance test specification 3GPP TS 34.121, section 5.6 "Change of TFC" defines a test for verification of the UE power steps caused by a changing data rate. For this test, the UE is induced to transmit a discontinuous DPDCH. The power step between a slot with DPDCH on and an adjacent slot with DPDCH off is measured. For this power step, test requirements are specified.

To generate the discontinuous DPDCH, an RMC with 12.2 kbps, loopback and 50 % downlink resources in use must be set up. As a result, the DPDCH is alternately switched on and off for 30 slots (two frames). To prevent the power control mechanism from counterbalancing the induced power steps, a power control algorithm 2 with alternating TPC pattern is used.

Setup-specific settings

To perform a "Change of TFC" measurement, select the TPC setup "Change of TFC". This results in an alternating TPC pattern with algorithm 2 and the measurement mode "Change of TFC".

Configure an RMC connection with loopback and usage of 50 % downlink resources. For combined signal path measurements, you can configure the usage of downlink resources in the configuration dialog of the measurement, see chapter 4.3.2.2, "UE Signal Info Settings", on page 309.

Remember to reset the usage of downlink resources to 100 % when switching to another measurement mode.

If you use a customer-specific application instead of the signaling application, note that the measurement expects alternating up and down power steps, one power step every 30 slots. Any other signal configuration will lead to erroneous power step results.

4.2.5.3 Max Power E-DCH TPC Setup

The conformance test specification 3GPP TS 34.121, section 5.2B "Maximum Output Power with HS-DPCCH and E-DCH" defines a test for verification of the maximum UE power with active HS-DPCCH and E-DCH. The test comprises five subtests.

The test procedure for subtest 1 to 4 is quite complex. It requires that the E-TFCI sent by the UE is monitored and that the TPC pattern reacts to the monitored values. The test procedure is implemented in the WCDMA signaling application.

At the end of the test procedure, the UE power is kept constant via an alternating pattern and algorithm 2. According to 3GPP this more or less constant UE power shall be measured. The measurement can be performed with the TPC measurement, triggered by the signaling application.

So a "Max Power E-DCH" measurement does only make sense as combined signal path measurement. A standalone "Max Power E-DCH" measurement does not evaluate any E-TFCI values sent by the UE. It only measures the UE power.

For description of the combined signal path "Max Power E-DCH" measurement, please refer to the documentation of the signaling application. The "Application Sheets" section of the signaling application chapter provides a detailed step-by-step description of a "Max Power E-DCH" measurement, including subtest 1 to 5.

4.2.5.4 Monitor Mode TPC Setups

When one of the TPC setups listed in table 4-1 is selected, the measurement is run in monitor mode. In this mode the measurement does not need to know which TPC commands are sent to the UE.

If you use the standalone scenario, you may select any monitor mode TPC setup to perform a monitor mode measurement. The measurement still works correctly if the monitor mode TPC setup selected in the measurement differs from the monitor mode TPC setup really executed.

Only if you use the combined signal path scenario, it is important which monitor mode TPC setup you select in the measurement. The reason is that the measurement displays the TPC setup parameter of the signaling application. So the parameter determines which TPC setup is executed by the signaling application.

The following table provides an overview of the monitor mode TPC setups.

Table 4-1: TPC setups measured in monitor mode

TPC Setup Name	Pattern
Closed Loop	Pattern suitable to command the UE to a selected target power, followed by an alternating pattern when the target power is reached. Provided by WCDMA signaling application, but not by WCDMA generator.
Alternating	(1)010101010...
All 1	1111111111...
All 0	0000000000...
Single Pattern + Alternating	<Pattern>(0)101010101...
Single Pattern + All 1	<Pattern>1111111111...
Single Pattern + All 0	<Pattern>0000000000...
Continuous Pattern	<Pattern><Pattern><Pattern><Pattern>...
Phase Discontinuity Up	n x 111110000, followed by alternating pattern
Phase Discontinuity Down	m x 000001111, followed by alternating pattern

4.2.6 Limit Settings and Conformance Requirements

Conformance requirements for WCDMA transmitter tests are specified in 3GPP TS 34.121, section 5, "Transmitter Characteristics".

The following sections give an overview of the TPC measurement limit settings and the related test requirements.

4.2.6.1 Maximum Output Power Limits (Inner Loop Power)

WCDMA equipment is divided into several power classes. For each power class 3GPP defines the maximum output power of the UE transmitter (averaged over one slot) and an upper and lower tolerance value. Example: According to the test requirements, the maximum output power of a class 1 UE must be between 33 dBm - 3.7 dB and 33 dBm + 1.7 dB.

The nominal maximum power and tolerance values can be comfortably configured in the limits section by selecting the power class of the UE. The resulting settings are displayed in column "Active Limits". If you want to use different values, select "User Defined" for "Active Limit Select" and adjust the values in column "User Defined".

If the combined signal path scenario is active, an additional parameter "Use Reported", is displayed. If this parameter is enabled, the UE power class value reported by the UE in the capability report is used. The manually configured value is used if the parameter is disabled or no value has been reported.

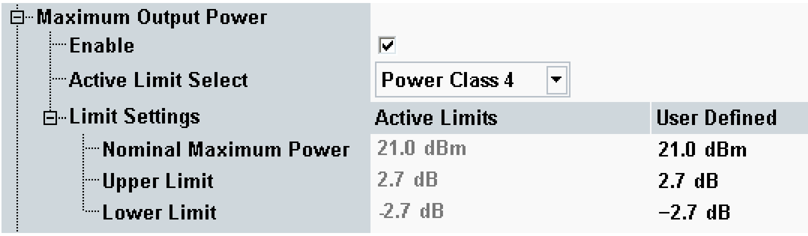


Fig. 4-3: Maximum output power limits

The test requirements for the individual UE power classes are defined in 3GPP TS 34.121, section 5.2 "Maximum Output Power" and listed in the following table.

UE Power Class	Nominal Maximum Power	Tolerances (Upper and Lower Limit)
Class 1	33 dBm	+1.7 dB, -3.7 dB
Class 2	27 dBm	
Class 3	24 dBm	
Class 3bis	23 dBm	+2.7 dB, -2.7 dB
Class 4	21 dBm	

To test the maximum output power you can use the "TPC Test Step" setups F, EF and GH.

If the measured maximum output power is out of tolerance, please first ensure that the attenuation of any cables and/or antenna couplers used is being taken into account, see "External Attenuation (Input)" on page 130.

The cables, RF connections and antenna couplers must also be in good condition for satisfactory measurements. Dirty or broken RF connections can cause problems at the high frequencies used by WCDMA networks.

4.2.6.2 Minimum Output Power Limits (Inner Loop Power)

The minimum controlled output power of a UE (averaged over one slot) shall be below -49 dBm. This test requirement is defined in 3GPP TS 34.121, section 5.4.3 "Minimum Output Power". A corresponding limit can be set in the configuration dialog.

Fig. 4-4: Minimum output power limit

To test the minimum output power you can use the "TPC Test Step" setups E, EF and GH.

If the measured minimum output power is out of tolerance, please first ensure that the configured external attenuation value corresponds to your setup, see "External Attenuation (Input)" on page 130.

4.2.6.3 Power Step and Power Step Group Limits (Inner Loop Power)

When the UE receives Transmit Power Control (TPC) commands in the downlink it is expected to adjust its output power in accordance with the received commands. A TPC command orders the UE to increase or decrease the output power by a certain amount, the expected step size.

3GPP defines upper limits for the power step error, depending on the expected step size. In addition to error limits for single power steps, there are also error limits for groups of 10 or 50 power steps.

The configuration dialog allows to set symmetrical error limits for single power steps and power step groups, depending on the expected step size.

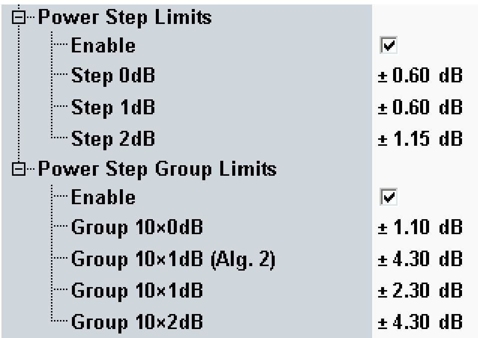


Fig. 4-5: Power step (group) limit settings

The test requirements are defined in 3GPP TS 34.121, section 5.4.2 "Inner Loop Power Control in the Uplink". An overview is provided in the following tables. The default limit values correspond to the test requirements.

Table 4-2: Allowed step sizes for single TPC steps

Expected Step Size	Error Limit	Allowed Step Size	Relevant for Test Step
0 dB	±0.6 dB	-0.6 dB to +0.6 dB	A, B, C
±1 dB	±0.6 dB	+0.4 dB to +1.6 dB	B, F
		-0.4 dB to -1.6 dB	C, E
±2 dB	±1.15 dB	+0.85 dB to +3.15 dB	H
		-0.85 dB to -3.15 dB	G

Table 4-3: Allowed step sizes for TPC step groups

Expected Step Group Size / Algorithm	Error Limit	Allowed Step Group Size	Relevant for Test Step
10 x 0 dB = 0 dB (Alg. 2)	±1.1 dB	-1.1 dB to +1.1 dB	A
10 x ±1 dB + 40 x 0 dB = ±10 dB (Alg. 2)	±4.3 dB	+5.7 dB to +14.3 dB	B
		-5.7 dB to -14.3 dB	C
10 x ±1 dB = ±10 dB (Alg. 1)	±2.3 dB	+7.7 dB to +12.3 dB	F
		-7.7 dB to -12.3 dB	E

Expected Step Group Size / Algorithm	Error Limit	Allowed Step Group Size	Relevant for Test Step
10 x ±2 dB = ±20 dB (Alg. 1)	±4.3 dB	+15.7 dB to +24.3 dB	H
		-15.7 dB to -24.3 dB	G

The multi evaluation measurement provides additional power control tests and limit checks, see chapter 3.2.5.3, "Power Control Limits", on page 108.

4.2.6.4 Max. Power E-DCH Limits

The conformance test specification 3GPP TS 34.121, section 5.2B "Maximum Output Power with HS-DPCCH and E-DCH" defines a test for verification of the maximum UE power with active HS-DPCCH and E-DCH. The test comprises five subtests.

At the end of each subtest procedure, the maximum output power shall be measured and checked against tolerance values.

You can configure the expected maximum power and a pair of tolerance values in the configuration dialog. The limit applies to measurements with TPC setup "Max. Power E-DCH".

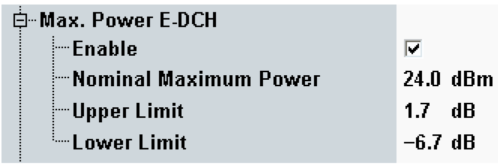


Fig. 4-6: Max. Power E-DCH limit settings

3GPP defines the following requirements depending on the subtest and on the power class of the UE. The default settings correspond to subtest 1 for power class 3.

Table 4-4: Nominal maximum power and tolerances, depending on subtest and power class

Subtest	Power Class 3		Power Class 4	
	Power [dBm]	Tolerance [dB]	Power [dBm]	Tolerance [dB]
1	24	+1.7 / -6.7	21	+2.7 / -5.7
2	22	+3.7 / -5.2	19	+4.7 / -4.2
3	23	+2.7 / -5.2	20	+3.7 / -4.2
4	22	+3.7 / -5.2	19	+4.7 / -4.2
5	24	+1.7 / -3.7	21	+2.7 / -2.7

4.2.6.5 Change of TFC Limits

When the uplink Transport Format Combination (TFC) changes, this means that the data rate changes and also that the uplink power changes. 3GPP defines a power step tolerance for a specific data rate change: the change between a signal with DPCCH only and a signal with DPCCH and DPDCH.

The "Change of TFC" test is specified in 3GPP TS 34.121, section 5.6. A requirement is defined for an RMC signal with 12.2 kbps, β_c= 8/15 and β_d=15/15. For this signal, a power step size of 7 dB is expected between a slot with DPDCH on and an adjacent slot with DPDCH off (DTX). The tolerance specified as test requirement equals ±2.3 dB.

The default limit settings in the configuration dialog correspond to the test requirements. The expected step size can be calculated automatically from the configured beta factors and is rounded to the closest integer dB value as requested by 3GPP. Alternatively you can disable "Calculate from Beta Factors" and enter the expected step size manually.

Fig. 4-7: Change of TFC limit settings

The limit is relevant for TPC setup "Change of TFC".

4.2.7 Measurement Results

The WCDMA TPC measurement provides all measurement results in a single view. This view displays two diagrams, showing the measured UE power vs slot and the corresponding power steps between the slots. Configured limits are indicated by red limit lines.

Below the diagrams, a table providing a statistical evaluation of the UE power vs slot results is displayed. The contents of the table depend on the measurement mode and on the selected TPC setup.

For details refer to the following sections.

4.2.7.1 Monitor Mode

In monitor mode, the result view displays two diagrams and a table with statistical results.

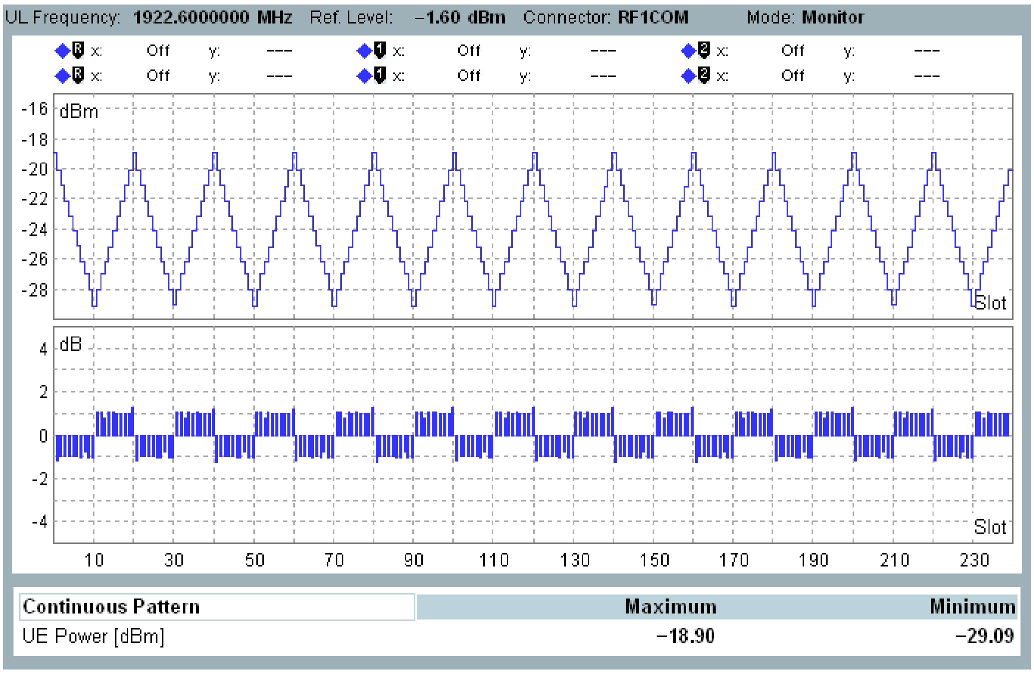


Fig. 4-8: Results in monitor mode

Upper diagram - UE power vs slot

The diagram displays the transmitter output power of the UE, measured in a bandwidth of at least (1+α) times the chip rate, where α is the roll-off factor of the WCDMA channel filter. The values correspond to the "mean power" defined in 3GPP TS 34.121.

The diagram displays one measurement result per slot, calculated as the average of the measured quantity of all samples in the slot, excluding a 25 µs guard period at the beginning and at the end of the slot.

The measured range of slots is configurable, see "Monitor > Measurement Length" on page 311.

Lower diagram - power steps

The bar graph in the lower diagram displays the power steps between the slots in the upper diagram. One value per slot boundary is displayed, indicating the difference between the UE power of the previous slot and the UE power of the next slot.

Maximum / Minimum UE power

The table displays the maximum and minimum value of the upper diagram, i.e. of the measured UE power vs slot values.

Scaling the diagrams

To modify the ranges of the X-axis and of the Y-axis, press the "Display" softkey and use the hotkeys "Y Scale" and "X Scale".

Automatic scaling is used by default, adapting the X-axis to the measurement length and the Y-axis to the measured values.

4.2.7.2 Change of TFC Mode

The result view displays two diagrams and a table with statistical results.

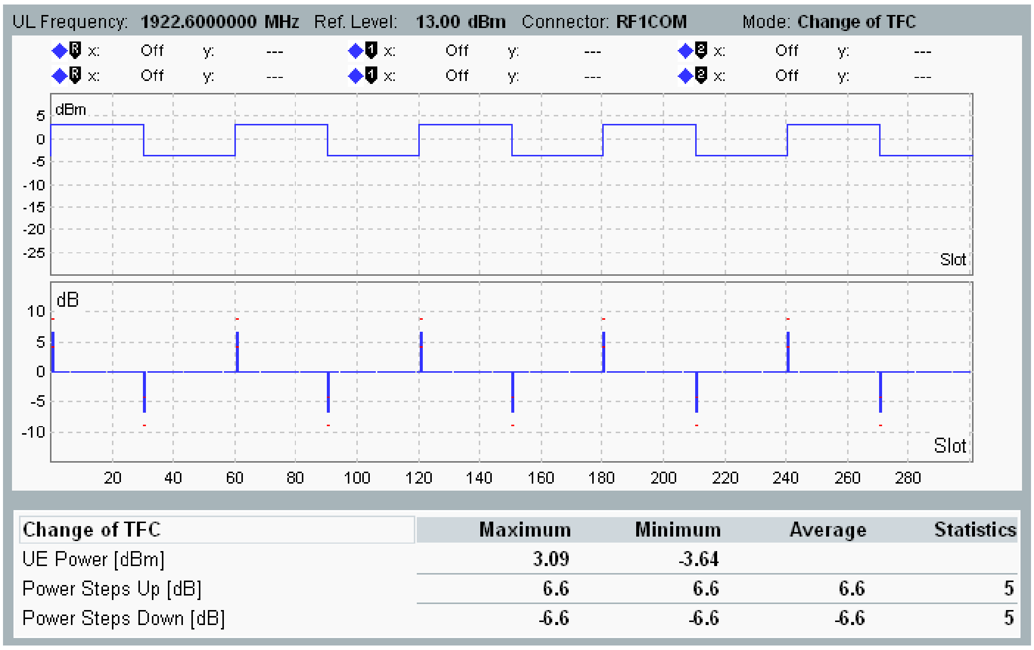


Fig. 4-9: Results in Change of TFC mode

Diagrams

The diagrams show the measured UE power vs slot and the corresponding power steps between the slots. For a detailed description refer to chapter 4.2.7.1, "Monitor Mode", on page 300.

The measurement starts at a slot boundary with a power step. The measured range of slots depends on the configured number of steps to be measured, see "Change of TFC > Number of Steps Up/Down" on page 313.

The measurement expects alternating up and down power steps every 30 slots

UE Power

Maximum and minimum value of the measured UE power vs slot values displayed in the upper diagram.

Power Steps Up/Down

These table rows provide a statistical evaluation of the measured power steps. The columns indicate the maximum, minimum and average measured power step value. The column "Statistics" indicates how many power step values have been considered for the statistical evaluation.

4.2.7.3 Max. Power E-DCH Mode

The result view displays two diagrams and a table with statistical results.

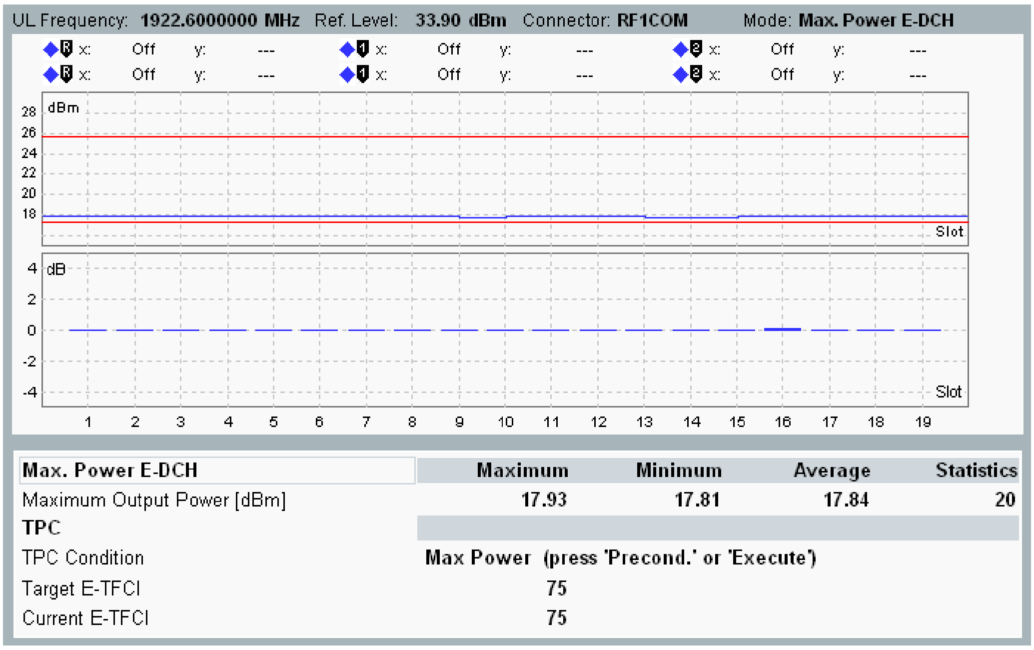


Fig. 4-10: Results in Max. Power E-DCH mode

Diagrams

The diagrams show the measured UE power vs slot and the corresponding power steps between the slots. For a detailed description refer to chapter 4.2.7.1, "Monitor Mode", on page 300.

The measured range of slots is configurable, see "Max. Power E-DCH > Measurement Length" on page 312.

Maximum Output Power

The maximum output power of the UE is determined from the UE power vs slot diagram. The columns indicate the maximum, minimum and average UE power value within the diagram. The column "Statistics" indicates how many UE power values have been considered for the statistical evaluation.

TPC Condition / Target E-TFCI / Current E-TFCI

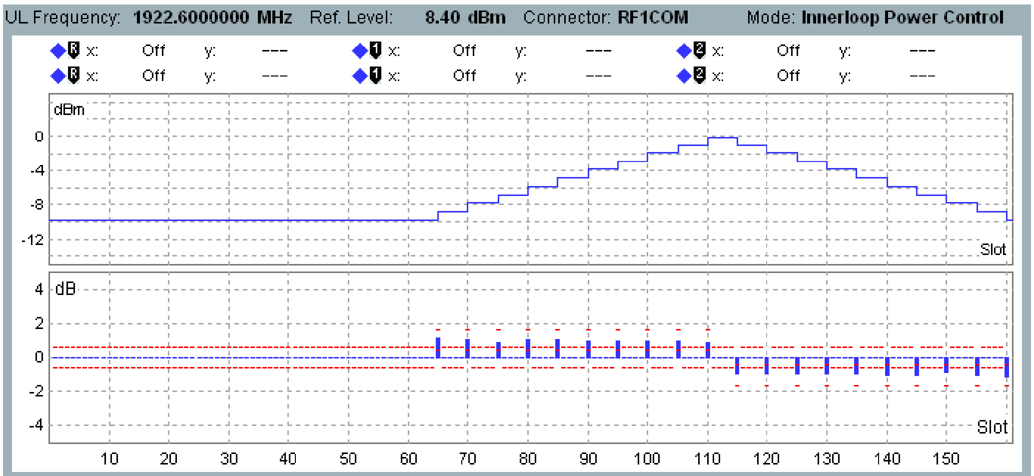
This information is only available for combined signal path measurements. It is reported by the signaling application.

For details refer to the description of the signaling application, parameter "TPC Condition" and "Max. Power E-DCH Condition".

4.2.7.4 Inner Loop - Test Steps A, B and C

This section describes the results in inner loop power control mode for the TPC setup "TPC Test Step ABC".

The result view displays two diagrams and a table with statistical results.



TPC Test Step ABC	Maximum	Minimum	Average	Statistics
UE Power [dBm]	−0.13	−9.91		
Power Steps 0 dB A,B,C [dB]	0.0	0.0	0.0	140
Power Steps +1 dB B [dB]	1.1	0.8	1.0	10
Power Steps -1 dB C [dB]	−0.8	−1.1	−1.0	10
Power Steps Group 0 dB A [dB]	0.0	0.0	0.0	51
Beginning @ Slot [Slot]	12	34		
Power Steps Group +10 dB B [dB]	9.8			
Power Steps Group -10 dB C [dB]	−9.8			

Fig. 4-11: Results for test steps A, B and C

Diagrams

The diagrams show the measured UE power vs slot and the corresponding power steps between the slots. For a detailed description refer to chapter 4.2.7.1, "Monitor Mode", on page 300.

The measured range of slots depends on the TPC setup. For "TPC Test Step ABC" the upper diagram covers 161 slots. For background information concerning the test steps see chapter 4.2.5.1, "Inner Loop Power Control TPC Setups", on page 292.

UE Power

Maximum and minimum value of the measured UE power vs slot values displayed in the upper diagram.

Power Steps...

These table rows provide a statistical evaluation of the measured power steps for which the indicated step size has been expected.

In test step A a size of 0 dB is expected for all 60 power steps. In test step B (C) a size of 0 dB is expected for 4 consecutive power steps and a size of +1 dB (-1 dB) for the fifth power step. So there are 40 steps of 0 dB and 10 steps of ±1 dB in step B and C.

The columns indicate the maximum, minimum and average measured power step value. The column "Statistics" indicates how many power step values have been considered for the statistical evaluation.

Power Steps Group 0 dB A

This table row provides a statistical evaluation of the power step groups within test step A. Each group comprises 10 adjacent power steps. The step sizes within a group are summed up and result in a power step group value. Thus the total step sizes of power step 1 to 10, 2 to 11, 3 to 12 etc. are calculated.

The columns indicate the maximum, minimum and average power step group value determined in this way. The column "Statistics" indicates how many power step group values have been considered for the statistical evaluation.

For the determined minimum and maximum value, the number of the first slot of the group is indicated as "Beginning @ Slot".

Power Steps Group +/- 10 dB B/C

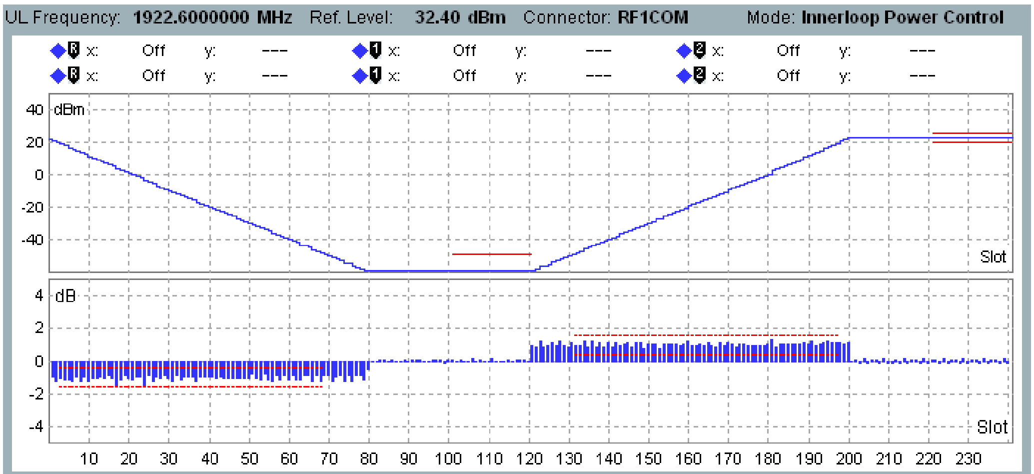
These rows consider all power steps within test step B or C. The sizes of all 50 power steps of the test step are summed up and result in a power step group value. The expected total step size equals +10 dB for step B: (4 x 0 dB + 1 x 1 dB) x 10. For step C it equals -10 dB.

Thus there is only one power step group value for test step B and one value for test step C. They are indicated in column "Maximum".

4.2.7.5 Inner Loop - Test Steps EFGH

This section describes the results in inner loop power control mode for the TPC test step setups E, F, EF and GH.

The result view displays two diagrams and a table with statistical results.



TPC Test Step EF	Maximum	Minimum	Average	Statistics
Maximum Output Power [dBm]	22.48	22.31	22.40	20
Minimum Output Power [dBm]	-59.64	-59.79	-59.73	20
Power Steps -1 dB E [dB]	-0.8	-1.3	-1.0	66
Power Steps +1 dB F [dB]	1.4	0.8	1.0	66
Power Steps Group -10 dB E [dB]	-9.8	-11	-10	57
Beginning @ Slot [Slot]	33	16		
Power Steps Group +10 dB F [dB]	11	9.7	10	57
Beginning @ Slot [Slot]	179	168		

Fig. 4-12: Results for test steps E and F

Diagrams

The diagrams show the measured UE power vs slot and the corresponding power steps between the slots. For a detailed description refer to chapter 4.2.7.1, "Monitor Mode", on page 300.

The measured range of slots is configurable, see "Inner Loop Power > Measurement Length" on page 312. For background information concerning the test steps see chapter 4.2.5.1, "Inner Loop Power Control TPC Setups", on page 292.

Maximum / Minimum Output Power

The maximum output power of the UE is determined from the UE power vs slot diagram in a configurable number of slots at the end of test step F and H. The minimum output power is determined at the end of test step E and G.

For configuration of the slot ranges see "Inner Loop Power > TPC Test Step Settings" on page 312.

The columns indicate the maximum, minimum and average UE power value within the slot range. The column "Statistics" indicates how many UE power values have been considered for the statistical evaluation.

Limit lines are displayed in the UE power vs slot diagram for the relevant slots. The upper limit for the minimum output power and the lower and upper limit for the maximum output power are indicated.

Power Steps... / Power Steps Group...

The "Power Steps..." table rows provide a statistical evaluation of the measured power steps within a test step. The power step sizes expected for the test steps E, F, G and H are -1 dB, +1 dB, -2 dB and +2 dB.

The "Power Steps Group..." table rows provide a statistical evaluation of the power step groups within a test step. Each group comprises 10 adjacent power steps. The step sizes within a group are summed up and result in a power step group value. Thus the total step sizes of power step 1 to 10, 2 to 11, 3 to 12 etc. are calculated. The expected power step group values for the test steps E, F, G and H are -10 dB, +10 dB, -20 dB and +20 dB.

Only power steps are considered, where the UE power of both adjacent slots is larger than the minimum output power and smaller than the maximum output power as defined by the limit settings. The slots used for calculation of the maximum or minimum output power are not used for "Power Steps" and "Power Steps Group" calculation. The considered steps are also marked by limit lines in the lower diagram.

The columns indicate the maximum, minimum and average determined power step or power step group value. The column "Statistics" indicates how many power step or power step group values have been considered for the statistical evaluation.

For the determined minimum and maximum power step group value, the number of the first slot of the group is indicated as "Beginning @ Slot".

4.2.7.6 Using Markers

Use the "Marker" parameters to activate markers and to modify their position. The following "Marker" hotkeys are available at the bottom of the GUI:

Hotkey	Description
"UE Power / Power Steps"	Selects for which trace the markers shall be configured: the UE power vs slot trace or the power steps trace. The other hotkeys apply to the selected trace.
"Ref. Marker ..."	Enable or disable the reference marker and select the marker position.
"Marker 1 /2 ..."	Enable or disable marker 1 or 2 and define the marker position (absolute or relative to the reference marker).

See also: "Markers" in the R&S CMW user manual, chapter "System Overview"

4.3 GUI Reference

The following sections provide detailed reference information on the Graphical User Interface (GUI) and the parameters of the WCDMA TPC measurement.

4.3.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"

TPC Meas. (Softkey)
The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:
INITiate:WCDMa:MEAS<i>:TPC
STOP:WCDMa:MEAS<i>:TPC
ABORt:WCDMa:MEAS<i>:TPC
FETCh:WCDMa:MEAS<i>:TPC:STATe?
FETCh:WCDMa:MEAS<i>:TPC:STATe:ALL?

4.3.2 Parameters and Settings

The most important settings of the WCDMA TPC measurement are displayed in the measurement dialog.

All settings are defined via softkeys and hotkeys or using the "WCDMA TPC Measurement Configuration" dialog. The configuration dialog is described in the following sections. To open the dialog, select the "TPC Measurement" tab and press the "Config" hotkey.

4.3.2.1 Signal Routing and Analyzer Settings

The following parameters configure the RF input path. All parameters are common measurement settings, i.e. they have the same value in all measurements (e.g. TPC measurement and multi evaluation measurement).

For parameter descriptions refer to the multi evaluation measurement, chapter 3.3.2.1, "Signal Routing and Analyzer Settings", on page 129.

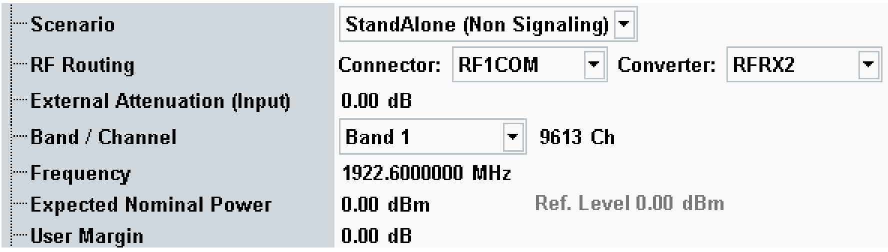


Fig. 4-13: Signal routing and analyzer settings

4.3.2.2 UE Signal Info Settings

The "UE Signal Info" parameters describe properties of the measured uplink WCDMA signal. The parameters are common measurement settings, i.e. a parameter has the same value in all WCDMA measurements for which it is relevant (e.g. TPC measurement and multi evaluation measurement).

While the combined signal path scenario is active, all parameters display values determined by the controlling signaling application. Some parameters are not displayed for standalone measurements.

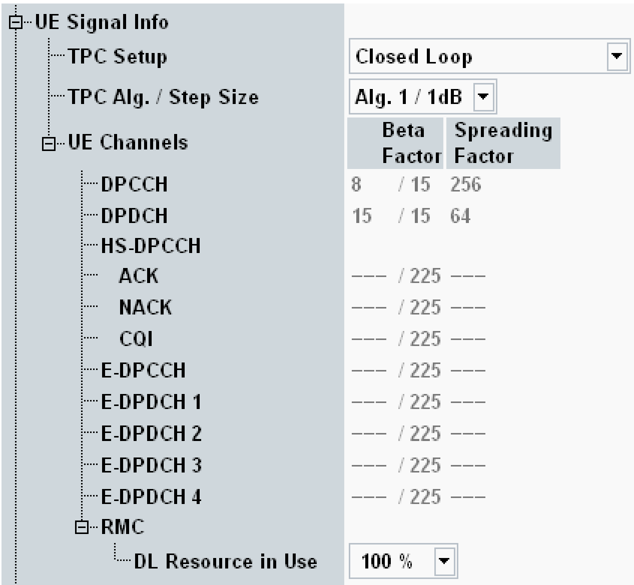


Fig. 4-14: UE signal info settings with combined signal path

TPC Setup

Selects the TPC setup (expected) to be executed during the measurement.

If the combined signal path scenario is active, this parameter is controlled by the signaling application and selects the TPC setup to be executed.

If the standalone scenario is active, this parameter selects the TPC setup which is expected to be executed, e.g. via the WCDMA generator or an ARB file.

For standalone measurements in monitor mode, you can select any monitor mode TPC setup. The effect of selecting e.g. "Closed Loop" or "Phase Disc Up" is the same.

For background information see chapter 4.2.5, "TPC Setups", on page 292.

Remote command:

`CONFigure:WCDMa:MEAS<i>:TPC:SETup`

Alg. / Step Size

This parameter is only displayed while the combined signal path scenario is active.

It selects the power control algorithm (1 or 2) and the TPC step size (1dB or 2dB) for TPC setups that do not use fixed values.

For more details and remote commands, refer to the description of the WCDMA signaling application.

UE Channels

Indicates which physical channels are contained in the measured signal and which beta factors and spreading factors are used for these channels.

For the HS-DPCCH three sets of values can be configured, depending on whether it transports an ACK, NACK or CQI.

The settings are for example used to determine the expected power step size for the "Change of TFC" limits.

While the combined signal path scenario is active, the displayed parameters are automatically set to suitable values. Please note that:

- For call types containing an RMC, the displayed beta factors for DPCCH and DPDCH may be so-called "computed gain factors" for the Transport Format Combination (TFC) used during the TX tests. These values can slightly differ from the values signaled to the UE by the signaling application.
- The HS- and E-channels in general may have variable power, or even be off from time to time. In that case the displayed beta factors reflect the actual UL signal properties only temporarily.

Remote command:

`CONFigure:WCDMa:MEAS<i>:UEChannels:DPCCh`
`CONFigure:WCDMa:MEAS<i>:UEChannels:DPDCh`
`CONFigure:WCDMa:MEAS<i>:UEChannels:HSDPcch`
`CONFigure:WCDMa:MEAS<i>:UEChannels:HSDPcch:CONFig`
`CONFigure:WCDMa:MEAS<i>:UEChannels:EDPCch`
`CONFigure:WCDMa:MEAS<i>:UEChannels:EDPDch<no>`

RMC > DL Resource in Use

This parameter is only displayed while the combined signal path scenario is active and if option R&S CMW-KS410 is available.

For measurement mode "Change of TFC" set 50 % to generate a discontinuous DPDCH. For all other measurement modes, 100 % is recommended to avoid undesired power steps.

For more details and remote commands, refer to the description of the WCDMA signaling application.

4.3.2.3 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the WCDMA TPC measurement.

Fig. 4-15: WCDMA TPC: Measurement Control settings

Measure on Exception

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected. A faulty result occurs e.g. when an overload is detected or when the RF receiver is underdriven. In remote control, the cause of the error is indicated by the "reliability indicator".

- **Off:** Faulty results are rejected. The measurement is continued; the statistical counters are not re-set. Use this mode to ensure that a single faulty result does not affect the entire measurement.
- **On:** Results are never rejected. Use this mode e.g. for development purposes, if you want to analyze the reason for occasional wrong transmissions.

Remote command:

CONFigure:WCDMa:MEAS<i>:TPC:MOEXception

Mode

Indicates the measurement mode resulting from the currently selected TPC setup: "Monitor", "Change of TFC", "Max. Power E-DCH" or "Inner Loop Power Control".

Remote command:

CONFigure:WCDMa:MEAS<i>:TPC:MODE?

Monitor > Measurement Length

Defines the number of slots to be measured in "Monitor" mode.

Remote command:

CONFigure:WCDMa:MEAS<i>:TPC:MONitor:MLENgth

Inner Loop Power > Measurement Length
Displays the number of slots to be measured in "Inner Loop Power Control" mode. The value depends on the selected TPC setup and the test step settings. A value is only displayed while the "Inner Loop Power Control" mode is active.

Remote command:
`CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:MLENgth?`

Inner Loop Power > TPC Auto Execute
This parameter is only available while the combined signal path scenario is active.

If it is enabled, starting or restarting the measurement in measurement mode "Inner Loop Power Control" triggers the execution of the TPC setup by the signaling application.

Remote command:
`CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:AEXecution`

Inner Loop Power > TPC Test Step Settings
The table lists settings for the individual inner loop power control test steps.

Test steps A, B and C are defined by 3GPP. The corresponding TPC bit patterns are fixed and the number of TPC bits per step is displayed as "Length".

For test steps E, F, G and H the number of TPC bits per test step is configurable. Example: "Test Step E,F" = "120 Bit" means that 120 zero bits are sent for step E and 120 one bits for step F, resulting in a measurement length of 241 slots for test step EF, so that all power steps are measured. While the combined signal path scenario is active, these parameters are controlled by the signaling application.

The second column defines the number of slots at the end of a test step, where the minimum output power or maximum output power results are measured. Example: 120 bits and 20 slots are defined for test step E. That means that 121 slots are measured for the test step and the last 20 slots of these 121 slots are used to measure the minimum output power.

For the test steps E, F, G and H segmentation can be enabled via a checkbox. If you use the WCDMA signaling application (combined signal path), the setting is controlled by the signaling application. If you use the WCDMA generator, enable/disable the checkbox so that it is compatible to the WCDMA generator settings. For any other standalone scenario, disable the checkbox.

Remote command:
`CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:TSEF`
`CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:TSGH`
`CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:TSSegment`

Max. Power E-DCH > Measurement Length
Defines the number of slots to be measured in "Max. Power E-DCH" mode.

Remote command:
`CONFigure:WCDMa:MEAS<i>:TPC:MPEDch:MLENgth`

Max. Power E-DCH > TPC Auto Execute
This parameter is only available while the combined signal path scenario is active.

If it is enabled, starting or restarting the measurement in measurement mode "Max. Power E-DCH" triggers the execution of the TPC setup by the signaling application.

Remote command:
CONFigure:WCDMa:MEAS<i>:TPC:MPEDch:AEXecution

Change of TFC > Measurement Length
Displays the number of slots to be measured in "Change of TFC" mode. The value is calculated from the configured "Number of Steps Up/Down", assuming alternating up/down power steps with 30 slots between subsequent steps.

Remote command:
CONFigure:WCDMa:MEAS<i>:TPC:CTFC:MLENgth

Change of TFC > Number of Steps Up/Down
Defines the number of power steps to be measured per step direction (n up steps + n down steps).

Remote command:
CONFigure:WCDMa:MEAS<i>:TPC:CTFC:MLENgth

4.3.2.4 Trigger Settings

The "Trigger" parameters configure the trigger system for the WCDMA TPC measurement.

Fig. 4-16: Trigger settings

Trigger Source
It is recommended to use a trigger signal provided by the application sending the TPC commands to the UE.

For exceptional measurement scenarios or in monitor mode a "Free Run" or "IF Power" trigger source may also be suitable.

For more detailed information see chapter 4.2.4, "Trigger Modes", on page 291.

Remote command:
TRIGger:WCDMa:MEAS<i>:TPC:SOURce
TRIGger:WCDMa:MEAS<i>:TPC:CATalog:SOURce?

Trigger Slope
Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse. This setting has no influence on "Free Run" measurements and for evaluation of trigger pulses provided by other firmware applications.

Remote command:
`TRIGger:WCDMa:MEAS<i>:TPC:SLOPe`

Trigger Threshold
Defines the input signal power where the trigger condition is satisfied and a trigger event is generated. The trigger threshold is valid for power trigger sources. It is a dB value, relative to the reference level minus the external attenuation (<Ref. Level> – <External Attenuation (Input)> – <Frequency Dependent External Attenuation>). If the reference level is set to the actual maximum output power of the DUT, and the external attenuation settings are in accordance with the test setup, then the trigger threshold is referenced to the actual maximum RF input power at the R&S CMW.

A low threshold may be required to ensure that the R&S CMW can always detect the input signal. A higher threshold can prevent unintended trigger events.

Remote command:
`TRIGger:WCDMa:MEAS<i>:TPC:THReshold`

Trigger Delay
Defines a time delaying the start of the measurement relative to the trigger event. This is useful if the trigger event and the uplink DPCH slot border are not synchronous. A measurement starts always at an uplink DPCH slot border. Triggering a measurement at another time may yield a synchronization error.

For internal trigger sources aligned to the downlink DPCH an additional delay of 1024 chips is automatically applied. It corresponds to the assumed delay between downlink and uplink slot.

This setting has no influence on "Free Run" measurements.

Remote command:
`TRIGger:WCDMa:MEAS<i>:TPC:DELay`

Trigger Time Out
Sets a time after which an initiated measurement must have received a trigger event. If no trigger event is received, a trigger timeout is indicated in manual operation mode. In remote control mode the measurement is automatically stopped. The parameter can be disabled so that no timeout occurs.

This setting has no influence on "Free Run" measurements.

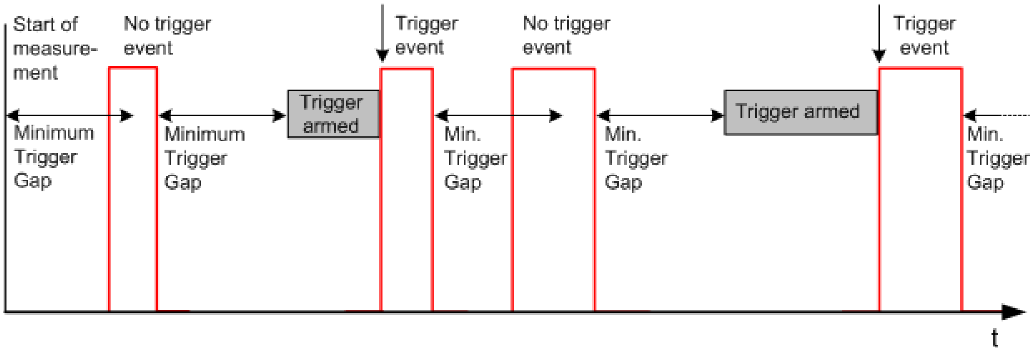
Remote command:
`TRIGger:WCDMa:MEAS<i>:TPC:TOUT`

Minimum Trigger Gap
Defines a minimum duration of the power-down periods (gaps) between two triggered power pulses. This setting is valid for an "(IF) Power" trigger source.

The trigger system is controlled by means of a timer which is reset to zero in the following instances:

- At the IF power-down ramp of each triggered or untriggered pulse, even though the previous counter may not have elapsed yet. A power-down ramp is detected when the signal power falls below the trigger threshold.
- At the beginning of each measurement: The minimum gap defines the minimum time between the start of the measurement and the first trigger event.

The trigger system is re-armed as soon as the timer has reached the specified minimum gap.



This parameter can be used to prevent unwanted trigger events due to fast power variations.

Remote command:
`TRIGger:WCDMa:MEAS<i>:TPC:MGAP`

4.3.2.5 Limit Settings

The "Limits" section defines tolerances for the individual measurement modes.

For details see chapter 4.2.6, "Limit Settings and Conformance Requirements", on page 296.

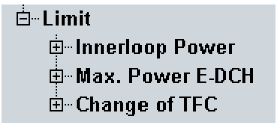


Fig. 4-17: Limit settings

Limits

The limits can be configured via the following remote commands.

Remote command:

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:URPClass
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:ACTive?
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:UDEFined
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MINPower
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:PSTep
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:PSGRoup
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:MPEDch
CONFigure:WCDMa:MEAS<i>:TPC:LIMit:CTFC

4.3.2.6 Additional Softkeys and Hotkeys

The WCDMA TPC measurement provides some softkey/hotkey combinations which have no equivalent in the configuration dialog. Most of these hotkeys provide display configurations (like diagram scaling). They are self-explanatory and do not have any remote-control commands assigned.

The remaining softkeys > hotkeys are described below. They are displayed only while the combined signal path scenario is active and are provided by the "WCDMA Signaling" application selected as master application. See also "Scenario = Combined Signal Path" on page 129.

The measurement provides no remote-control commands corresponding to these hotkeys. Use the remote-control commands of the signaling application instead.

While one of these softkeys is selected, the "Config" hotkey opens the configuration dialog of the signaling application, not the configuration dialog of the measurement.

TPC Meas. > Execute

This hotkey is available in all measurement modes except in "Monitor" mode. It triggers the execution of a TPC setup by the signaling application. So it has the same effect as pressing the "Execute" button in the signaling application.

Signaling Parameter > ...

Provides access to the most essential settings of the "WCDMA Signaling" application.

WCDMA-UE Signaling

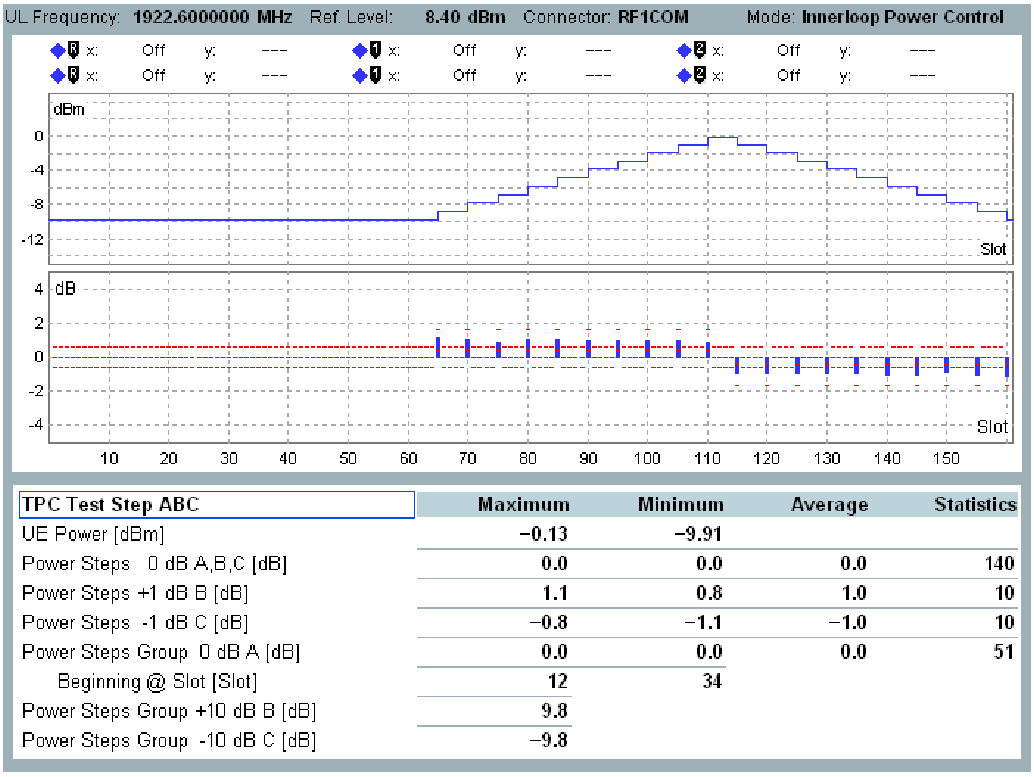
Select this softkey and press ON | OFF to turn the downlink signal transmission on or off.

Press the softkey two times (select it and press it again) to switch to the signaling application.

4.3.3 Measurement Results

All results of the WCDMA TPC measurement are displayed in a single view.

For a detailed description see chapter 4.2.7, "Measurement Results", on page 300.



TPC Test Step ABC	Maximum	Minimum	Average	Statistics
UE Power [dBm]	–0.13	–9.91		
Power Steps 0 dB A,B,C [dB]	0.0	0.0	0.0	140
Power Steps +1 dB B [dB]	1.1	0.8	1.0	10
Power Steps -1 dB C [dB]	–0.8	–1.1	–1.0	10
Power Steps Group 0 dB A [dB]	0.0	0.0	0.0	51
Beginning @ Slot [Slot]	12	34		
Power Steps Group +10 dB B [dB]	9.8			
Power Steps Group -10 dB C [dB]	–9.8			

Fig. 4-18: Measurement results for TPC test step ABC

Traces

The results can be retrieved via the following remote commands.

Remote command:

`FETCh:WCDMa:MEAS<i>:TPC:TRACe:UEPower:CURRent?` etc.

`FETCh:WCDMa:MEAS<i>:TPC:TRACe:PSTeps:CURRent?` etc.

Statistical Overviews and other Single Values

The results can be retrieved via the following remote commands.

Remote command:

`FETCh:WCDMa:MEAS<i>:TPC:UEPower:MINimum?` etc.

`FETCh:WCDMa:MEAS<i>:TPC:UEPower:MAXimum?` etc.

`FETCh:WCDMa:MEAS<i>:TPC:UEPower:AVERage?` etc.

`FETCh:WCDMa:MEAS<i>:TPC:PSTeps:MINimum?` etc.

`FETCh:WCDMa:MEAS<i>:TPC:PSTeps:MAXimum?` etc.

`FETCh:WCDMa:MEAS<i>:TPC:PSTeps:AVERage?` etc.

`FETCh:WCDMa:MEAS<i>:TPC:PSTeps:STATistics?` etc.

4.4 Programming

The following sections provide programming examples for the WCDMA TPC measurement, using the standalone scenario or the combined signal path scenario.

See also: "Remote Control" in the R&S CMW user manual

4.4.1 Measurements with Standalone Scenario

The following sections provide programming examples for the WCDMA TPC measurement, using the standalone scenario. The WCDMA generator is used to send TPC commands to the UE. The main focus is on measurement mode "Inner Loop Power Control".

The WCDMA TPC measurement is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: `...WCDMa:MEAS:TPC...`
- Use general commands of the type `...WCDMa:MEAS...` (no `:TPC` mnemonic) to define the signal routing and perform RF and analyzer settings.
- After a `*RST`, the measurement is switched off. Use `READ:WCDMa:MEAS:TPC...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:WCDMa:MEAS:TPC` and retrieve the results using `FETCh:WCDMa:MEAS:TPC...?`.

4.4.1.1 Specifying General Measurement Settings

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define signal routing, perform RF and analyzer settings for a WCDMA uplink
// signal with a carrier frequency of 1963 MHz and a peak power of 24 dBm.
// *****************************************************************************
ROUTe:WCDMa:MEAS:SCENario:SALone RF1C, RX1
CONFigure:WCDMA:MEAS:RFSettings:EATTenuation 2
CONFigure:WCDMA:MEAS:RFSettings:ENPower 24
CONFigure:WCDMA:MEAS:RFSettings:UMARgin 0
CONFigure:WCDMA:MEAS:RFSettings:FREQuency 1963E+6

// *****************************************************************************
// Alternatively set the frequency indirectly via band and channel.
// *****************************************************************************
CONFigure:WCDMa:MEAS:BAND OB3
CONFigure:WCDMa:MEAS:RFSettings:FREQuency 1162 CH
```

4.4.1.2 Specifying Additional Measurement-Specific Settings

```
// *****************************************************************************
// Define the error handling.
// *****************************************************************************
CONFigure:WCDMa:MEAS:TPC:MOEXception ON
CONFigure:WCDMa:MEAS:TPC:TOUT 1800

// *****************************************************************************
// Select the TPC setup and query the measurement mode.
// Set the measurement length for the monitor mode,
// and query it for the inner loop power control mode.
// *****************************************************************************
CONFigure:WCDMa:MEAS:TPC:SETup TSEF
CONFigure:WCDMa:MEAS:TPC:MODE?
CONFigure:WCDMa:MEAS:TPC:MONitor:MLENgth 300
CONFigure:WCDMa:MEAS:TPC:ILPControl:MLENgth?

// *****************************************************************************
// Configure the inner loop power control mode:
// Switch off automatic TPC setup execution, configure the test steps E to H,
// enable segmentation.
// *****************************************************************************
CONFigure:WCDMa:MEAS:TPC:ILPControl:AEXecution OFF
CONFigure:WCDMa:MEAS:TPC:ILPControl:TSEF 130, 20
CONFigure:WCDMa:MEAS:TPC:ILPControl:TSGH 90, 20
CONFigure:WCDMa:MEAS:TPC:ILPControl:TSSegment ON
```

4.4.1.3 Configuring the Trigger System

```
// *****************************************************************************
// Set trigger source, timeout, trigger level, slope, delay
// and minimum trigger gap.
// *****************************************************************************
TRIGger:WCDMa:MEAS:TPC:SOURce 'WCDMA Gen1: TPC Trigger'
TRIGger:WCDMa:MEAS:TPC:TOUT 1
TRIGger:WCDMa:MEAS:TPC:THReshold -30
TRIGger:WCDMa:MEAS:TPC:SLOPe FEDGe
TRIGger:WCDMa:MEAS:TPC:DELay 0
TRIGger:WCDMa:MEAS:TPC:MGAP 0.00002
```

4.4.1.4 Specifying Limits

```
// *****************************************************************************
// Configure limits for "Inner Loop Power Control" measurements:
// Enable the check of the maximum output power limits, apply user-defined
// limit values and define these values. Query the used limit values.
// Define a minimum output power limit and enable the limit check.
// Define power step and power step group limits and enable the limit check.
```

```
// ******************************************************************************
CONFigure:WCDMa:MEAS:TPC:LIMit:ILPControl:MAXPower ON, USER
CONFigure:WCDMa:MEAS:TPC:LIMit:ILPControl:MAXPower:UDEFined 27, 1.5, -3.5
CONFigure:WCDMa:MEAS:TPC:LIMit:ILPControl:MAXPower:ACTive?
CONFigure:WCDMa:MEAS:TPC:LIMit:ILPControl:MINPower ON, -50
CONFigure:WCDMa:MEAS:TPC:LIMit:ILPControl:PSTep ON, 0.5, 0.5, 1.1
CONFigure:WCDMa:MEAS:TPC:LIMit:ILPControl:PSGRoup ON, 1, 4.2, 2.2, 4.2
```

4.4.1.5 Configuring the WCDMA Generator

Configure the WCDMA generator compatible to the WCDMA TPC measurement. Especially the TPC settings must be compatible.

For a command description and programming examples refer to the WCDMA generator documentation.

4.4.1.6 Performing Measurements

```
// ******************************************************************************
// Switch on the WCDMA generator, start the TPC measurement and wait until
// command processing is complete.
// ******************************************************************************
SOURce:WCDMa:GEN:STATe ON
INIT:WCDMa:MEAS:TPC
*OPC?

// ******************************************************************************
// Execute the TPC setup.
// ******************************************************************************
SOURce:WCDMa:GEN:TPC:PEXecute

// ******************************************************************************
// Query the traces obtained in the measurement.
// ******************************************************************************
FETCh:WCDMa:MEAS:TPC:TRACe:UEPower:CURRent?
FETCh:WCDMa:MEAS:TPC:TRACe:PSTeps:CURRent?

// ******************************************************************************
// Query the measurement state (should be "RDY").
// ******************************************************************************
FETCh:WCDMa:MEAS:TPC:STATe?

// ******************************************************************************
// Query statistical results obtained in the measurement
// ******************************************************************************
FETCh:WCDMa:MEAS:TPC:UEPower:MAXimum?
FETCh:WCDMa:MEAS:TPC:UEPower:MINimum?
FETCh:WCDMa:MEAS:TPC:UEPower:STATistics?
FETCh:WCDMa:MEAS:TPC:PSTeps:MAXimum?
```

```
FETCh:WCDMa:MEAS:TPC:PSTeps:MINimum?
FETCh:WCDMa:MEAS:TPC:PSTeps:STATistics?

// *****************************************************************************
// Query limit check results obtained in the measurement
// *****************************************************************************
CALCulate:WCDMa:MEAS:TPC:UEPower:MAXimum?
CALCulate:WCDMa:MEAS:TPC:UEPower:MINimum?
CALCulate:WCDMa:MEAS:TPC:UEPower:AVERage?
CALCulate:WCDMa:MEAS:TPC:PSTeps:MAXimum?
CALCulate:WCDMa:MEAS:TPC:PSTeps:MINimum?
CALCulate:WCDMa:MEAS:TPC:PSTeps:AVERage?
```

4.4.2 Measurements with Combined Signal Path Scenario

The following sections provide programming examples for the WCDMA TPC measurement, using the combined signal path scenario. The WCDMA signaling application is used to send TPC commands to the UE. The main focus is on measurement mode "Max. Power E-DCH".

Many settings are controlled by the signaling application. These settings are configured via the commands of the signaling application. The related commands of the TPC measurement have no effect.

4.4.2.1 Specifying Basic Measurement Settings

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define the error handling.
// *****************************************************************************
CONFigure:WCDMa:MEAS:TPC:MOEXception ON
CONFigure:WCDMa:MEAS:TPC:TOUT 1800

// *****************************************************************************
// Activate the combined signal path scenario and select instance 1 of the
// signaling application as master.
// *****************************************************************************
ROUTe:WCDMa:MEAS:SCENario:CSPath 'WCDMA Sig1'

// *****************************************************************************
// Use the commands of the signaling application to define the signal routing
// and to perform the RF and analyzer settings.
// *****************************************************************************
...
```

```
// *****************************************************************************
// Use the wizard provided by the signaling application to configure a signal
// suitable for "Max. Power E-DCH" subtest 1.
// This action selects also the TPC setup.
// Query the measurement mode (must be MPED).
// *****************************************************************************
CONFigure:WCDMa:SIGN:PSETtings:HUMP S1
CONFigure:WCDMa:SIGN:PSETtings HUMP
CONFigure:WCDMa:MEAS:TPC:MODE?

// *****************************************************************************
// Configure the "Max Power E-DCH" mode:
// Set the measurement length and enable auto execution.
// *****************************************************************************
CONFigure:WCDMa:MEAS:TPC:MPEDch:MLENgth 30
CONFigure:WCDMa:MEAS:TPC:MPEDch:AEXecution ON

// *****************************************************************************
// Set the measurement length for the "Change of TFC" mode.
// *****************************************************************************
CONFigure:WCDMa:MEAS:TPC:CTFC:MLENgth 4

// *****************************************************************************
// Specify the uplink channel configuration, so that the expected power step
// size can be calculated for the "Change of TFC" mode.
// *****************************************************************************
CONFigure:WCDMa:MEAS:UECHannels:DPCCh ON,4,256
CONFigure:WCDMa:MEAS:UECHannels:DPDCh ON,14,64
CONFigure:WCDMa:MEAS:UECHannels:HSDPcch:CONFig ACK
CONFigure:WCDMa:MEAS:UECHannels:HSDPcch ON,50,256
CONFigure:WCDMa:MEAS:UECHannels:EDPCch ON,20,256
CONFigure:WCDMa:MEAS:UECHannels:EDPDch2 ON,160,4
```

4.4.2.2 Configuring the Trigger System

```
// *****************************************************************************
// A high trigger timeout is required for "Max. Power E-DCH" subtest 1 to 4.
// The UE power must be ramped up via algorithm 2, from the target power to the
// maximum power, before the measurement is triggered.
// The trigger source is selected automatically when the scenario is activated.
//
// Set a trigger timeout of 10 s.
// *****************************************************************************
TRIGger:WCDMa:MEAS:TPC:TOUT 10
```

4.4.2.3 Specifying Limits

```
// ******************************************************************************
// Configure UE power limits for "Max. Power E-DCH" measurements.
// ******************************************************************************
CONFigure:WCDMa:MEAS:TPC:LIMit:MPEDch ON, 24, 1.7, -6.7

// ******************************************************************************
// Configure power step limit for "Change of TFC" measurements.
// ******************************************************************************
CONFigure:WCDMa:MEAS:TPC:LIMit:CTFC 2.2, ON, 7
```

4.4.2.4 Setting up a Connection to the UE

```
// ******************************************************************************
// Connect the UE (switched off). Switch on the DL signal. Query the cell
// state until it equals ON,ADJ (DL signal available at RF connector).
// ******************************************************************************
SOURce:WCDMa:SIGN:CELL:STATe ON
WHILE SOURce:WCDMa:SIGN:CELL:STATe:ALL? <> "ON,ADJ"

// ******************************************************************************
// Switch on the UE and wait until it is registered and attached.
// ******************************************************************************
WHILE FETCh:WCDMa:SIGN:CSWitched:STATe? <> "REG"
WHILE FETCh:WCDMa:SIGN:PSWitched:STATe? <> "ATT"

// ******************************************************************************
// Set up the test mode connection. For subtest 1 the wizard configures
// an RMC connection and an HSPA connection.
// Query the connection state until the connections have been established.
// ******************************************************************************
CALL:WCDMa:SIGN:CSWitched:ACTion CONNect
WHILE FETCh:WCDMa:SIGN:CSWitched:STATe? <> "CEST"
WHILE FETCh:WCDMa:SIGN:PSWitched:STATe? <> "CEST"
```

4.4.2.5 Performing Measurements

```
// ******************************************************************************
// Start the TPC measurement and wait until command processing is complete.
// The TPC setup is executed automatically.
// ******************************************************************************
INIT:WCDMa:MEAS:TPC
*OPC?

// ******************************************************************************
// Query the traces obtained in the measurement.
// ******************************************************************************
FETCh:WCDMa:MEAS:TPC:TRACe:UEPower:CURRent?
```

```
FETCh:WCDMa:MEAS:TPC:TRACe:PSTeps:CURRent?

// *****************************************************************************
// Query the measurement state (should be "RDY"),
// the TPC state (should be "MAXP") and
// the E-TFCI information (should deliver two equal values).
// *****************************************************************************
FETCh:WCDMa:MEAS:TPC:STATe?
CONFigure:WCDMa:SIGN:UL:TPC:STATe?
CONFigure:WCDMa:SIGN:UL:TPC:MPEDch:STATe?

// *****************************************************************************
// Query statistical results obtained in the measurement
// *****************************************************************************
FETCh:WCDMa:MEAS:TPC:UEPower:MAXimum?
FETCh:WCDMa:MEAS:TPC:UEPower:MINimum?
FETCh:WCDMa:MEAS:TPC:UEPower:STATistics?

// *****************************************************************************
// Query limit check results obtained in the measurement
// *****************************************************************************
CALCulate:WCDMa:MEAS:TPC:UEPower:MAXimum?
CALCulate:WCDMa:MEAS:TPC:UEPower:MINimum?
CALCulate:WCDMa:MEAS:TPC:UEPower:AVERage?
```

4.5 Command Reference

The following sections provide detailed reference information on the remote control commands of the WCDMA TPC measurement.

4.5.1 Conventions and General Information

The following sections describe the most important conventions and general informations concerning the command reference.

4.5.1.1 MEAS<i>

MEAS<i> is used as abbreviation of "MEASurement<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW user manual, chapter "Remote Control"

4.5.1.2 FETCh, READ and CALCulate Commands

All commands are used to retrieve measurement results:

- `FETCh...` returns the results of the current measurement cycle (single-shot measurement) after they are valid. `FETCh...` must be used after the measurement has been started (`INITiate...`, measurement states RUN or RDY).
- `READ...` starts a new single-shot measurement and returns the results.
- `CALCulate...` returns one limit check result per `FETCh` result:
  – **OK**: The `FETCh` result is located within the limits or no limit has been defined/ enabled for this result.
  – **ULEU** (User limit exceeded upper): An upper limit is violated. The `FETCh` result is located above the limit.
  – **ULEL** (User limit exceeded lower): A lower limit is violated. The `FETCh` result is located below the limit.

See also: "Retrieving Measurement Results" in the R&S CMW user manual, chapter "Remote Control"

4.5.1.3 Reliability Indicator

The first value in the output arrays of `FETCh...?, READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 (OK)**:
  Measurement values available, no error detected.
- **1 (Measurement Timeout)**:
  The measurement has been stopped after the (configurable) measurement timeout. Measurement results may be available, however, at least a part of the measurement provides only INValid results or has not completed the full statistic count.
- **2 (Capture Buffer Overflow)**:
  The measurement configuration results in a capture length exceeding the available memory.
- **3 (Overdriven) / 4 (Underdriven)**:
  The accuracy of measurement results may be impaired because the input signal level was too high / too low.
- **6 (Trigger Timeout)**:

The measurement could not be started or continued because no trigger event was detected.

- **7 (Acquisition Error)**:
  The R&S CMW could not properly decode the RF input signal.
- **8 (Sync Error)**:
  The R&S CMW could not synchronize to the RF input signal.
- **9 (Uncal)**:
  Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 (Reference Frequency Error)**:
  The instrument has been configured to use an external reference signal but the reference oscillator could not be phase locked to the external signal (e.g. signal level too low, frequency out of range or reference signal not available at all).
- **16 (RF Not Available)**:
  The measurement could not be started because the configured RF input path was not active. This problem may occur e.g. when a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 (RF Level not Settled) / 18 (RF Frequency not Settled)**:
  The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.
- **19 (Call not Established)**:
  For measurements: The measurement could not be started because no signaling connection to the DUT was established.
  For DAU IMS service: Establishing a voice over IMS call failed.
- **20 (Call Type not Usable)**:
  For measurements: The measurement could not be started because the established signaling connection had wrong properties.
  For DAU IMS service: The voice over IMS settings could not be applied.
- **21 (Call Lost)**:
  For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
  For DAU IMS service: The voice over IMS call was lost.
- **23 (Missing Option)**:
  The ARB file can not be played by the GPRF generator due to a missing option.
- **26 (Resource Conflict)**:
  The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
  Please stop the application that has allocated the conflicting resources and try again.
- **27 (No Sensor Connected)**:
  The GPRF External Power Sensor measurement could not be started due to missing power sensor.
- **40 (ARB File CRC Error)**:
  The ARB file CRC check failed. The ARB file is corrupt and not reliable.

- **42 (ARB Header Tag Invalid)**:
  The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 (ARB Segment Overflow)**:
  The number of segments in the multi-segment ARB file is higher than the allowed maximum.
- **44 (ARB File not Found)**:
  The selected ARB file could not be found.
- **50 (Startup Error)**:
  The Data Application Unit (DAU), a DAU service or a DAU measurement could not be started. Please execute a DAU selftest.
- **51 (No Reply)**:
  The DAU has received no response, for example for a ping request.
- **52 (Connection Error)**:
  The DAU could not establish a connection to internal components. Please restart the instrument.
- **53 (Configuration Error)**:
  The current DAU configuration by the user is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 (Filesystem Error)**:
  The hard disk of the DAU is full or corrupt. Please execute a DAU selftest.
- **101 (Firmware Error)**:
  Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.
  If the error occurs again, consider the following hints:
  – Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.
  – If a software package (update) has not been properly installed this is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".
  – A software update correcting the error may be available. Updates are e.g. provided in the "CMW Customer Web" on GLORIS (registration required): https://extranet.rohde-schwarz.com.

  If you get firmware errors even with the properly installed latest software version, please send a problem report including log files to Rohde & Schwarz.
- **102 (Unidentified Error)**:
  Indicates an error not covered by other reliability values. For troubleshooting please follow the steps described for "101 (Firmware Error)".
- **103 (Parameter Error)**:
  Indicates that the measurement could not be performed due to internal conflicting parameter settings.
  A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.
  If you need assistance to localize the conflicting parameter settings please contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).

4.5.2 General Measurement Settings

The commands valid for all WCDMA measurements are described here: chapter 3.5.2, "General Measurement Settings", on page 159

4.5.3 TPC Measurement Commands

The commands for the WCDMA TPC measurement are divided into the groups listed below.

4.5.3.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:MEAS<i>:TPC
STOP:WCDMa:MEAS<i>:TPC
ABORt:WCDMa:MEAS<i>:TPC

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.
- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See Performing Measurements

Usage: Event

Firmware/Software: V2.1.20

Manual operation: See "TPC Meas. (Softkey)" on page 308

FETCh:WCDMa:MEAS<i>:TPC:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RUN | RDY

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued
RDY: measurement has been terminated, valid results may be available

*RST: OFF

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "TPC Meas. (Softkey)" on page 308

FETCh:WCDMa:MEAS<i>:TPC:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <MainState>: OFF or RDY ("invalid")

<RessourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable because <MainState>: OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "TPC Meas. (Softkey)" on page 308

4.5.3.2 UE Signal Info Settings

The following commands define expected properties of the UE signal, specific for the TPC measurement. For additional common "UE Signal Info" commands, see chapter 3.5.2.3, " UE Signal Info", on page 163.

CONFigure:WCDMa:MEAS<i>:TPC:SETup <SetType>

Selects the TPC setup (expected) to be executed during the measurement.

Parameters:

<SetType> CLOop | ALTernating | ALL1 | ALL0 | SALT | SAL1 | SAL0 | CONTinuous | TSE | TSF | PHUP | PHDown | TSABc | TSEF | TSGH | MPEDch | CTFC

CLOop: Closed Loop
ALTernating: Alternating
ALL1: All 1
ALL0: All 0
SALT: Single Pattern + Alternating
SAL1: Single Pattern + All 1
SAL0: Single Pattern + All 0
CONTinuous: Continuous Pattern
TSE: TPC Test Step E
TSF: TPC Test Step F
PHUP: Phase Discontinuity Up
PHDown: Phase Discontinuity Down
TSABc: TPC Test Step ABC
TSEF: TPC Test Step EF
TSGH: TPC Test Step GH
MPEDch: Max. Power E-DCH
CTFC: Change of TFC

*RST: CLO

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20
V3.0.30: added MPEDch and CTFC

Manual operation: See "TPC Setup" on page 309

4.5.3.3 Measurement Control Settings

The following commands define measurement control parameters for the TPC measurement.

CONFigure:WCDMa:MEAS<i>:TPC:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY` and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout> *RST: 0 s
Default unit: s

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20

CONFigure:WCDMa:MEAS<i>:TPC:MOEXception <MeasOnException>

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected.

Parameters:

<MeasOnException> OFF | ON

OFF: Faulty results are rejected.
ON: Results are never rejected.

*RST: OFF

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20

Manual operation: See "Measure on Exception" on page 311

CONFigure:WCDMa:MEAS<i>:TPC:MODE?

Queries the active measurement mode resulting from the currently selected TPC setup.

Return values:

<MeasMode> MONitor | ILPControl | MPEDch | CTFC

MONitor: Monitor
ILPControl: Inner Loop Power Control
MPEDch: Max. Power E-DCH
CTFC: Change of TFC

*RST: MON

Example: See Specifying Additional Measurement-Specific Settings

Usage: Query only

Firmware/Software: V2.1.20
V3.0.30: added MPEDch and CTFC

Manual operation: See "Mode" on page 311

CONFigure:WCDMa:MEAS<i>:TPC:MONitor:MLENgth <MeasLength>

Defines the number of slots to be measured in "Monitor" mode.

Parameters:

<MeasLength> Range: 1 slot to 341 slots
*RST: 240 slots
Default unit: slots

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20

Manual operation: See "Monitor > Measurement Length" on page 311

CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:MLENgth?

Query the number of slots measured in "Inner Loop Power Control" mode. The value depends on the selected TPC setup and the test step settings.

It can only be determined while the "Inner Loop Power Control" mode is active. In other modes INV is returned.

Return values:

<MeasLength> Range: 101 slots to 341 slots
*RST: INV
Default unit: slots

Example: See Specifying Additional Measurement-Specific Settings

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Inner Loop Power > Measurement Length" on page 312

CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:AEXecution <Enable>

Enables or disables automatic execution of the TPC setup for combined signal path measurements in "Inner Loop Power Control" mode.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20

Manual operation: See "Inner Loop Power > TPC Auto Execute" on page 312

CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:TSEF <Length>, <Statistics>

Configures the inner loop power control test steps E and F.

Parameters:

<Length> Number of TPC bits per test step

Range: 100 to 170
*RST: 120

<Statistics> Number of slots at the end of test step E (F), where the minimum (maximum) output power results are measured.

Range: 1 slot to 20 slots
*RST: 20 slots
Default unit: slots

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20

Manual operation: See "Inner Loop Power > TPC Test Step Settings" on page 312

CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:TSGH <Length>, <Statistics>

Configures the inner loop power control test steps G and H.

Parameters:

<Length> Number of TPC bits per test step

Range: 60 to 170
*RST: 80

<Statistics> Number of slots at the end of test step G (H), where the minimum (maximum) output power results are measured.

Range: 1 slot to 20 slots
*RST: 20 slots
Default unit: slots

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20

Manual operation: See "Inner Loop Power > TPC Test Step Settings" on page 312

CONFigure:WCDMa:MEAS<i>:TPC:ILPControl:TSSegment <Enable>

Enables or disables segmentation for test steps E, F, G and H.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V2.1.20

Manual operation: See "Inner Loop Power > TPC Test Step Settings" on page 312

CONFigure:WCDMa:MEAS<i>:TPC:MPEDch:MLENgth <MeasLength>

Defines the number of slots to be measured in "Max. Power E-DCH" mode.

Parameters:

<MeasLength> Range: 1 slot to 341 slots
*RST: 20 slots
Default unit: slots

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "Max. Power E-DCH > Measurement Length" on page 312

CONFigure:WCDMa:MEAS<i>:TPC:MPEDch:AEXecution <Enable>

Enables or disables automatic execution of the TPC setup for combined signal path measurements in "Max. Power E-DCH" mode.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "Max. Power E-DCH > TPC Auto Execute" on page 312

CONFigure:WCDMa:MEAS<i>:TPC:CTFC:MLENgth <NrSteps>

Specifies the number of power steps to be measured per step direction (n up steps + n down steps). A query returns the configured number of steps and additionally the resulting measurement length.

Parameters:

<NrSteps> Number of steps to be measured per direction
Range: 1 to 5
*RST: 5

Return values:

<MeasLength> Number of slots to be measured
Range: 1 slot to 301 slots
*RST: 301 slots
Default unit: slots

Example: See Specifying Basic Measurement Settings

Firmware/Software: V3.0.30

Manual operation: See "Change of TFC > Measurement Length" on page 313

4.5.3.4 Trigger Settings

The following commands define the trigger parameters.

TRIGger:WCDMa:MEAS<i>:TPC:CATalog:SOURce?

Lists all trigger source values that can be set using `TRIGger:WCDMa:MEAS<i>:TPC:SOURce`.

Return values:

<TriggerList> Comma separated list of all supported values. Each value is represented as a string.

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Trigger Source" on page 313

TRIGger:WCDMa:MEAS<i>:TPC:SOURce <Source>

Selects the source of the trigger events. A complete list of all supported values can be displayed using `TRIGger:WCDMa:MEAS:TPC:CATalog:SOURce?`.

Which values are available, depends on the installed options. The list below contains the values which are always available and the relevant values provided by the WCDMA generator or the WCDMA signaling application.

Parameters:

<Source>

'WCDMA Sig1: TPC Trigger'
TPC trigger signal provided by the WCDMA signaling application instance 1, adapt the "1" if required

'WCDMA Sig1: Change of TFC Trigger'
Change of TFC trigger signal provided by the WCDMA signaling application instance 1, adapt the "1" if required

'WCDMA Gen1: TPC Trigger'
TPC trigger signal provided by the WCDMA generator instance 1, adapt the "1" if required

'Base1: External TRIG A'
External trigger fed in at TRIG A connector

'Base1: External TRIG B'
External trigger fed in at TRIG B connector

'Free Run (Standard)'
Free Run (standard synchronization)

'Free Run (Fast Sync)'
Free Run (fast synchronization)

'IF Power'
Power trigger (normal synchronization)

'IF Power (Sync)'
Power trigger (extended synchronization)

*RST: 'Free Run (Standard)'

Example: See Configuring the Trigger System

Firmware/Software: V2.1.20

Manual operation: See "Trigger Source" on page 313

TRIGger:WCDMa:MEAS<i>:TPC:SLOPe <Slope>

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse (valid for external and power trigger sources).

Parameters:

<Slope> REDGe | FEDGe

REDGe: Rising edge
FEDGe: Falling edge

*RST: REDG

Example: See Configuring the Trigger System

Firmware/Software: V2.1.20

Manual operation: See "Trigger Slope" on page 314

TRIGger:WCDMa:MEAS<i>:TPC:THReshold <Threshold>

Defines the trigger threshold for power trigger sources.

Parameters:

<Threshold> Range: -47 dB to 0 dB
*RST: -26 dB
Default unit: dB (full scale, i.e. relative to reference level minus external attenuation)

Example: See Configuring the Trigger System

Firmware/Software: V2.1.20

Manual operation: See "Trigger Threshold" on page 314

TRIGger:WCDMa:MEAS<i>:TPC:DELay <Delay>

Defines a time delaying the start of the measurement relative to the trigger event. This is useful if the trigger event and the uplink DPCH slot border are not synchronous. A measurement starts always at an uplink DPCH slot border. Triggering a measurement at another time may yield a synchronization error.

For internal trigger sources aligned to the downlink DPCH an additional delay of 1024 chips is automatically applied. It corresponds to the assumed delay between downlink and uplink slot.

This setting has no influence on "Free Run" measurements.

Parameters:

<Delay> Range: -666.7E-6 s to 0.24 s
*RST: 0 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V2.1.20

Manual operation: See "Trigger Delay" on page 314

TRIGger:WCDMa:MEAS<i>:TPC:TOUT <TimeOut>

Selects the maximum time that the R&S CMW will wait for a trigger event before it stops the measurement in remote control mode or indicates a trigger timeout in manual operation mode. This setting has no influence on "Free Run" measurements.

Parameters:

<TimeOut> Range: 0.01 s to 10 s
*RST: 2 s
Default unit: s
Additional parameters: OFF | ON (disables | enables the timeout)

Example: See Configuring the Trigger System

Firmware/Software: V2.1.20
V3.0.10: OFF | ON added

Manual operation: See "Trigger Time Out" on page 314

TRIGger:WCDMa:MEAS<i>:TPC:MGAP <MinimumGap>

Sets a minimum time during which the IF signal must be below the trigger threshold before the trigger is armed so that an IF power trigger event can be generated.

Parameters:

<MinimumGap> Range: 0 s to 0.01 s
*RST: 25E-6 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V2.1.20

Manual operation: See "Minimum Trigger Gap" on page 314

4.5.3.5 Limits

The following commands define limits for the individual measurement modes. For "Monitor" mode measurements there are no limits.

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower <Enable>, <ActiveLimit>

Enables or disables the check of the maximum UE output power limits for the "Inner Loop Power Control" mode and selects the set of limit settings to be used.

Parameters:

<Enable> OFF | ON

Disables | enables the limit check

*RST: ON

<ActiveLimit> USER | PC1 | PC2 | PC3 | PC3B | PC4

To use the limits defined by 3GPP, select the power class of the UE (**PC1** to **PC4** = power class 1, 2, 3, 3bis, 4). To use the UE power class value reported by the UE in the capability report, see also `CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:URPClass`.
For user-defined limit values, select **USER** and define the limits via `CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:UDEFined`.

*RST: PC4

Example: See Specifying Limits

Firmware/Software: V2.1.20

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:URPClass <Enable>

Enables or disables the usage of the UE power class value reported by the UE in the capability report.

This is only relevant for combined signal path "Inner Loop Power Control" measurements and only if the predefined limit sets are used.

Parameters:

<Enable> OFF | ON
*RST: ON

Firmware/Software: V2.1.20

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:ACTive?

Queries the active limit values for the "Inner Loop Power Control" mode.

These limit values result either from the configured UE power class or from the reported UE power class or have been defined by the user.

Return values:

<NominalMaxPower> Nominal maximum output power of the UE
Range: -50 dBm to 34 dBm
Default unit: dBm

<UpperLimit> Tolerance value for too high maximum UE power
Range: 0 dB to 5 dB
Default unit: dB

<LowerLimit> Tolerance value for too low maximum UE power
Range: -5 dB to 0 dB
Default unit: dB

Example: See Specifying Limits

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower:UDEFined <NominalMaxPower>, <UpperLimit>, <LowerLimit>

Sets the user-defined maximum output power limits for the "Inner Loop Power Control" mode. To activate the usage of this limit set, see `CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MAXPower`.

Parameters:

<NominalMaxPower> Nominal maximum output power of the UE

Range: -50 dBm to 34 dBm
*RST: 21 dBm
Default unit: dBm

<UpperLimit> Tolerance value for too high maximum UE power

Range: 0 dB to 5 dB
*RST: 2.7 dB
Default unit: dB

<LowerLimit> Tolerance value for too low maximum UE power

Range: -5 dB to 0 dB
*RST: -2.7 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V2.1.20

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:MINPower <Enable>, <UpperLimit>

Defines an "Inner Loop Power Control" limit: upper limit for the minimum UE output power. Also enables or disables the limit check.

Parameters:

<Enable> OFF | ON

Disables | enables the limit check

*RST: ON

<UpperLimit> Range: -70 dBm to 34 dBm
*RST: -49 dBm
Default unit: dBm

Example: See Specifying Limits

Firmware/Software: V2.1.20

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:PSTep <Enable>, <Step0dB>, <Step1dB>, <Step2dB>

Defines "Inner Loop Power Control" limits: upper limits for the absolute value of the power step error, depending on the expected step size. Also enables or disables the limit check.

Parameters:

<Enable> OFF | ON

Disables | enables the limit check

*RST: ON

<Step0dB> Limit for steps with expected step size 0 dB

Range: 0 dB to 5 dB
*RST: 0.6 dB
Default unit: dB

<Step1dB> Limit for steps with expected step size ±1 dB

Range: 0 dB to 5 dB
*RST: 0.6 dB
Default unit: dB

<Step2dB> Limit for steps with expected step size ±2 dB

Range: 0 dB to 5 dB
*RST: 1.15 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V2.1.20

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:ILPControl:PSGRoup <Enable>, <Group10x0dB>, <Group10x1dBAlg2>, <Group10x1dB>, <Group10x2dB>

Defines "Inner Loop Power Control" limits: upper limits for the absolute value of the power step group error, depending on the expected step size. Also enables or disables the limit check.

Parameters:

<Enable> OFF | ON

Disables | enables the limit check

*RST: ON

<Group10x0dB> Limit for groups with expected step size 10 x 0 dB (algorithm 2)

Range: 0 dB to 9 dB
*RST: 1.1 dB
Default unit: dB

<Group10x1dBAlg2> Limit for groups with expected step size 10 x ±1 dB + 40 x 0 dB (algorithm 2)

Range: 0 dB to 9 dB
*RST: 4.3 dB
Default unit: dB

<Group10x1dB> Limit for groups with expected step size 10 x ±1 dB (algorithm 1)

Range: 0 dB to 9 dB
*RST: 2.3 dB
Default unit: dB

<Group10x2dB> Limit for groups with expected step size 10 x ±2 dB (algorithm 1)

Range: 0 dB to 9 dB
*RST: 4.3 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V2.1.20

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:MPEDch <Enable>, <NomMaxPower>, <UpperLimit>, <LowerLimit>

Configures UE power limits for the measurement mode "Max. Power E-DCH".

Parameters:

<Enable> OFF | ON

Disables | enables the limit check

*RST: ON

<NomMaxPower> Nominal maximum UE power

Range: -47 dBm to 34 dBm
*RST: 24 dBm
Default unit: dBm

<UpperLimit> Upper limit = nominal power + this value

Range: 0 dB to 10 dB
*RST: 1.7 dB
Default unit: dB

<LowerLimit> Lower limit = nominal power + this value

Range: -10 dB to 0 dB
*RST: -6.7 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V3.0.30

Manual operation: See "Limits" on page 316

CONFigure:WCDMa:MEAS<i>:TPC:LIMit:CTFC <PowerStepLimit>, <CalcBetaFactors>[, <PowerStepSize>]

Configures a power step limit for the measurement mode "Change of TFC".

Parameters:

<PowerStepLimit> Symmetrical tolerance value for the power step size

Range: 0 dB to 10 dB
*RST: 2.3 dB
Default unit: dB

<CalcBetaFactors> OFF | ON

Enables or disables the automatic calculation of the expected power step size from the configured beta factors

*RST: ON

<PowerStepSize> Expected power step size applicable if the automatic calculation from beta factors is disabled

Range: 0 dB to 24 dB
*RST: 7 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V3.0.30

Manual operation: See "Limits" on page 316

4.5.3.6 Results (Traces)

The following commands return the results displayed in the diagrams at the GUI.

FETCh:WCDMa:MEAS<i>:TPC:TRACe:UEPower:CURRent?
READ:WCDMa:MEAS<i>:TPC:TRACe:UEPower:CURRent?

Return the values of the UE power vs slot trace.

You can query the number of measured slots using the `CONFigure:WCDMa:MEAS:TPC:...:MLENgth?` command of the used measurement mode.

Return values:

<Reliability> Reliability Indicator

<UEpower> n power results, one per measured slot

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V2.1.20

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:TPC:TRACe:PSTeps:CURRent?
READ:WCDMa:MEAS<i>:TPC:TRACe:PSTeps:CURRent?

Return the values of the power steps trace.

Each power step is calculated as the difference between the UE power of a slot and the UE power of the preceding slot. For the first measured slot a 0 is returned.

You can query the number of measured slots using the `CONFigure:WCDMa:MEAS:TPC:...:MLENgth?` command of the used measurement mode.

Return values:

<Reliability> Reliability Indicator

<PowerSteps> n power step results, one per measured slot
Power step result number m indicates the difference between the UE power results number m and number m-1. The first power step result equals NCAP.
Range: -50 dB to 50 dB
Default unit: dB

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V2.1.20

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

4.5.3.7 Results (Single Values)

The following commands return the statistical results displayed in tables at the GUI.

CALCulate:WCDMa:MEAS<i>:TPC:UEPower:MAXimum?
CALCulate:WCDMa:MEAS<i>:TPC:UEPower:MINimum?
CALCulate:WCDMa:MEAS<i>:TPC:UEPower:AVERage?
FETCh:WCDMa:MEAS<i>:TPC:UEPower:MAXimum?
FETCh:WCDMa:MEAS<i>:TPC:UEPower:MINimum?
FETCh:WCDMa:MEAS<i>:TPC:UEPower:AVERage?
READ:WCDMa:MEAS<i>:TPC:UEPower:MAXimum?
READ:WCDMa:MEAS<i>:TPC:UEPower:MINimum?
READ:WCDMa:MEAS<i>:TPC:UEPower:AVERage?

Return the UE power and minimum/maximum output power single value results. The minimum, maximum and average values of these results can be retrieved.

The command returns all parameters listed below, independent of the selected TPC setup. However, only for some of the parameters measured values are available. For the other parameters only an indicator is returned (e.g. NAV).

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

Return values:

<Reliability> Reliability Indicator

<UEPower> UE power
Range: -100 dBm to 55 dBm
Default unit: dBm

<MaxOutputPower> Maximum output power
Range: -100 dBm to 55 dBm
Default unit: dBm

<MinOutputPower> Minimum output power
Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V2.1.20
V3.0.20: added CALCulate commands

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

CALCulate:WCDMa:MEAS<i>:TPC:PSTeps:MAXimum?
CALCulate:WCDMa:MEAS<i>:TPC:PSTeps:MINimum?
CALCulate:WCDMa:MEAS<i>:TPC:PSTeps:AVERage?
FETCh:WCDMa:MEAS<i>:TPC:PSTeps:MAXimum?
FETCh:WCDMa:MEAS<i>:TPC:PSTeps:MINimum?
FETCh:WCDMa:MEAS<i>:TPC:PSTeps:AVERage?
READ:WCDMa:MEAS<i>:TPC:PSTeps:MAXimum?
READ:WCDMa:MEAS<i>:TPC:PSTeps:MINimum?
READ:WCDMa:MEAS<i>:TPC:PSTeps:AVERage?

Return the power step and power step group single value results. The minimum, maximum and average results can be retrieved.

The command returns all parameters listed below, independent of the selected TPC setup. However, only for some of the parameters measured values are available. For the other parameters only an indicator is returned (e.g. NAV).

"Step A" to "step H" refer to the test steps of the "Inner Loop Power Control" mode (result <2_Step0dB_ABC> to <14_StartFH>).

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_Step0dB_ABC> Power step, expected 0 dB, test steps A, B, C

Range: -50 dB to 50 dB
Default unit: dB

<3_Step1dB_B> Power step, expected +1 dB, test step B

Range: -50 dB to 50 dB
Default unit: dB

<4_StepM1dB_C> Power step, expected -1 dB, test step C

Range: -50 dB to 50 dB
Default unit: dB

<5_Group0dB_A> Power step group, expected 0 dB, test step A

Range: -50 dB to 50 dB
Default unit: dB

<6_Group10dB_B> Power step group, expected +10 dB, test step B

Range: -50 dB to 50 dB
Default unit: dB

<7_GroupM10dB_C>	Power step group, expected -10 dB, test step C Range: -50 dB to 50 dB Default unit: dB
<8_Start0dB_A>	First slot of the group where the result <5_Group0dB_A> has been measured Range: 1 to 51
<9_StepEG>	Power step, expected -1 dB in step E / -2 dB in step G Range: -50 dB to 50 dB Default unit: dB
<10_StepFH>	Power step, expected +1 dB in step F / +2 dB in step H Range: -50 dB to 50 dB Default unit: dB
<11_GroupEG>	Power step group, expected -10 dB in step E / -20 dB in step G Range: -50 dB to 50 dB Default unit: dB
<12_GroupFH>	Power step group, expected +10 dB in step F / +20 dB in step H Range: -50 dB to 50 dB Default unit: dB
<13_StartEG>	First slot of the group where the result <11_GroupEG> has been measured Range: 1 to 161
<14_StartFH>	First slot of the group where the result <12_GroupFH> has been measured Range: 1 to 161
<15_PwrStepsUp>	Power steps up result of "Change of TFC" mode Range: -25 dB to 25 dB Default unit: dB
<16_PwrStepsDown>	Power steps down result of "Change of TFC" mode Range: -25 dB to 25 dB Default unit: dB
Example:	See Performing Measurements
Usage:	Query only
Firmware/Software:	V2.1.20 V3.0.20: added CALCulate commands V3.0.30: added results <15_PwrStepsUp> and <16_PwrSteps-Down>

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:TPC:UEPower:STATistics?
READ:WCDMa:MEAS<i>:TPC:UEPower:STATistics?

Return the "Statistics" values, indicating how many trace values have been considered to derive the maximum, minimum and average values of the maximum output power and the minimum output power.

The command returns all parameters listed below, independent of the selected TPC setup. Depending on the TPC setup either a result value or an indicator is returned (e.g. NAV).

Return values:

<Reliability> Reliability Indicator

<MaxOutputPower> Number of trace values for maximum output power
Range: 0 to 341

<MinOutpuPower> Number of trace values for minimum output power
Range: 0 to 341

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V2.1.20

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

FETCh:WCDMa:MEAS<i>:TPC:PSTeps:STATistics?
READ:WCDMa:MEAS<i>:TPC:PSTeps:STATistics?

Return the "Statistics" values, indicating how many trace values have been considered to derive the maximum, minimum and average power step and power step group results.

The command returns all parameters listed below, independent of the selected TPC setup. However, only for some of the parameters result values are available. For the other parameters only an indicator is returned (e.g. NAV).

"Step A" to "step H" refer to the test steps of the "Inner Loop Power Control" mode (result <2_Step0dB_ABC> to <9_GroupFH>).

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability> Reliability Indicator

<2_Step0dB_ABC> Power step, expected 0 dB, test steps A, B, C
Range: 140 (fixed value)

<3_Step1dB_B> Power step, expected +1 dB, test step B
Range: 10 (fixed value)

<4_StepM1dB_C> Power step, expected -1 dB, test step C
Range: 10 (fixed value)

<5_Group0dB_A> Power step group, expected 0 dB, test step A
Range: 51 (fixed value)

<6_StepEG> Power step, expected -1 dB in step E / -2 dB in step G
Range: 0 to 170

<7_StepFH> Power step, expected +1 dB in step F / +2 dB in step H
Range: 0 to 170

<8_GroupEG> Power step group, expected -10 dB in step E / -20 dB in step G
Range: 0 to 161

<9_GroupFH> Power step group, expected +10 dB in step F / +20 dB in step H
Range: 0 to 161

<10_PwrStepsUp> Power steps up result of "Change of TFC" mode
Range: 0 to 5

<11_PwrStepsDown> Power steps down result of "Change of TFC" mode
Range: 0 to 5

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V2.1.20
V3.0.30: added results <10_PwrStepsUp> and <11_PwrSteps-Down>

For additional information concerning syntax elements and returned values refer to Conventions and General Information.

4.6 List of Commands

5 WCDMA PRACH Measurement

The "WCDMA PRACH" measurement provides quick and flexible tests on random access preambles. The tests cover the following UE transmitter properties:

- Modulation accuracy (EVM, magnitude error, phase error, frequency error)
- Preamble power (ON power), transmit OFF power and power steps between the preambles
- I/Q constellation diagram

The PRACH measurement requires option R&S CMW-KM400.

5.1 What's New in this Revision

This revision describes version 3.0.20 and later of the "WCDMA PRACH Measurement" firmware application. This is the initial software version.

5.2 General Description

The WCDMA PRACH measurement captures an uplink (UL) WCDMA PRACH signal and provides TX measurement results for up to five subsequent random access preambles. The OFF power before and after an additional preamble can also be measured.

The following sections describe how to perform and configure the measurement.

5.2.1 Test Setup

The external RF signal source (mobile station, signal generator etc.) is connected to one of the RF input connectors (RF COM) at the front panel of the R&S CMW. No additional cabling and no external trigger is needed.

The input level ranges of all RF COM connectors are identical.

See also: "RF Connectors" in the R&S CMW user manual, chapter "Getting Started"

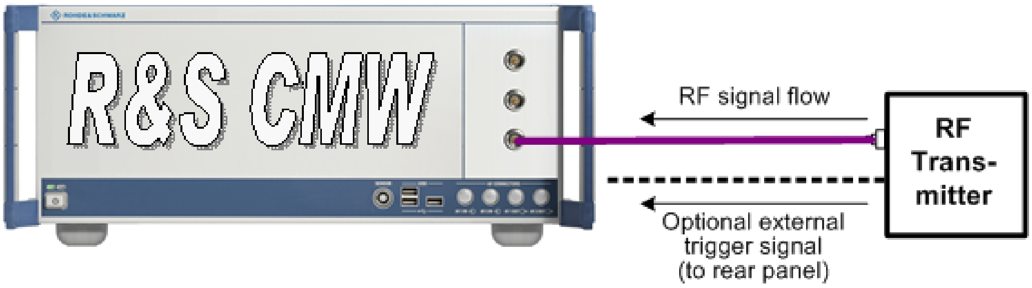


Fig. 5-1: Connecting an RF transmitter to the instrument

5.2.2 How to Perform a Measurement

The measurement expects a WCDMA PRACH UL signal. Any other signals, e.g. a WCDMA UL signal without preambles (established connection) will not yield measurement results.

After preparing the physical test setup, you have to adjust at least the following analyzer settings to the properties of the analyzed PRACH signal:

- Analyzer "Frequency"
- "Expected Nominal Power", "User Margin" (optional) and "External Attenuation (Input)"
  Recommended values: "Expected Nominal Power" = peak power of the first preamble; "User Margin" = 0 dB. The smallest possible value of the "Expected Nominal Power" plus the "User Margin" ensures maximum dynamic range.
  When using the combined signal path scenario, let the signaling application calculate the expected nominal power from the UL power control settings (expected nominal power mode = "According to UL Power Control Settings"). Do not use the manual mode.
- "UE Signal Info" setting "DL Scrambling Code"
  Configure this parameter for a standalone measurement. For the combined signal path scenario it is set automatically.
- Power step limit setting "Preamble Power Steps"
  For a standalone measurement, configure the power step size expected for consecutive preambles. The value is used to calculate the expected nominal power of the second preamble and of subsequent preambles.
  For the combined signal path scenario the value is set automatically.

The default trigger settings are usually appropriate and don't need to be modified, see chapter 5.2.5, "Trigger Modes", on page 355.

Start the measurement before switching on the UE. This ensures that the measurement starts with the first preamble of the preamble cycle.

5.2.3 Defining the Scope of the Measurement

The WCDMA PRACH measurement analyzes up to five preambles of a random access preamble cycle, starting with the first preamble of the cycle. Additionally it measures the transmit OFF power.

Depending on the type of measurement result there are three different measurement scopes, listed and illustrated below:

- Most results are available per preamble, for the first n preambles of the preamble cycle.
  The maximum value of n equals 5. So the results can be provided for up to 5 preambles, labeled "Measured preambles" in the figure.
  n is configured via parameter "No of Measured Preambles" on page 367
- For one "Preselected Preamble" the "vs. Chip" diagrams and an I/Q constellation diagram provide more detailed results.
  This preamble can be freely selected within the range of "Measured preambles". It must be selected before the measurement is started.
  The "Preselected Preamble" is configured via parameter "Preselected Preamble" on page 367.
- The transmit OFF power is measured before and after the preamble following the "Measured preambles". This preamble is labeled "Subsequent preamble" in the figure. Only the power before and after the preamble is measured. The preamble itself is not evaluated.

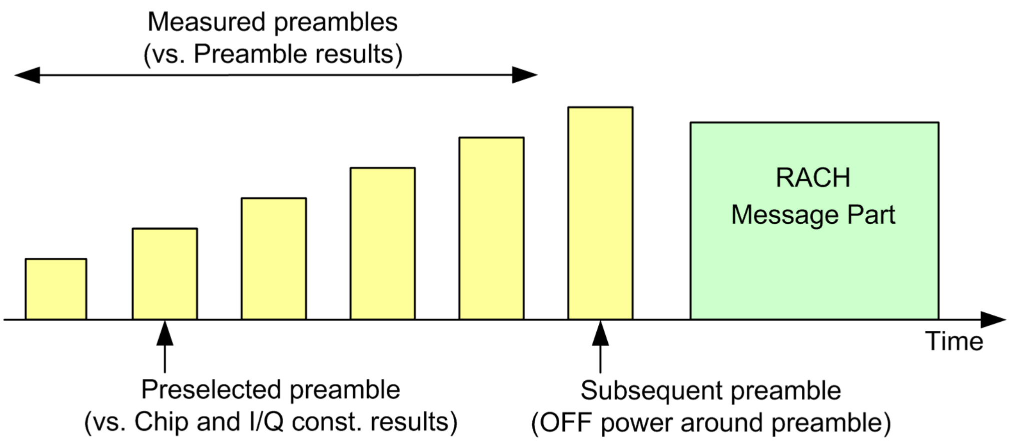


Fig. 5-2: Measured preambles, preselected preamble and OFF power preamble

5.2.4 Parallel Signaling and Measurement

The PRACH measurement can be used in parallel to the WCDMA signaling application (option R&S CMW-KS400). The signaling application emulates a UTRAN cell signal so that the UE tries to attach and sends random access preambles. These preambles can then be measured using the PRACH measurement.

To use both applications in parallel, the combined signal path scenario must be activated (see "Scenario = Combined Signal Path" on page 129). The signal routing and analyzer settings, the UE signal info settings and some measurement control settings are then configured by the signaling application. The PRACH measurement displays the corresponding signaling settings instead of its own settings. These signaling settings can be configured both in the measurement GUI and in the GUI of the signaling application. To configure the signaling settings via remote commands, the commands of the signaling application have to be used.

Additional signaling parameters, e.g. the PRACH settings, can be accessed in the measurement GUI via hotkeys, see chapter 5.3.2.6, "Additional Softkeys and Hotkeys", on page 370.

Whenever the combined signal path scenario is activated or the controlling application is changed, the PRACH trigger signal provided by the controlling signaling application is selected automatically as trigger source.

You can configure the signaling application so that it does not answer the received preambles (enhanced AICH settings, Acknowledge = Negative) and the UE performs several preamble cycles. However, this is not recommended, as the measurement is designed to measure one preamble cycle only. Correct triggering on the first preamble of a cycle can only be ensured for the first preamble cycle.

5.2.5 Trigger Modes

The WCDMA PRACH measurement requires a trigger event for the first preamble to be measured. It can be performed in the following trigger modes:

- IF Power (default mode for standalone scenario): With an internal IF power trigger, the measurement is triggered by the power ramp of the first received preamble.
- WCDMA Sig<n>: PRACH Trigger (default mode for combined signal path scenario): Trigger signal provided by the WCDMA signaling application, suitable for combined signal path measurements.
- External Trigger A/B: External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument.
  The trigger signal must be slot aligned to the CPICH and the trigger event must occur within 18 slots after the rising edge of the preamble.

Initiate the measurement before starting a preamble cycle, not during a preamble cycle. This ensures that the measurement starts with the first preamble of the cycle. By default a quite big trigger timeout value is configured so that you can initiate the measurement before switching on the UE.

For configuration see chapter 5.3.2.4, "Trigger Settings", on page 368.

5.2.6 Limit Settings and Conformance Requirements

Conformance requirements for WCDMA transmitter tests are specified in 3GPP TS 34.121, section 5, "Transmitter Characteristics".

The following sections give an overview of the WCDMA PRACH limit settings and the related test requirements.

5.2.6.1 Transmit Modulation Limits

The WCDMA PRACH measurement provides a subset of the modulation limits available in the multi evaluation measurement.

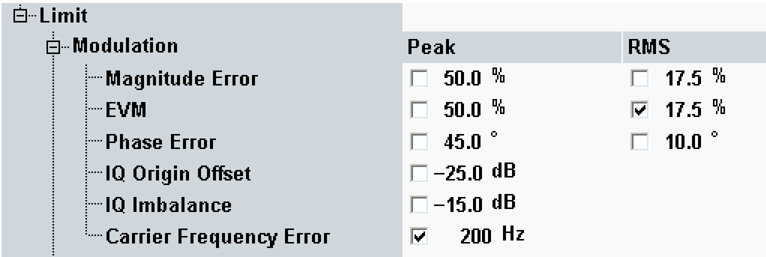


Fig. 5-3: Modulation limit settings

For background information refer to chapter 3.2.5.1, "Transmit Modulation Limits", on page 104.

5.2.6.2 Maximum Output Power Limits

WCDMA equipment is divided into several power classes. For each power class 3GPP defines the maximum output power of the UE transmitter and an upper and lower tolerance value. Example: According to the test requirements, the maximum output power of a class 1 UE must be between 33 dBm - 3.7 dB and 33 dBm + 1.7 dB.

The nominal maximum power and tolerance values can be comfortably configured in the limits section by selecting the power class of the UE. The resulting settings are displayed in column "Active Limits". If you want to use different values, select "User Defined" for "Active Limit Select" and adjust the values in column "User Defined".

If the combined signal path scenario is active, an additional parameter "Use Reported", is displayed. If this parameter is enabled, the UE power class value reported by the UE in the capability report is used. The manually configured value is used if the parameter is disabled or no value has been reported.

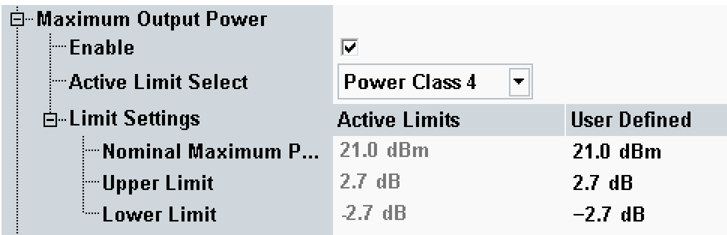


Fig. 5-4: Maximum output power limits

The test requirements for the individual UE power classes are defined in 3GPP TS 34.121, section 5.2 "Maximum Output Power" and listed in the following table.

The measured power of all preambles must not exceed the "Nominal Maximum Power" + "Upper Limit".

The "Lower Limit" is relevant for power steps, see chapter 5.2.6.5, "Power Step Limits", on page 358.

UE Power Class	Nominal Maximum Power	Tolerances (Upper and Lower Limit)
Class 1	33 dBm	+1.7 dB, -3.7 dB
Class 2	27 dBm	
Class 3	24 dBm	
Class 3bis	23 dBm	+2.7 dB, -2.7 dB
Class 4	21 dBm	

5.2.6.3 Open Loop Power Limits

The UE shall calculate the output power for the first transmitted preamble from system information received via the BCCH and from the received signal power level of the CPICH.

According to 3GPP TS 34.121, section 5.4.1 "Open Loop Power Control in the Uplink", the tolerance for the power of the first preamble is ±10 dB under normal conditions and ±13 dB under extreme conditions.

You can define the expected power of the first (initial) preamble and a symmetrical tolerance value in the configuration dialog.

When the combined signal path scenario is active, the initial preamble power parameter is controlled by the signaling application.

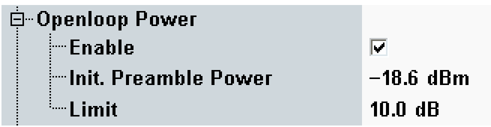


Fig. 5-5: Open loop power limit

5.2.6.4 Off Power Limit

The UE power measured when the UE transmitter is off is called "OFF power". According to 3GPP TS 34.121, section 5.5.1 "Transmit OFF Power", the measured value must be below -55 dBm. The same limit is defined in section 5.5.2 "Transmit ON/OFF Time Mask".

You can set a corresponding upper limit in the configuration dialog. It is applied to the OFF power measured before and after the last preamble received by the R&S CMW.

Fig. 5-6: Off power limit

5.2.6.5 Power Step Limits

During a random access procedure the UE is expected to transmit RACH preambles at increasing power until the Node B sends an ACK on the AICH or until the maximum number of preambles within one cycle is exceeded.

In the configuration dialog you can specify the expected step size and a symmetrical tolerance value. The limit applies to all preamble steps. Exception: If the preamble power exceeds the nominal maximum power plus the lower limit (see chapter 5.2.6.2, "Maximum Output Power Limits", on page 356), no limit check is applied to the related steps.

When the combined signal path scenario is active, the expected step size parameter ("Preamble Power Steps") is controlled by the signaling application.

The expected step size "Preamble Power Steps" is also used to calculate the expected preamble power and to adapt the expected nominal power internally during the preamble cycle.

Please note that 3GPP TS 34.121 specifies no test requirement for the accuracy of the preamble power step size. But the minimum requirements section 5.5.2 "Transmit ON/OFF Time Mask" contains a reference to 3GPP TS 25.101, section 6.5.2.1 and a table of power step size tolerances.

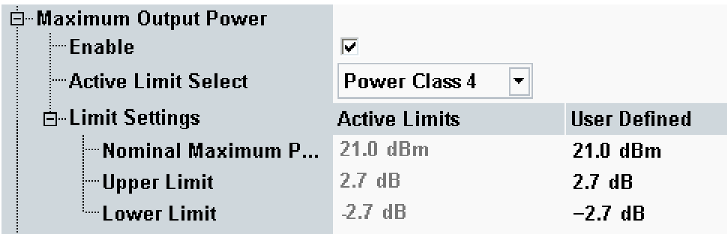


Fig. 5-7: Power step limits

5.2.7 Measurement Results

The results of the WCDMA PRACH measurement are displayed in several different views. Use the "Display" parameters to select the views and to change the appearance and contents of the views. The views are described in the following sections.

5.2.7.1 Overview

In the overview a selection of the following results can be displayed:

- Error Vector Magnitude (vs preamble and vs chip)
- Magnitude Error (vs preamble and vs chip)
- Phase Error (vs preamble and vs chip)
- I/Q Constellation Diagram
- Frequency Error
- UE Power (vs preamble and vs chip)
- Power Steps
- Most important results of detailed view "TX Measurement"

See also: "TX Measurements" in the R&S CMW user manual, chapter "System Overview"

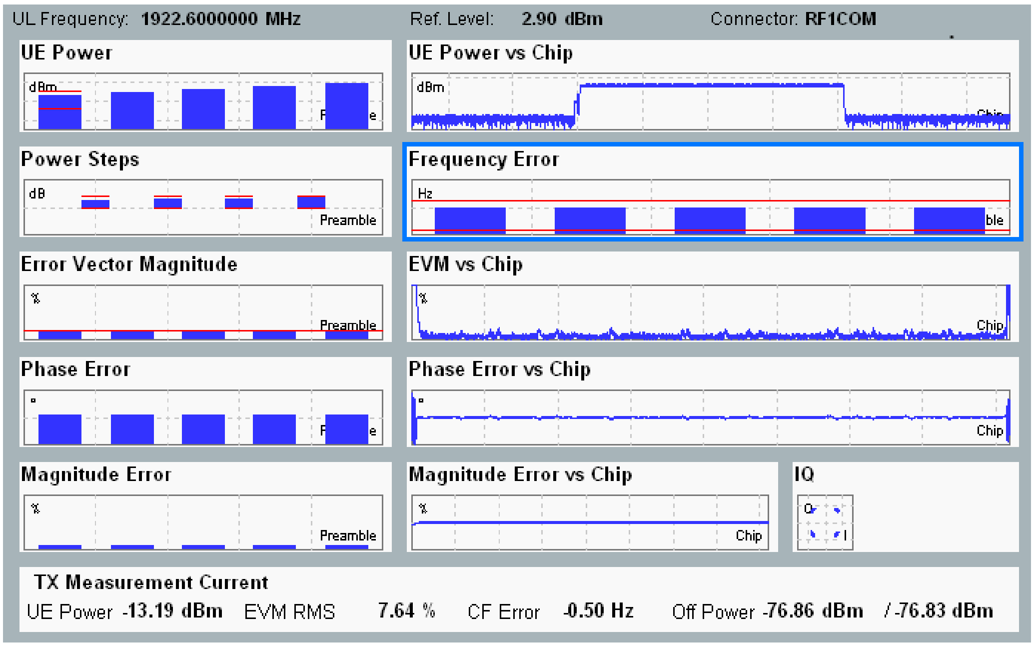


Fig. 5-8: WCDMA PRACH: Overview

The results to be measured and displayed in the overview can be limited using the hotkey "Assign Views", see "Assign Views (Hotkey)" on page 367.

You can enlarge one of the diagrams in the overview and show a detailed view with additional measurement results, see chapter 5.2.7.6, "Selecting and Modifying Views", on page 363.

The traces and bar graphs are described in the "Detailed Views" sections.

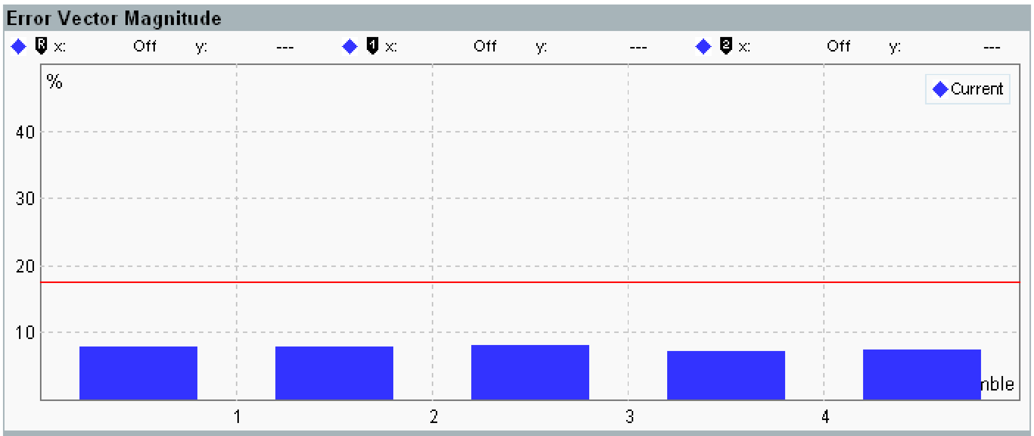
5.2.7.2 Detailed Views: Modulation

This section applies to the following detailed views:

- Error Vector Magnitude (vs preamble and vs chip)

- Magnitude Error (vs preamble and vs chip)
- Phase Error (vs preamble and vs chip)
- Frequency Error (vs preamble)

Each of the detailed views shows a bar graph or diagram and a table of results per preamble.



Preamble	0	1	2	3	4
Power [dBm]	-23.41	-20.50	-17.34	-14.35	-11.70
EVM RMS [%]	7.93	7.92	8.12	7.23	7.56
EVM Peak [%]	24.86	23.96	24.35	25.76	25.68
IQ Origin Offset [dB]	-25.73	-25.73	-25.67	-28.21	-26.92
IQ Imbalance [dB]	-40.43	-41.21	-41.80	-43.24	-44.38
CF Error [Hz]	-0.34	-0.41	-0.31	-0.19	-0.34
Signature	0	0	0	0	0

Fig. 5-9: WCDMA PRACH: EVM

- Error Vector Magnitude, Magnitude Error, Phase Error and Frequency Error
  The bar graphs cover up to 5 preambles and display one result per preamble, calculated as the average of the measured quantity of all samples in the preamble, excluding a 25 µs guard period at the beginning and end of the preamble.
- Error Vector Magnitude vs Chip, Magnitude Error vs Chip, and Phase Error vs Chip
  The diagrams cover all 4096 chips of the "Preselected Preamble" and contain one measurement result per chip.

5.2.7.3 Detailed Views: I/Q Constellation Diagram

The constellation diagram shows the modulation symbols of the preselected preamble in the I/Q plane.

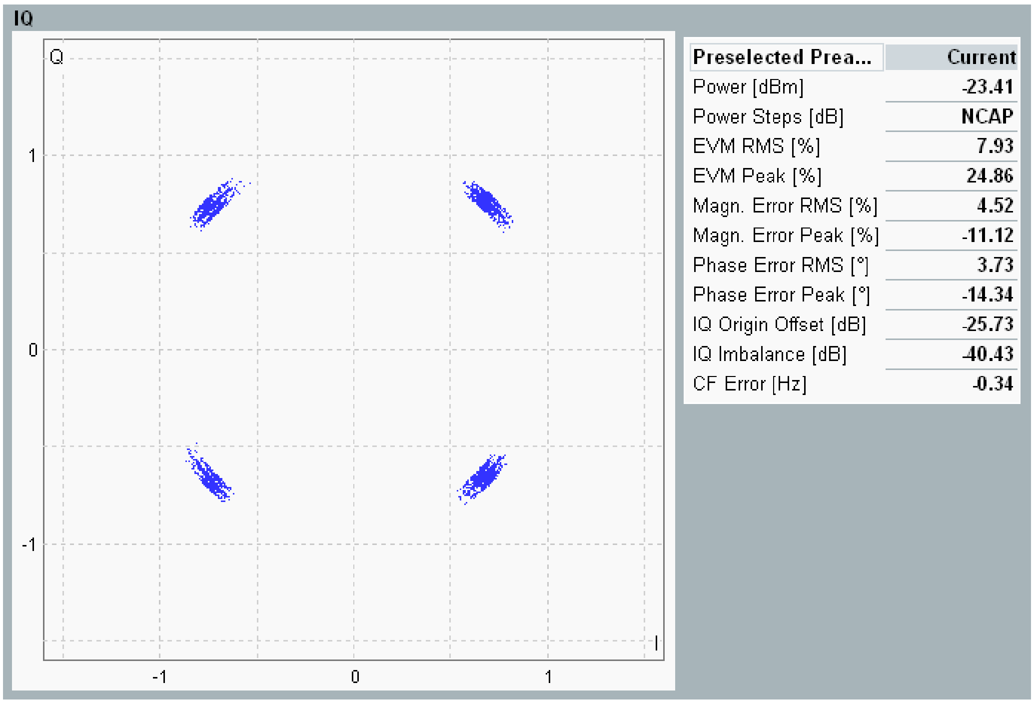


Fig. 5-10: WCDMA PRACH: I/Q constellation diagram

All samples in the preamble are evaluated, excluding a 25 µs guard period at the beginning and end of the preamble. Thus 3904 points are displayed.

PRACH preambles are QPSK modulated, so that the points are grouped in four spots, ideally located on a circle around the origin, with relative phase angles of 90 deg.

See also: "I/Q Constellation Diagram" in the R&S CMW user manual, chapter "System Overview"

5.2.7.4 Detailed Views: UE Power and Power Steps

Each of the detailed views shows a bar graph or diagram and a table of results per preamble.

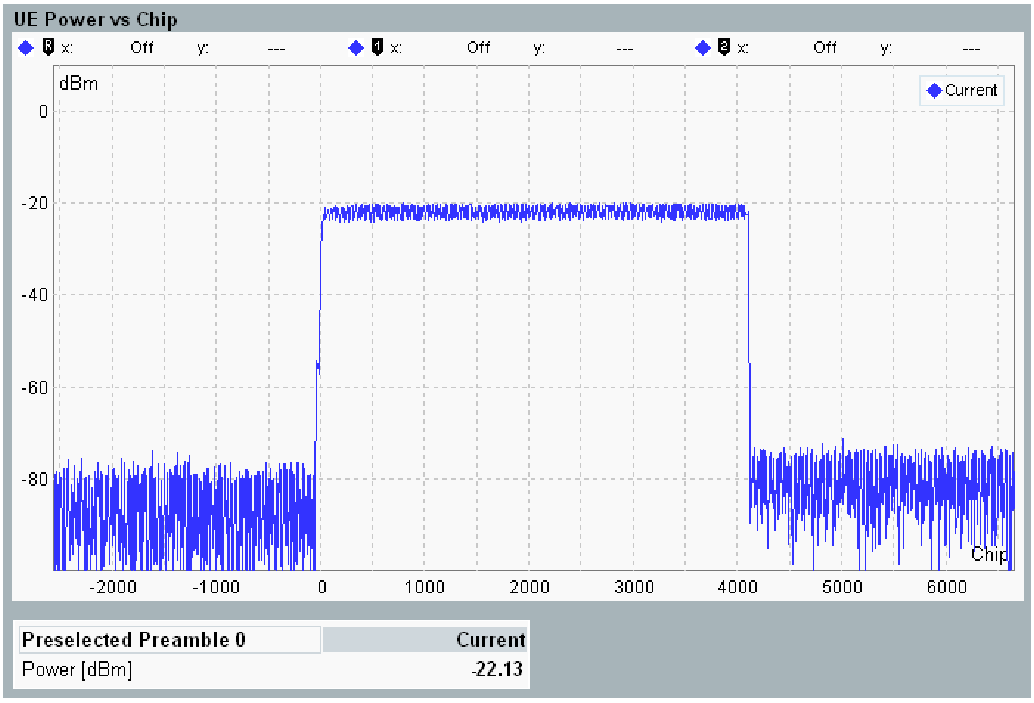


Fig. 5-11: WCDMA PRACH: UE Power vs Chip

- UE Power
  The bar graph covers up to 5 preambles and displays the mean power of each preamble, calculated as the average of the power of all samples in the preamble, excluding a 25 µs guard period at the beginning and end of the preamble.
- UE Power vs Chip
  The diagram covers all 4096 chips of the "Preselected Preamble", labeled 0 to 4095. Additionally the diagram shows the power for 2560 chips before and after the last evaluated preamble. These results are labeled -2560 to -1 and 4096 to 6655.
- Power Steps
  For each preamble the bar graph displays the UE power difference to the previous preamble. For the first preamble there is no power step result.

5.2.7.5 Detailed Views: TX Measurement

This view provides an overview of all results presented in the tables of the other detailed views.

TX Measurement

Preamble	0	1	2	3	4
Power [dBm]	-13.19	-10.60	-7.49	-4.37	-0.41
Power Steps [dB]	NCAP	2.60	3.11	3.12	3.96
EVM RMS [%]	7.64	7.70	7.87	7.65	7.91
EVM Peak [%]	22.59	24.73	24.70	25.87	33.80
Magnitude Error RMS [%]	4.11	4.13	4.06	4.09	3.86
Magnitude Error Peak [%]	-11.37	-11.14	-12.01	-11.91	-11.45
Phase Error RMS [°]	3.69	3.72	3.86	3.70	3.95
Phase Error Peak [°]	-12.90	-14.20	-13.66	-14.35	-19.36
IQ Origin Offset [dB]	-26.80	-26.93	-27.44	-27.81	-27.08
IQ Imbalance [dB]	-43.96	-44.50	-46.06	-46.72	-41.50
CF Error [Hz]	-0.50	-0.12	-0.33	-0.36	-0.32
Signature	0	0	0	0	0

Preamble	Before	After
Off Power [dBm]	-76.86	-76.83

Fig. 5-12: WCDMA PRACH: Overview of table results

Available results:

- Power: Mean preamble power
- Power Steps: Difference between the mean power of the preamble and the mean power of the previous preamble. For the first preamble there is no previous preamble, so NCAP is always displayed.
- EVM, Magnitude Error, Phase Error
  The RMS / Peak values are calculated as the average / peak of the measured quantity of all samples in the preamble, excluding a 25 µs guard period at the beginning and end of the preamble.
- I/Q Origin Offset, I/Q Imbalance and Carrier Frequency Error.
- Signature: detected preamble signature (0 to 15)
- Off Power: Transmit OFF power measured before and after the last evaluated preamble, see also chapter 5.2.3, "Defining the Scope of the Measurement", on page 354.
  The OFF power is calculated as the average power within one slot before and after the preamble, excluding a 25 µs guard period next to the preamble. In the UE power vs. chip diagram these ranges are labeled -2560 to -97 and 4192 to 6655.

See also: "TX Measurements" in the R&S CMW user manual, chapter "System Overview"

5.2.7.6 Selecting and Modifying Views

Use the "Display" parameters to select the views and to change the appearance and contents of the views. Depending on the selected view the following "Display" hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Select View ..."	Switch to a certain detailed view or overview. Alternatively select a diagram in the overview and press ENTER or the rotary knob.
"X Scale... / Y Scale... / Scale IQ"	Modify the ranges of the X-axis and the Y-axis. For the Y-axis both manual scaling and automatic scaling are possible. Manual scaling allows to enter a range, to display the full range or to display the default range.

Additional options are available in the "Measurement Control" section of the configuration dialog, e.g. change the preselected preamble or the number of measured preambles.

5.2.7.7 Using Markers

Use the "Marker" parameters to activate markers and to modify their position. The following "Marker" hotkeys are available at the bottom of the GUI:

Hotkey	Description
"Ref. Marker ..."	Enable or disable the reference marker and set the marker position.
"Marker 1/2 ..."	Enable or disable marker 1 or 2 and define the marker position (absolute or relative to the reference marker).

See also: "Markers" in the R&S CMW user manual, chapter "System Overview"

5.3 GUI Reference

The following sections provide detailed reference information on the Graphical User Interface (GUI) and the parameters of the WCDMA PRACH measurement.

5.3.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"

PRACH (Softkey)

The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:

`INITiate:WCDMa:MEAS<i>:PRACh`
`STOP:WCDMa:MEAS<i>:PRACh`
`ABORt:WCDMa:MEAS<i>:PRACh`
`FETCh:WCDMa:MEAS<i>:PRACh:STATe?`
`FETCh:WCDMa:MEAS<i>:PRACh:STATe:ALL?`

5.3.2 Parameters and Settings

The most important settings of the WCDMA PRACH measurement are displayed in the measurement dialog.

All settings are defined via softkeys and hotkeys or using the "WCDMA PRACH Configuration" dialog. The configuration dialog is described in the following sections. To open the dialog, select the "PRACH Measurement" tab and press the "Config" hotkey.

5.3.2.1 Signal Routing and Analyzer Settings

The following parameters configure the RF input path. All parameters are common measurement settings, i.e. they have the same value in all measurements (e.g. PRACH measurement and multi evaluation measurement).

For parameter descriptions refer to the multi evaluation measurement, chapter 3.3.2.1, "Signal Routing and Analyzer Settings", on page 129.

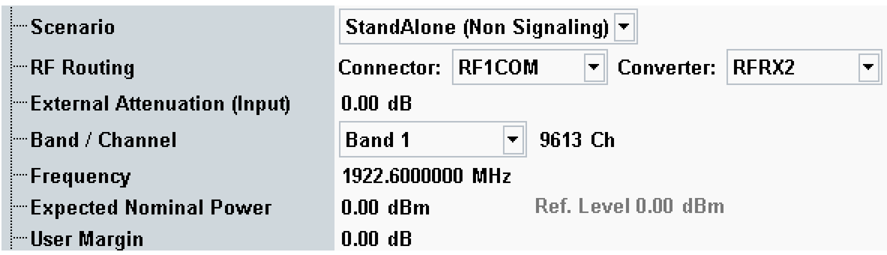


Fig. 5-13: Signal routing and analyzer settings

5.3.2.2 UE Signal Info

The "UE Signal Info" parameters describe properties of the measured uplink signal that the R&S CMW needs for synchronization and decoding. The parameters are common measurement settings, i.e. a parameter has the same value in all WCDMA measurements for which it is relevant.

While the combined signal path scenario is active, these parameters are controlled by the signaling application.

Fig. 5-14: UE Signal Info settings

DL Scrambling Code

Index i for calculation of the downlink primary scrambling code number by multiplication with 16.

Remote command:

`CONFigure:WCDMa:MEAS<i>:CELL:SCODe`

5.3.2.3 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the WCDMA PRACH measurement.

While the combined signal path scenario is active, some of the parameters are controlled by the signaling application. In that case the additional signaling application parameter "Preambles before AICH Transmission" is present. It influences the other parameters as follows:

- If it is set to 1, exactly one preamble is measured; the off power is not measured: "No of Measured Preambles" = 1, "Measure Off Power" = off
- It it is set to a value greater 1, all but the last preamble are measured; the last preamble is used to determine the off power:
  "No of Measured Preambles" = "Preambles before AICH Transmission" - 1, "Measure Off Power" = on

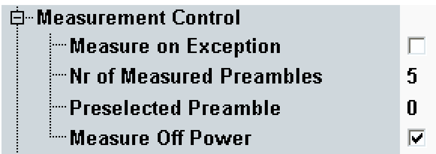


Fig. 5-15: WCDMA PRACH: Measurement Control settings

Assign Views (Hotkey)

The hotkey "Assign Views" selects the view types to be displayed in the overview. The R&S CMW does not evaluate the results for disabled views. Therefore, limiting the number of assigned views can speed up the measurement. Press the softkey "PRACH" to activate the hotkey.

Remote command:

`CONFigure:WCDMa:MEAS<i>:PRACh:RESult[:ALL]`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:UEPower`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:PSTeps`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:FERRor`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:EVMagnitude`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:MERRor`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:PERRor`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:UEPower`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:EVM`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:MERRor`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:PERRor`
`CONFigure:WCDMa:MEAS<i>:PRACh:RESult:IQ`

Measure on Exception

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected. A faulty result occurs e.g. when an overload is detected. In remote control, the cause of the error is indicated by the "reliability indicator".

- **Off:** Faulty results are rejected. The measurement is continued; the statistical counters are not re-set. Use this mode to ensure that a single faulty result does not affect the entire measurement.
- **On:** Results are never rejected. Use this mode e.g. for development purposes, if you want to analyze the reason for occasional wrong transmissions.

Remote command:

`CONFigure:WCDMa:MEAS<i>:PRACh:MOEXception`

No of Measured Preambles

Defines the number of preambles to be measured.

While the combined signal path scenario is active, this parameter is controlled by the signaling parameter "Preambles before AICH Transmission".

Remote command:

`CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble`

Preselected Preamble

Selects one preamble within the range of measured preambles. This preamble is used to determine all single preamble results, i.e. the "... vs Chip" results and the I/Q diagram.

The single preamble results are only available for the preselected preamble. To derive the results for another preamble, modify the parameter and repeat the measurement.

Remote command:

`CONFigure:WCDMa:MEAS<i>:PRACh:PPReamble`

Measure Off Power

Selects whether the off power is measured (before and after the last preamble) or not.

While the combined signal path scenario is active, this parameter is set automatically. If at least two preambles are available, it is enabled, else disabled. The number of available preambles is determined by the signaling parameter "Preambles before AICH Transmission".

Remote command:

`CONFigure:WCDMa:MEAS<i>:PRACh:OFFPower`

5.3.2.4 Trigger Settings

The "Trigger" parameters configure the trigger system for the WCDMA PRACH measurement.

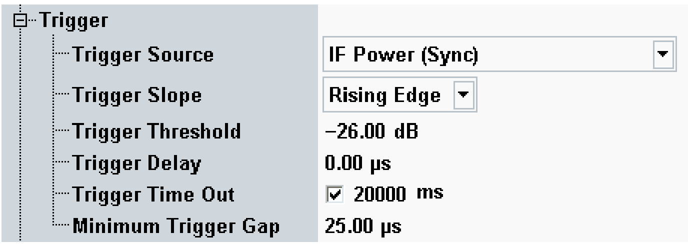


Fig. 5-16: Trigger settings

Trigger Source

Selects the source of the trigger event. Some of the trigger sources require additional options.

- **IF Power (Sync):**
  The measurement is triggered by the power of the received signal, converted into an IF signal. The trigger event coincides with the rising or falling edge of the detected WCDMA power step. The R&S CMW tries to synchronize to the signal during a full slot after the trigger event.
- **WCDMA Sig<n> PRACH Trigger:**
  PRACH trigger signal provided by WCDMA signaling application instance <n>. This selection is suitable for combined signal path measurements (or for standalone measurements if the signaling application uses another RF path than the measurement).
- **…External…:**
  External trigger signal fed in via TRIG A or TRIG B on the rear panel of the instrument.

Remote command:

`TRIGger:WCDMa:MEAS<i>:PRACh:SOURce`

`TRIGger:WCDMa:MEAS<i>:PRACh:CATalog:SOURce?`

Trigger Slope
Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse. This setting is relevant for "IF Power (Sync)" and external trigger signals (TRIG A or TRIG B). For "IF Power (Sync)" select "Rising Edge".

Remote command:
`TRIGger:WCDMa:MEAS<i>:PRACh:SLOPe`

Trigger Threshold
Defines the input signal power where the trigger condition is satisfied and a trigger event is generated. The trigger threshold is valid for power trigger sources. It is a dB value, relative to the reference level minus the external attenuation (<Ref. Level> – <External Attenuation (Input)> – <Frequency Dependent External Attenuation>). If the reference level is set to the actual maximum output power of the DUT, and the external attenuation settings are in accordance with the test setup, then the trigger threshold is referenced to the actual maximum RF input power at the R&S CMW.

A low threshold may be required to ensure that the R&S CMW can always detect the input signal. A higher threshold can prevent unintended trigger events.

Remote command:
`TRIGger:WCDMa:MEAS<i>:PRACh:THReshold`

Trigger Delay
Defines a time delaying the start of the measurement relative to the trigger event.

Remote command:
`TRIGger:WCDMa:MEAS<i>:PRACh:DELay`

Trigger Time Out
Sets a time after which an initiated measurement must have received a trigger event. If no trigger event is received, a trigger timeout is indicated in manual operation mode. In remote control mode the measurement is automatically stopped. The parameter can be disabled so that no timeout occurs.

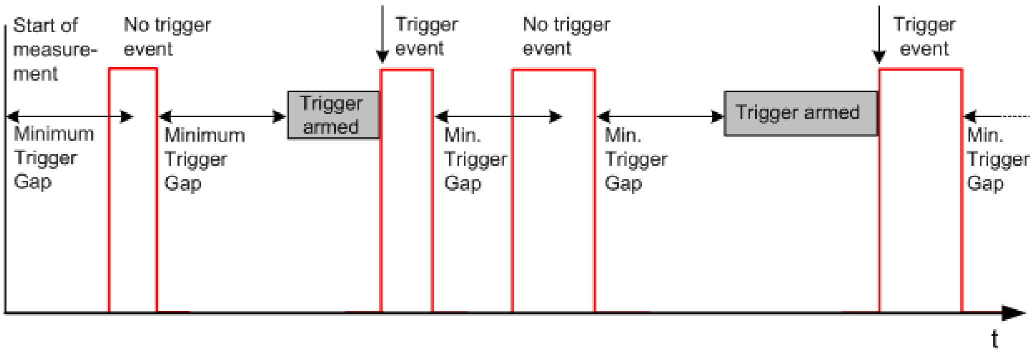
Remote command:
`TRIGger:WCDMa:MEAS<i>:PRACh:TOUT`

Minimum Trigger Gap
Defines a minimum duration of the power-down periods (gaps) between two triggered power pulses. This setting is valid for an "(IF) Power" trigger source.

The trigger system is controlled by means of a timer which is reset to zero in the following instances:

- At the IF power-down ramp of each triggered or untriggered pulse, even though the previous counter may not have elapsed yet. A power-down ramp is detected when the signal power falls below the trigger threshold.
- At the beginning of each measurement: The minimum gap defines the minimum time between the start of the measurement and the first trigger event.

The trigger system is re-armed as soon as the timer has reached the specified minimum gap.



This parameter can be used to prevent unwanted trigger events due to fast power variations.

Remote command:

TRIGger:WCDMa:MEAS<i>:PRACh:MGAP

5.3.2.5 Limit Settings

The "Limits" section defines limits for the modulation and power results.

For details see chapter 5.2.6, "Limit Settings and Conformance Requirements", on page 355.

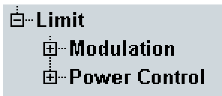


Fig. 5-17: Limit settings

Limits

The limits can be configured via the remote commands described in the following sections:

- chapter 5.5.3.5, "Limits (Modulation)", on page 391
- chapter 5.5.3.6, "Limits (Power Control)", on page 393

Some examples are listed below.

Remote command:

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:EVMagnitude

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:OLPower

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:OFFPower

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:PSTep

5.3.2.6 Additional Softkeys and Hotkeys

The WCDMA PRACH measurement provides some softkey/hotkey combinations which have no equivalent in the configuration dialog. Most of these hotkeys provide display configurations (like diagram scaling). They are self-explanatory and usually do not have any remote-control commands assigned.

The remaining softkeys > hotkeys are described below. They are displayed only while the combined signal path scenario is active and are provided by the "WCDMA Signaling" application selected as master application. See also "Scenario = Combined Signal Path" on page 129.

The measurement provides no remote-control commands corresponding to these hotkeys. Use the remote-control commands of the signaling application instead.

While one of these softkeys is selected, the "Config" hotkey opens the configuration dialog of the signaling application, not the configuration dialog of the measurement.

Signaling Parameter > ...
Provides access to the most essential settings of the "WCDMA Signaling" application.

WCDMA-UE Signaling
Select this softkey and press ON | OFF to turn the downlink signal transmission on or off.

Press the softkey two times (select it and press it again) to switch to the signaling application.

5.3.3 Measurement Results

The results of the WCDMA PRACH measurement are displayed in several different views.

For detailed description see chapter 5.2.7, "Measurement Results", on page 358.

The PRACH measurement provides an overview dialog and a detailed view for each diagram in the overview. The overview dialog shows the modulation and power results as traces or bar graphs. A selection of single value results is also shown.

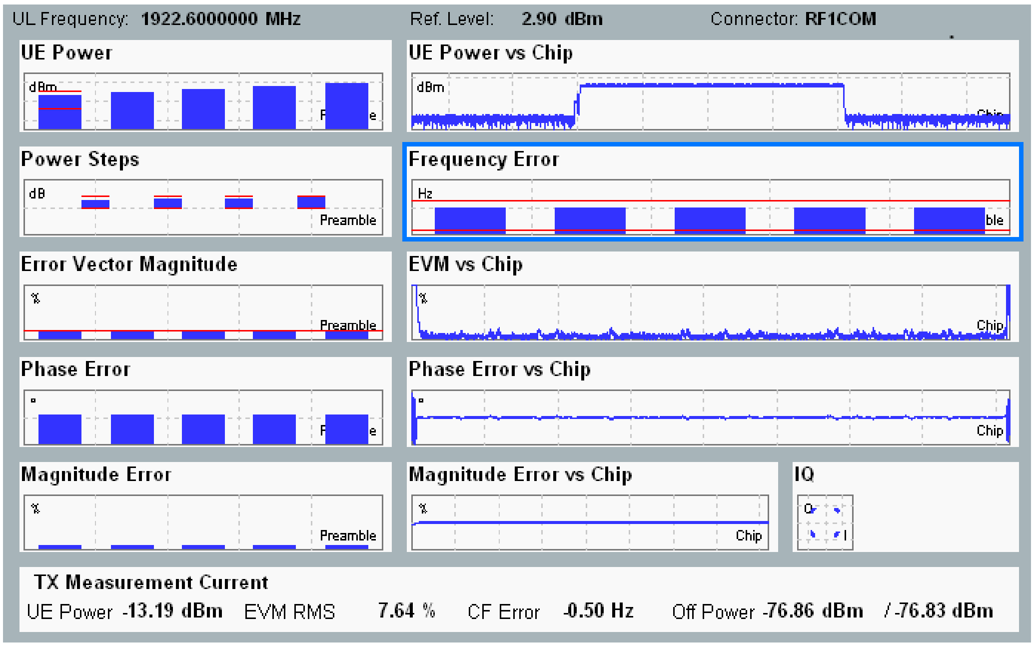


Fig. 5-18: WCDMA PRACH: Overview

Traces and Bar Graphs
The results can be retrieved via the following remote commands.

Remote command:
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:UEPower:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:UEPower:CHIP:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:PSTeps:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:FERRor:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude[:RMS]:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude:CHIP:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:PERRor[:RMS]:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:PERRor:CHIP:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:MERRor[:RMS]:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:MERRor:CHIP:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:IQ:CURRent? etc.

Single Values
The results can be retrieved via the following remote commands.

Remote command:
FETCh:WCDMa:MEAS<i>:PRACh:PREamble<no>:CURRent? etc.
FETCh:WCDMa:MEAS<i>:PRACh:OFFPower? etc.

5.4 Programming

The following sections provide programming examples for the WCDMA PRACH measurement, using the standalone scenario.

See also: "Remote Control" in the R&S CMW user manual

5.4.1 Key Features

The WCDMA PRACH measurement is programmed as follows:

- The measurement is controlled by SCPI commands with the following syntax: `...WCDMa:MEAS:PRACh...`
- Use general commands of the type `...WCDMa:MEAS...` (no `:PRACh` mnemonic) to define the signal routing and perform RF and analyzer settings.
- After a `*RST`, the measurement is switched off. Use `READ:WCDMa:MEAS:PRACh...?` to initiate a single-shot measurement and retrieve

the results. You can also start the measurement using `INIT:WCDMa:MEAS:PRACh` and retrieve the results using `FETCh:WCDMa:MEAS:PRACh...?`.

- For synchronization and proper decoding, some UE signal settings must be in accordance with the measured signal; see chapter 5.4.3, "Specifying Required PRACH Settings", on page 373.

5.4.2 Specifying General and Common Measurement Settings

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Define signal routing, perform RF and analyzer settings for a WCDMA uplink
// signal with a carrier frequency of 1963 MHz and a peak power of 24 dBm.
// *****************************************************************************
ROUTe:WCDMa:MEAS:SCENario:SALone RF1C, RX1
CONFigure:WCDMA:MEAS:RFSettings:EATTenuation 2
CONFigure:WCDMA:MEAS:RFSettings:ENPower 24
CONFigure:WCDMA:MEAS:RFSettings:UMARgin 0
CONFigure:WCDMA:MEAS:RFSettings:FREQuency 1963E+6
```

5.4.3 Specifying Required PRACH Settings

```
// *****************************************************************************
// Specify required UE signal settings: DL scrambling code
// *****************************************************************************
CONFigure:WCDMa:MEAS:CELL:SCODe #H1A
```

5.4.4 Specifying Additional Measurement-Specific Settings

```
// *****************************************************************************
// Define the error handling.
// *****************************************************************************
CONFigure:WCDMa:MEAS:PRACh:MOEXception ON
CONFigure:WCDMa:MEAS:PRACh:TOUT 1800

// *****************************************************************************
// Configure number of measured preambles and preselected preamble.
// Enable measurement of off power.
// *****************************************************************************
CONFigure:WCDMa:MEAS:PRACh:MPReamble 5
CONFigure:WCDMa:MEAS:PRACh:PPReamble 1
CONFigure:WCDMa:MEAS:PRACh:OFFPower ON
```

5.4.5 Configuring the Trigger System

```
// ****************************************************************************
// Set trigger source, timeout, trigger level, slope, delay
// and minimum trigger gap.
// ****************************************************************************
TRIGger:WCDMa:MEAS:PRACh:SOURce 'IF Power (Sync)'
TRIGger:WCDMa:MEAS:PRACh:TOUT 15
TRIGger:WCDMa:MEAS:PRACh:THReshold -30
TRIGger:WCDMa:MEAS:PRACh:SLOPe REDGe
TRIGger:WCDMa:MEAS:PRACh:DELay 0
TRIGger:WCDMa:MEAS:PRACh:MGAP 0.00002
```

5.4.6 Specifying Limits

```
// ****************************************************************************
// Define all modulation limits
// ****************************************************************************
CONFigure:WCDMa:MEAS:PRACh:LIMit:MERRor 20, OFF
CONFigure:WCDMa:MEAS:PRACh:LIMit:EVMagnitude 20, 40
CONFigure:WCDMa:MEAS:PRACh:LIMit:PERRor 20, OFF
CONFigure:WCDMa:MEAS:PRACh:LIMit:IQOFfset -20
CONFigure:WCDMa:MEAS:PRACh:LIMit:IQIMbalance ON
CONFigure:WCDMa:MEAS:PRACh:LIMit:CFERror 150

// ****************************************************************************
// Enable the check of the maximum output power limits, apply user-defined
// limit values and define these values. Query the used limit values.
// ****************************************************************************
CONFigure:WCDMa:MEAS:PRACh:LIMit:PCONtrol:MAXPower ON, USER
CONFigure:WCDMa:MEAS:PRACh:LIMit:PCONtrol:MAXPower:UDEFined 27, 1.5, -3.5
CONFigure:WCDMa:MEAS:PRACh:LIMit:PCONtrol:MAXPower:ACTive?

// ****************************************************************************
// Define open loop power limits, OFF power limit and power step limits.
// ****************************************************************************
CONFigure:WCDMa:MEAS:PRACh:LIMit:PCONtrol:OLPower ON, -20, 9
CONFigure:WCDMa:MEAS:PRACh:LIMit:PCONtrol:OFFPower -56
CONFigure:WCDMa:MEAS:PRACh:LIMit:PCONtrol:PSTep ON, 2, 1.5
```

5.4.7 Performing Measurements

```
// ****************************************************************************
// Enable all measurements and start the measurement.
// ****************************************************************************
CONFigure:WCDMa:MEAS:PRACh:RESult:ALL ON,ON,ON,ON,ON,ON,ON,ON,ON,ON,ON
INIT:WCDMa:MEAS:PRACh
```

```
// ****************************************************************************
// Query all trace results.
// ****************************************************************************
FETCh:WCDMa:MEAS:PRACh:TRACe:EVMagnitude:RMS:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:EVMagnitude:PEAK:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:EVMagnitude:CHIP:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:MERRor:RMS:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:MERRor:PEAK:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:MERRor:CHIP:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:PERRor:RMS:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:PERRor:PEAK:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:PERRor:CHIP:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:FERRor:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:IQ:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:UEPower:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:UEPower:CHIP:CURRent?
FETCh:WCDMa:MEAS:PRACh:TRACe:PSTeps:CURRent?

// ****************************************************************************
// Query all single value results.
// ****************************************************************************
FETCh:WCDMa:MEAS:PRACh:OFFPower?
FETCh:WCDMa:MEAS:PRACh:PREamble1:CURRent?
FETCh:WCDMa:MEAS:PRACh:PREamble2:CURRent?
FETCh:WCDMa:MEAS:PRACh:PREamble3:CURRent?
FETCh:WCDMa:MEAS:PRACh:PREamble4:CURRent?
FETCh:WCDMa:MEAS:PRACh:PREamble5:CURRent?

// ****************************************************************************
// Query limit check results.
// ****************************************************************************
CALCulate:WCDMa:MEAS:PRACh:OFFPower?
CALCulate:WCDMa:MEAS:PRACh:PREamble1:CURRent?
CALCulate:WCDMa:MEAS:PRACh:PREamble2:CURRent?
CALCulate:WCDMa:MEAS:PRACh:PREamble3:CURRent?
CALCulate:WCDMa:MEAS:PRACh:PREamble4:CURRent?
CALCulate:WCDMa:MEAS:PRACh:PREamble5:CURRent?
```

5.5 Command Reference

The following sections provide detailed reference information on the remote control commands of the WCDMA PRACH measurement.

5.5.1 Conventions and General Information

The following sections describe the most important conventions and general informations concerning the command reference.

5.5.1.1 MEAS<i>

MEAS<i> is used as abbreviation of "MEASurement<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW user manual, chapter "Remote Control"

5.5.1.2 FETCh and READ Commands

All commands are used to retrieve measurement results:

- `FETCh...` returns the results of the current measurement cycle (single-shot measurement) after they are valid. `FETCh...` must be used after the measurement has been started (`INITiate...`, measurement states RUN or RDY).
- `READ...` starts a new single-shot measurement and returns the results.

See also: "Retrieving Measurement Results" in the R&S CMW user manual, chapter "Remote Control"

5.5.1.3 Reliability Indicator

The first value in the output arrays of `FETCh...?, READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 (OK)**:
  Measurement values available, no error detected.
- **1 (Measurement Timeout)**:
  The measurement has been stopped after the (configurable) measurement timeout. Measurement results may be available, however, at least a part of the measurement provides only INValid results or has not completed the full statistic count.
- **2 (Capture Buffer Overflow)**:
  The measurement configuration results in a capture length exceeding the available memory.
- **3 (Overdriven) / 4 (Underdriven)**:

The accuracy of measurement results may be impaired because the input signal level was too high / too low.

- **6 (Trigger Timeout)**:
The measurement could not be started or continued because no trigger event was detected.
- **7 (Acquisition Error)**:
The R&S CMW could not properly decode the RF input signal.
- **8 (Sync Error)**:
The R&S CMW could not synchronize to the RF input signal.
- **9 (Uncal)**:
Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 (Reference Frequency Error)**:
The instrument has been configured to use an external reference signal but the reference oscillator could not be phase locked to the external signal (e.g. signal level too low, frequency out of range or reference signal not available at all).
- **16 (RF Not Available)**:
The measurement could not be started because the configured RF input path was not active. This problem may occur e.g. when a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 (RF Level not Settled) / 18 (RF Frequency not Settled)**:
The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.
- **19 (Call not Established)**:
For measurements: The measurement could not be started because no signaling connection to the DUT was established.
For DAU IMS service: Establishing a voice over IMS call failed.
- **20 (Call Type not Usable)**:
For measurements: The measurement could not be started because the established signaling connection had wrong properties.
For DAU IMS service: The voice over IMS settings could not be applied.
- **21 (Call Lost)**:
For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
For DAU IMS service: The voice over IMS call was lost.
- **23 (Missing Option)**:
The ARB file can not be played by the GPRF generator due to a missing option.
- **26 (Resource Conflict)**:
The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
Please stop the application that has allocated the conflicting resources and try again.
- **27 (No Sensor Connected)**:
The GPRF External Power Sensor measurement could not be started due to missing power sensor.

- **40 (ARB File CRC Error)**:
  The ARB file CRC check failed. The ARB file is corrupt and not reliable.
- **42 (ARB Header Tag Invalid)**:
  The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 (ARB Segment Overflow)**:
  The number of segments in the multi-segment ARB file is higher than the allowed maximum.
- **44 (ARB File not Found)**:
  The selected ARB file could not be found.
- **50 (Startup Error)**:
  The Data Application Unit (DAU), a DAU service or a DAU measurement could not be started. Please execute a DAU selftest.
- **51 (No Reply)**:
  The DAU has received no response, for example for a ping request.
- **52 (Connection Error)**:
  The DAU could not establish a connection to internal components. Please restart the instrument.
- **53 (Configuration Error)**:
  The current DAU configuration by the user is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 (Filesystem Error)**:
  The hard disk of the DAU is full or corrupt. Please execute a DAU selftest.
- **101 (Firmware Error)**:
  Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.
  If the error occurs again, consider the following hints:
  – Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.
  – If a software package (update) has not been properly installed this is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".
  – A software update correcting the error may be available. Updates are e.g. provided in the "CMW Customer Web" on GLORIS (registration required): https://extranet.rohde-schwarz.com.

  If you get firmware errors even with the properly installed latest software version, please send a problem report including log files to Rohde & Schwarz.
- **102 (Unidentified Error)**:
  Indicates an error not covered by other reliability values. For troubleshooting please follow the steps described for "101 (Firmware Error)".
- **103 (Parameter Error)**:
  Indicates that the measurement could not be performed due to internal conflicting parameter settings.
  A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.

If you need assistance to localize the conflicting parameter settings please contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).

5.5.2 General Measurement Settings

The commands valid for all WCDMA measurements are described here: chapter 3.5.2, "General Measurement Settings", on page 159

5.5.3 PRACH Measurement Commands

The commands for the WCDMA PRACH measurement are divided into the groups listed below.

5.5.3.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:MEAS<i>:PRACh
STOP:WCDMa:MEAS<i>:PRACh
ABORt:WCDMa:MEAS<i>:PRACh

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.
- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See Performing Measurements

Usage: Event

Firmware/Software: V3.0.20

Manual operation: See "PRACH (Softkey)" on page 365

FETCh:WCDMa:MEAS<i>:PRACh:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RUN | RDY

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued
RDY: measurement has been terminated, valid results may be available

*RST: OFF

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "PRACH (Softkey)" on page 365

FETCh:WCDMa:MEAS<i>:PRACh:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate..., READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <MainState>: OFF or RDY ("invalid")

<RessourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable because <MainState>: OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "PRACH (Softkey)" on page 365

5.5.3.2 Enabling Results and Views

The following commands select the evaluated results and the displayed views.

CONFigure:WCDMa:MEAS<i>:PRACh:RESult[:ALL] <EnableUEpower>, <EnablePowSteps>, <EnableFreqError>, <EnableEVM>, <EnableMagError>, <EnablePhaseErr>, <EnableUEPchip>, <EnableEVMchip>, <EnableMErrChip>, <EnablePhErrChip>, <EnableIQ>

Enables or disables the evaluation of results and shows or hides the views in the PRACH measurement. This command combines all other `CONFigure:WCDMa:MEAS<i>:PRACh:RESult...` commands.

Parameters:

<EnableUEpower> OFF | ON

UE Power
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

<EnablePowSteps> OFF | ON

Power Steps

*RST: ON

<EnableFreqError> OFF | ON

Frequency Error

*RST: ON

<EnableEVM> OFF | ON

Error Vector Magnitude

*RST: ON

<EnableMagError> OFF | ON

Magnitude Error

*RST: ON

<EnablePhaseErr> OFF | ON

Phase Error

*RST: ON

<EnableUEPchip> OFF | ON

UE Power vs. Chip

*RST: ON

<EnableEVMchip> OFF | ON

EVM vs. Chip

*RST: ON

<EnableMErrChip> OFF | ON

Magnitude Error vs. Chip

*RST: ON

<EnablePhErrChip> OFF | ON
Phase Error vs. Chip
*RST: ON

<EnableIQ> OFF | ON
I/Q Constellation Diagram
*RST: ON

Example: See Performing Measurements

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:UEPower <EnableUEpower>

Enables or disables the evaluation of results and shows or hides the UE Power view in the PRACH measurement.

Parameters:

<EnableUEpower> OFF | ON
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view
*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:PSTeps <EnablePowSteps>

Enables or disables the evaluation of results and shows or hides the Power Steps view in the PRACH measurement.

Parameters:

<EnablePowSteps> OFF | ON
OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view
*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:FERRor <EnableFreqError>

Enables or disables the evaluation of results and shows or hides the Frequency Error view in the PRACH measurement.

Parameters:

<EnableFreqError> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:EVMagnitude <EnableEVM>

Enables or disables the evaluation of results and shows or hides the Error Vector Magnitude view in the PRACH measurement.

Parameters:

<EnableEVM> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:MERRor <EnableMagError>

Enables or disables the evaluation of results and shows or hides the Magnitude Error view in the PRACH measurement.

Parameters:

<EnableMagError> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:PERRor <EnablePhaseErr>

Enables or disables the evaluation of results and shows or hides the Phase Error view in the PRACH measurement.

Parameters:

<EnablePhaseErr> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:UEPower <EnableUEPChip>

Enables or disables the evaluation of results and shows or hides the UE Power vs. Chip view in the PRACH measurement.

Parameters:

<EnableUEPChip> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:EVM <EnableEVMchip>

Enables or disables the evaluation of results and shows or hides the EVM vs. Chip view in the PRACH measurement.

Parameters:

<EnableEVMchip> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:MERRor <EnableMErrChip>

Enables or disables the evaluation of results and shows or hides the Magnitude Error vs. Chip view in the PRACH measurement.

Parameters:

<EnableMErrChip> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:CHIP:PERRor <EnablePhErrChip>

Enables or disables the evaluation of results and shows or hides the Phase Error vs. Chip view in the PRACH measurement.

Parameters:

<EnablePhErrChip> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:RESult:IQ <EnableIQ>

Enables or disables the evaluation of results and shows or hides the I/Q constellation diagram view in the PRACH measurement.

Parameters:

<EnableIQ> OFF | ON

OFF: Do not evaluate results, hide the view
ON: Evaluate results and show the view

*RST: ON

Firmware/Software: V3.0.20

Manual operation: See "Assign Views (Hotkey)" on page 367

5.5.3.3 Measurement Control Parameters

The following commands define measurement control parameters for the PRACH measurement.

CONFigure:WCDMa:MEAS<i>:PRACh:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to RDY and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running READ, FETCh or CALCulate commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:
<Timeout> *RST: 0 s
Default unit: s

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:MOEXception <MeasOnException>

Specifies whether measurement results that the R&S CMW identifies as faulty or inaccurate are rejected.

Parameters:
<MeasOnException> OFF | ON

OFF: Faulty results are rejected.
ON: Results are never rejected.

*RST: OFF

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V3.0.20

Manual operation: See "Measure on Exception" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble <Preambles>

Specifies the number of preambles to be measured.

Parameters:
<Preambles> Range: 1 to 5
*RST: 5

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V3.0.20

Manual operation: See "No of Measured Preambles" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:PPReamble <Preamble>

Selects the preamble used to determine the single preamble results, i.e. the "... vs Chip" results and the I/Q diagram. The number of the preselected preamble must be smaller than the number of measured preambles (CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble).

Parameters:

<Preamble>	Range:	0 to 4
	*RST:	0

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V3.0.20

Manual operation: See "Preselected Preamble" on page 367

CONFigure:WCDMa:MEAS<i>:PRACh:OFFPower <Enable>

Enables or disables the measurement of the off power before and after the last preamble.

Parameters:

<Enable> OFF | ON

*RST: ON

Example: See Specifying Additional Measurement-Specific Settings

Firmware/Software: V3.0.20

Manual operation: See "Measure Off Power" on page 368

5.5.3.4 Trigger Settings

The following commands define the trigger parameters.

TRIGger:WCDMa:MEAS<i>:PRACh:CATalog:SOURce?

Lists all trigger source values that can be set using `TRIGger:WCDMa:MEAS<i>:PRACh:SOURce`.

Return values:

<TriggerList> Comma separated list of all supported values. Each value is represented as a string.

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "Trigger Source" on page 368

TRIGger:WCDMa:MEAS<i>:PRACh:SOURce <Source>

Selects the source of the trigger events. A complete list of all supported values can be displayed using `TRIGger:WCDMa:MEAS<i>:PRACh:CATalog:SOURce?`.

Which values are available, depends on the installed options. The list below contains the values which are always available and the relevant values provided by the WCDMA signaling application.

Parameters:

<Source>

'WCDMA Sig1: PRACH Trigger'
PRACH trigger signal provided by the WCDMA signaling application instance 1, adapt the "1" if required

'Base1: External TRIG A'
External trigger fed in at TRIG A connector

'Base1: External TRIG B'
External trigger fed in at TRIG B connector

'IF Power (Sync)'
Power trigger (extended synchronization)

*RST: 'IF Power (Sync)'

Example: See Configuring the Trigger System

Firmware/Software: V3.0.20

Manual operation: See "Trigger Source" on page 368

TRIGger:WCDMa:MEAS<i>:PRACh:SLOPe <Slope>

Qualifies whether the trigger event is generated at the rising or at the falling edge of the trigger pulse (valid for external and power trigger sources).

Parameters:

<Slope> REDGe | FEDGe

REDGe: Rising edge
FEDGe: Falling edge

*RST: REDG

Example: See Configuring the Trigger System

Firmware/Software: V3.0.20

Manual operation: See "Trigger Slope" on page 369

TRIGger:WCDMa:MEAS<i>:PRACh:THReshold <Level>

Defines the trigger threshold for power trigger sources.

Parameters:

<Level> Range: -47 dB to 0 dB
*RST: -26 dB
Default unit: dB (full scale, i.e. relative to reference level minus external attenuation)

Example: See Configuring the Trigger System

Firmware/Software: V3.0.20

Manual operation: See "Trigger Threshold" on page 369

TRIGger:WCDMa:MEAS<i>:PRACh:DELay <Delay>

Defines a time delaying the start of the measurement relative to the trigger event.

Parameters:

<Delay> Range: -666.7E-6 s to 0.24 s
*RST: 0 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V3.0.20

Manual operation: See "Trigger Delay" on page 369

TRIGger:WCDMa:MEAS<i>:PRACh:TOUT <TimeOut>

Selects the maximum time that the R&S CMW will wait for a trigger event before it stops the measurement in remote control mode or indicates a trigger timeout in manual operation mode.

Parameters:

<TimeOut> Range: 0.01 s to 60 s
*RST: 20 s
Default unit: s
Additional parameters: OFF | ON (disables | enables the timeout)

Example: See Configuring the Trigger System

Firmware/Software: V3.0.20

Manual operation: See "Trigger Time Out" on page 369

TRIGger:WCDMa:MEAS<i>:PRACh:MGAP <MinimumGap>

Sets a minimum time during which the IF signal must be below the trigger threshold before the trigger is armed so that an IF power trigger event can be generated.

Parameters:

<MinimumGap> Range: 0 s to 0.01 s
*RST: 25E-6 s
Default unit: s

Example: See Configuring the Trigger System

Firmware/Software: V3.0.20

Manual operation: See "Minimum Trigger Gap" on page 369

5.5.3.5 Limits (Modulation)

The following commands define limits for results which characterize the modulation accuracy.

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:MERRor <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the magnitude error.

Parameters:

<RMS>
Range: 0 % to 99 %
*RST: 17.5 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak>
Range: 0 % to 99 %
*RST: 50 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:EVMagnitude <RMS>, <Peak>

Defines upper limits for the RMS and peak values of the error vector magnitude (EVM).

Parameters:

<RMS>
Range: 0 % to 99 %
*RST: 17.5 %, ON
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak> Range: 0 % to 99 %
*RST: 50 %, OFF
Default unit: %
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.0.20

Manual operation: See "Limits" on page 370

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PERRor <RMS>, <Peak>

Defines symmetric limits for the RMS and peak values of the phase error. The limit check fails the UE if the absolute value of the measured phase error exceeds the specified values.

Parameters:

<RMS> Range: 0 deg to 45 deg
*RST: 10 deg, OFF
Default unit: deg
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

<Peak> Range: 0 deg to 45 deg
*RST: 45 deg, OFF
Default unit: deg
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:IQOFfset <IQoffset>

Defines an upper limit for the I/Q origin offset.

Parameters:

<IQoffset> Range: -80 dB to 0 dB
*RST: -25 dB, OFF
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:IQIMbalance <IQimbalance>

Defines an upper limit for the I/Q imbalance.

Parameters:

<IQimbalance> Range: -99 dB to 0 dB
*RST: -15 dB, OFF
Default unit: dB
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:CFERror <FrequencyError>

Defines an upper limit for the carrier frequency error.

Parameters:

<FrequencyError> Range: 0 Hz to 4000 Hz
*RST: 200 Hz
Default unit: Hz
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.0.20

5.5.3.6 Limits (Power Control)

The following commands define limits for preamble power, OFF power and preamble power step results.

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower <Enable>, <ActiveLimit>

Enables or disables the check of the maximum output power limits and selects the set of limit settings to be used.

Parameters:

<Enable> OFF | ON
Disables | enables the limit check
*RST: ON

<ActiveLimit>	USER | PC1 | PC2 | PC3 | PC3B | PC4 To use the limits defined by 3GPP, select the power class of the UE (**PC1** to **PC4** = power class 1, 2, 3, 3bis, 4). To use the UE power class value reported by the UE in the capability report, see also `CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower:URPClass`. For user-defined limit values, select **USER** and define the limits via `CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower:UDEFined`. *RST: PC4
Example:	See Specifying Limits
Firmware/Software:	V3.0.20
Manual operation:	See "Limits" on page 370

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower:URPClass <Enable>

Enables or disables the usage of the UE power class value reported by the UE in the capability report.

This is only relevant if the combined signal path scenario is active and not relevant if user-defined limits are used instead of the predefined limit sets.

Parameters:

<Enable>	OFF | ON *RST: ON
Firmware/Software:	V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower:ACTive?

Queries the active maximum output power limit values.

These limit values result either from the configured UE power class or from the reported UE power class or have been defined by the user.

Return values:

<NominalMaxPower>	Nominal maximum output power of the UE Range: -50 dBm to 34 dBm Default unit: dBm
<UpperLimit>	Tolerance value for too high maximum UE power Range: 0 dB to 5 dB Default unit: dB
<LowerLimit>	Tolerance value for too low maximum UE power Range: -5 dB to 0 dB Default unit: dB

Example: See Specifying Limits

Usage: Query only

Firmware/Software: V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower:UDEFined <NominalMaxPower>, <UpperLimit>, <LowerLimit>

Sets the user-defined maximum output power limits. To activate the usage of this limit set, see `CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:MAXPower`.

Parameters:

<NominalMaxPower> Nominal maximum output power of the UE

Range: -50 dBm to 34 dBm
*RST: 21 dBm
Default unit: dBm

<UpperLimit> Tolerance value for too high maximum UE power

Range: 0 dB to 5 dB
*RST: 2.7 dB
Default unit: dB

<LowerLimit> Tolerance value for too low maximum UE power

Range: -5 dB to 0 dB
*RST: -2.7 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V3.0.20

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:OLPower <Enable>, <InitPreamblePwr>, <OLPLimit>

Enables or disables the check of the open loop power limits and specifies these limits.

Parameters:

<Enable> OFF | ON

Disables | enables the limit check

*RST: ON

<InitPreamblePwr> Initial preamble power

Range: -50 dBm to 34 dBm
*RST: -18.6 dBm
Default unit: dBm

<OLPLimit> Open loop power tolerance value

Range: 0 dB to 15 dB
*RST: 10 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V3.0.20

Manual operation: See "Limits" on page 370

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:OFFPower <Limit>

Defines an upper OFF power limit. Also enables or disables the limit check.

Parameters:

<Limit>
Range: -90 dBm to 53 dBm
*RST: -55 dBm
Default unit: dBm
Additional parameters: OFF | ON (disables the limit check | enables the limit check using the previous/default limit values)

Example: See Specifying Limits

Firmware/Software: V3.0.20

Manual operation: See "Limits" on page 370

CONFigure:WCDMa:MEAS<i>:PRACh:LIMit:PCONtrol:PSTep <Enable>, <PreamblePwrStep>, <PwrStepLimit>

Enables or disables the check of the preamble power step limits and specifies these limits.

Parameters:

<Enable>
OFF | ON
Disables | enables the limit check
*RST: ON

<PreamblePwrStep>
Expected preamble power step size
Range: 0 dB to 15 dB
*RST: 2 dB
Default unit: dB

<PwrStepLimit>
Preamble power step tolerance value
Range: 0 dB to 15 dB
*RST: 2 dB
Default unit: dB

Example: See Specifying Limits

Firmware/Software: V3.0.20

Manual operation: See "Limits" on page 370

5.5.3.7 Results (Traces)

The following commands return the results displayed in the diagrams and bar graphs at the GUI.

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:UEPower:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:UEPower:CURRent?

Return the values of the UE power bar graph.

See also chapter 5.2.7.4, "Detailed Views: UE Power and Power Steps", on page 361

Return values:

<Reliability> Reliability Indicator

<UEpower> Comma separated list of values, one result per measured preamble (see `CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble` on page 387)

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:UEPower:CHIP:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:UEPower:CHIP:CURRent?

Return the values of the UE power vs. chip diagram.

See also chapter 5.2.7.4, "Detailed Views: UE Power and Power Steps", on page 361

Return values:

<Reliability> Reliability Indicator

<UEpowerChip> Comma separated list of 9216 values, one per chip:
2560 values before last preamble, 4096 values for preselected preamble, 2560 values after last preamble

Range: -100 dBm to 55 dBm
Default unit: dBm

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:PSTeps:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:PSTeps:CURRent?

Return the values of the power steps bar graph.

See also chapter 5.2.7.4, "Detailed Views: UE Power and Power Steps", on page 361

Return values:

<Reliability> Reliability Indicator

<PowerSteps> Comma separated list of values, one result per measured preamble (see `CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble` on page 387)
For the first preamble NCAP is returned.

Range: -10 dB to 50 dB
Default unit: dB

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude[:RMS]:CURRent?
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude:PEAK:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude[:RMS]:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude:PEAK:CURRent?

Return the EVM RMS and peak values for each measured preamble.

Return values:

<Reliability> Reliability Indicator

<EVM> Comma separated list of values, one result per measured preamble (see CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble on page 387)

Range: 0 % to 100 %
Default unit: %

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:MERRor[:RMS]:CURRent?
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:MERRor:PEAK:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:MERRor[:RMS]:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:MERRor:PEAK:CURRent?

Return the magnitude error RMS and peak values for each measured preamble.

Return values:

<Reliability> Reliability Indicator

<MagnitudeError> Comma separated list of values, one result per measured preamble (see CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble on page 387)

Range: PEAK: -100 % to 100 %, RMS: 0 % to 100 %
Default unit: %

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:PERRor[:RMS]:CURRent?
FETCh:WCDMa:MEAS<i>:PRACh:TRACe:PERRor:PEAK:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:PERRor[:RMS]:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:PERRor:PEAK:CURRent?

Return the phase error RMS and peak values for each measured preamble.

Return values:

<Reliability> Reliability Indicator

<PhaseError> Comma separated list of values, one result per measured preamble (see CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble on page 387)

Range: PEAK: -180 deg to 180 deg, RMS: 0 deg to 180 deg
Default unit: deg

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude:CHIP:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:EVMagnitude:CHIP:CURRent?

Return the values of the error vector magnitude vs. chip diagram.

See also chapter 5.2.7.2, "Detailed Views: Modulation", on page 359

Return values:

<Reliability> Reliability Indicator

<EVMchip> Comma separated list of 4096 values, one per chip of the preselected preamble
Range: 0 % to 100 %
Default unit: %

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:MERRor:CHIP:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:MERRor:CHIP:CURRent?

Return the values of the magnitude error vs. chip diagram.

See also chapter 5.2.7.2, "Detailed Views: Modulation", on page 359

Return values:

<Reliability> Reliability Indicator

<MagErrorChip> Comma separated list of 4096 values, one per chip of the preselected preamble
Range: -100 % to 100 %
Default unit: %

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:PERRor:CHIP:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:PERRor:CHIP:CURRent?

Return the values of the phase error vs. chip diagram.

See also chapter 5.2.7.2, "Detailed Views: Modulation", on page 359

Return values:

<Reliability> Reliability Indicator

<PhaseErrorChip> Comma separated list of 4096 values, one per chip of the preselected preamble
Range: -180 deg to 180 deg
Default unit: deg

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:FERRor:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:FERRor:CURRent?

Return the values of the frequency error bar graph.

See also chapter 5.2.7.2, "Detailed Views: Modulation", on page 359

Return values:

<Reliability> Reliability Indicator

<FrequencyError> Comma separated list of values, one result per measured preamble (see `CONFigure:WCDMa:MEAS<i>:PRACh:MPReamble` on page 387)

Range: -60000 Hz to 60000 Hz
Default unit: Hz

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

FETCh:WCDMa:MEAS<i>:PRACh:TRACe:IQ:CURRent?
READ:WCDMa:MEAS<i>:PRACh:TRACe:IQ:CURRent?

Returns the results in the I/Q constellation diagram, see also chapter 5.2.7.3, "Detailed Views: I/Q Constellation Diagram", on page 360.

The constellation points are returned as pairs of I and Q values:

<Reliability>, <Iphase>$_1$, <Qphase>$_1$, ..., <Iphase>$_{3904}$, <Qphase>$_{3904}$

Return values:

<Reliability> Reliability Indicator

<Iphase> I amplitude of a constellation point

Range: -5 to 5

<Qphase> Q amplitude of a constellation point

Range: -5 to 5

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

5.5.3.8 Results (Single Values)

The following commands return the single value results displayed in tables at the GUI.

CALCulate:WCDMa:MEAS<i>:PRACh:PREamble<no>:CURRent?
FETCh:WCDMa:MEAS<i>:PRACh:PREamble<no>:CURRent?
READ:WCDMa:MEAS<i>:PRACh:PREamble<no>:CURRent?

Return the single value results for a selected preamble.

See also chapter 5.2.7.5, "Detailed Views: TX Measurement", on page 362

Suffix:

<no> 1..5
Number of the preamble

Return values:

<1_Reliability> Reliability Indicator

<2_UEpower> Mean preamble power
Range: -100 dBm to 55 dBm
Default unit: dBm

<3_PowerSteps> Mean preamble power minus mean power of previous preamble
For first preamble NCAP is returned.
Range: -10 dB to 50 dB
Default unit: dB

<4_CarrierFreqErr> Carrier frequency error
Range: -60000 Hz to 60000 Hz
Default unit: Hz

<5_EVMrms> Error vector magnitude RMS value
Range: 0 % to 100 %
Default unit: %

<6_EVMpeak> Error vector magnitude peak value
Range: 0 % to 100 %
Default unit: %

<7_MagErrorRMS> Magnitude error RMS value
Range: 0 % to 100 %
Default unit: %

<8_MagErrorPeak> Magnitude error peak value
Range: -100 % to 100 %
Default unit: %

<9_PhErrorRMS>	Phase error RMS value Range: 0 deg to 180 deg Default unit: deg
<10_PhErrorPeak>	Phase error peak value Range: -180 deg to 180 deg Default unit: deg
<11_IQoffset>	I/Q origin offset Range: -100 dB to 0 dB Default unit: dB
<12_IQimbalance>	I/Q imbalance Range: -100 dB to 0 dB Default unit: dB
<13_Signature>	Detected preamble signature Range: 0 to 15

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

CALCulate:WCDMa:MEAS<i>:PRACh:OFFPower?
FETCh:WCDMa:MEAS<i>:PRACh:OFFPower?
READ:WCDMa:MEAS<i>:PRACh:OFFPower?

Return the OFF power results.

See also chapter 5.2.7.5, "Detailed Views: TX Measurement", on page 362

Return values:

<Reliability>	Reliability Indicator
<OffPower>	<OFF power before preamble>, <OFF power after preamble> Range: -100 dBm to -24 dBm Default unit: dBm

Example: See Performing Measurements

Usage: Query only

Firmware/Software: V3.0.20

5.6 List of Commands

6 WCDMA Signaling

The "WCDMA signaling" firmware application (option R&S CMW-KS400) allows to emulate a UTRAN cell and to communicate with the UE under test. The UE can synchronize to the DL signal, register to the Circuit Switched (CS) domain and attach to the Packet Switched (PS) domain. A mobile originating or mobile terminating connection can be set up.

In addition to the signaling mode, a reduced signaling mode is supported. It allows to set up a connection without registration, attach and layer 3 signaling. Thus modules only supporting layer 1 and 2 can be tested.

The basic R99 signaling functionality provided by R&S CMW-KS400 can be enhanced by the following options:

- R&S CMW-KS410: advanced parameter settings for R99
- R&S CMW-KS401: basic signaling for R5/6, e.g. setup of an HSPA test mode connection
- R&S CMW-KS411: advanced parameter settings for R5/6, e.g. flexible user defined HSDPA configuration
- R&S CMW-KS403: basic signaling for R7, e.g. connection with 64-QAM modulation (HSPA+)
- R&S CMW-KS413: advanced parameter settings for R7, e.g. CPC feature
- R&S CMW-KS404: basic signaling for R8, e.g. dual carrier HSDPA
- R&S CMW-KS425 allows to use the not standardized S and L operating bands.
- R&S CMW-KE100 and R&S CMW-KE400 enable internal fading (R&S CMW-KS410 and fader I/Q board also required).

Most tests can be performed using the WCDMA "Multi Evaluation" measurement, the "TPC" measurement or the "PRACH" measurement (all included in option R&S CMW-KM400). Data transfer tests can be performed using the Data Application Unit (DAU, option R&S CMW-B450A and R&S CMW-KM050).

Additional measurements are provided by the "WCDMA signaling" application. For details refer to:

- BER Measurement
- HSDPA ACK Measurement
- RLC Throughput Measurement
- E-HICH Measurement
- UL Logging Measurement

6.1 What's New in this Revision

This revision describes version 3.0.30 and later of the WCDMA signaling application. Compared to version 3.0.20 it provides the following new features:

- Fading without an external fader, see Internal Fading

- External fading scenarios require now R&S CMW-KS410
- Sending date and time information to the UE, see Time
- Configurable rejection of location update and attach requests, see Reject Causes
- TPC setup "Max. Power E-DCH", see Max. Power E-DCH TPC Setup
  Wizard for "Max. Power E-DCH", see WCDMA Wizards
  Related application sheet, see Maximum Power Measurements with E-DCH
- TPC setup "Change of TFC", see Change of TFC TPC Setup
- Generation of "Change of TFC" trigger signal, see Trigger Signals
- OCNS R7, see Orthogonal Channel Noise Simulator (OCNS)
- "UL Logging" measurement for HS-DPCCH, E-DPCCH and DPCCH logging, see UL Logging Measurement
- CPC R7 for HSPA+, see Continuous Packet Connectivity (CPC)

Please note that base software V3.0.11 or higher is required for WCDMA signaling V3.0.30.

Software Version

To check your R&S CMW software version, open the "Setup" dialog and click "HW/SW Equipment". The initial software version for each remote control command is quoted in the reference description.

6.2 General Description

The following sections describe how to use the R&S CMW for WCDMA signaling tests and provide background information.

6.2.1 Test Setups

The following sections provide an overview of typical test setups for the individual scenarios.

6.2.1.1 Test Setup for Standard Cell Scenario

The basic test setup for a standard cell scenario uses a bidirectional RF connection between the tester and the device under test (DUT), carrying both the downlink and the uplink signal:

- The R&S CMW transmits the downlink signal to which the DUT can synchronize in order to perform an attach. The downlink signal is used to transfer signaling messages and user data to the DUT.
- The DUT transmits an uplink signal that the R&S CMW can receive and decode in order to set up a connection and perform various measurements.

For this setup the DUT is connected to one of the bidirectional RF COM connectors at the front panel of the R&S CMW. No additional cabling and no external trigger is needed. The input level ranges of all RF COM connectors are identical.

See also: "RF Connectors" in the R&S CMW user manual, chapter "Getting Started"

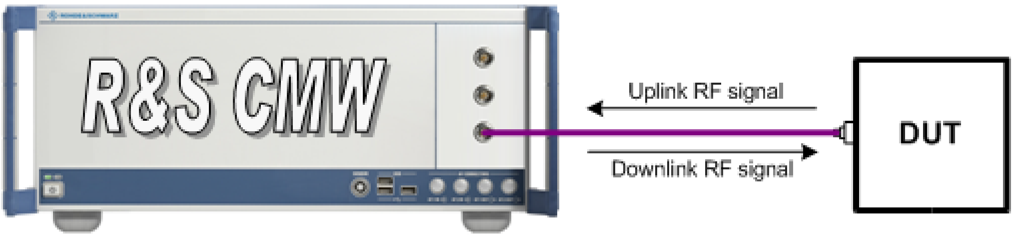


Fig. 6-1: Test setup for standard cell

6.2.1.2 Test Setup for Dual Carrier Scenario

A test setup for a connection with dual carrier HSDPA involves one uplink and two downlink signals. The two downlink signals must be transmitted via different TX modules, which implies that the instrument must support at least two TX paths.

Depending on the instrument hardware and the UE connectors, you can use one or two connectors at the R&S CMW and the UE. Many UEs provide several connectors, but only one of them can be used for WCDMA.

Typical scenarios:

- The UE provides only one connector for WCDMA; basic frontends are installed at the R&S CMW:

Use a bidirectional RF connector for the uplink and one downlink signal and a separate RF connector for the second downlink signal. Connect both RF connectors to an external combiner and connect the combiner to the UE.

- The UE provides only one connector for WCDMA; an advanced frontend is installed at the R&S CMW:
  Use one bidirectional RF connector for the uplink and both downlink signals. This is the same cabling as for a standard cell scenario.
- Connection via two cables, using two connectors at both sides (UE provides two connectors for WCDMA):
  Use a bidirectional connector for the uplink and one downlink signal and an additional connector for the second downlink signal.
  The following figure illustrates this example.

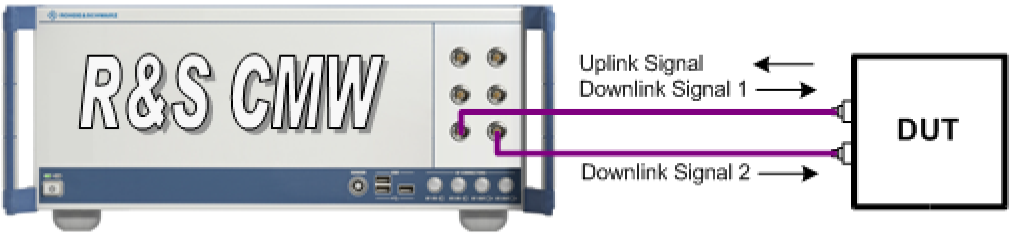


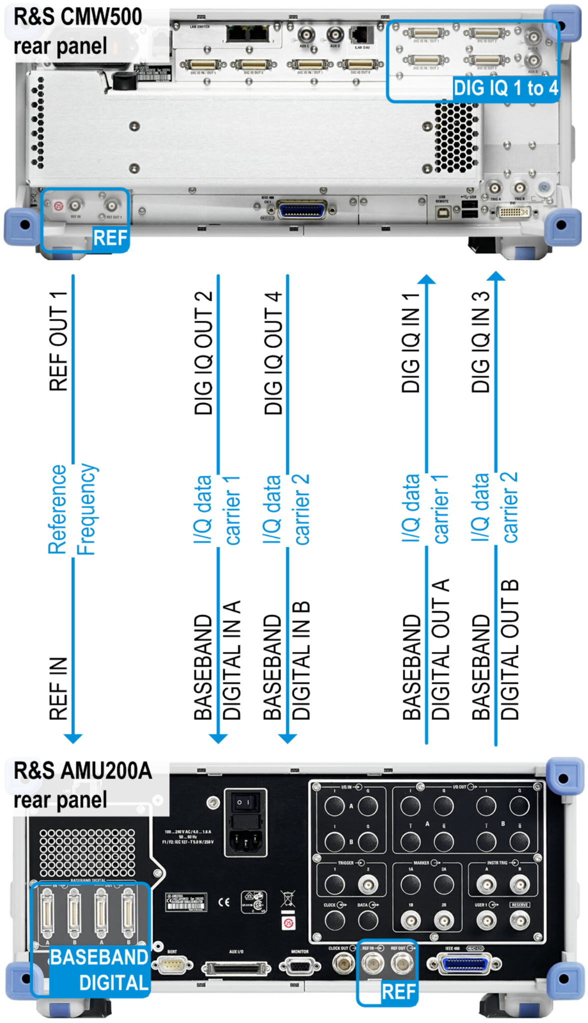
Fig. 6-2: Test setup using two connectors at instrument side and UE side

6.2.1.3 Test Setup for External Fading Scenarios

You can integrate an R&S AMU200A into a test setup in order to superimpose fading on the baseband signal. The R&S AMU200A must be connected to the digital I/Q interface of the R&S CMW. At least one I/Q board must be installed at the R&S CMW for that purpose (option R&S CMW-B510x/-B520x).

All connections between R&S CMW and R&S AMU200A are established via the rear panels of the instruments.

The following figure shows a setup with two downlink paths using the first I/Q board (DIG IQ 1 to 4).



For a setup with only one downlink path you need only two of the four I/Q data connections.

The RF connections between R&S CMW and DUT must be established in the same way as without external fading.

6.2.1.4 Test Setup for Internal Fading Scenarios

If internal fading shall be used, the test setup is the same as for the corresponding scenario without fading.

6.2.2 Initiating Signaling Tests

The signal generator of the "WCDMA signaling" application is controlled like any real-time signal generator, see chapter 6.4.2, "Signaling and Connection Control", on page 508.

The WCDMA downlink signal is turned on as long as the "WCDMA-UE Signaling" softkey indicates the "ON" state (after switching on, wait until the hour glass symbol has disappeared). When DL signal transmission has been turned on, the connection states can be controlled via hotkeys at the R&S CMW and via actions at the UE.

The default settings of the R&S CMW generally ensure a DL signal with suitable characteristics for connection setup. The most important settings can be modified directly in the main view.

Checks in case of failed registration or attach

If the registration of the UE fails, check the demodulation info (see "CMW Demod. Info" on page 495) and the following R&S CMW settings:

- Reduced signaling must be disabled.
- The "Frequency" of the generated DL signal must be within the frequency bands supported by the UE.
- The "Expected Nominal Power" must be in accordance with the uplink signal power.
- The "Output Power" must be sufficient so that the UE under test can receive the DL signal.
- The PRACH settings must allow a positive answer to received preambles:
  – Enhanced AICH settings: "Acknowledge" = "Positive"
  – PRACH settings: "Preambles before AICH Transmission" ≤ "Preamble maximum Retransmission"
- The UE capabilities must be in accordance with the security settings in the "Network" section of the configuration dialog.
  Registration can fail if authentication or security is disabled but the UE expects/ requires an authentication or security procedure. It can also fail if authentication or security is enabled but not supported by the UE or the SIM card type or secret key do not match.
  An appropriate 3GPP USIM can be obtained from Rohde & Schwarz (R&S CMW-Z04, stock no. 1207.9901.02).
- If operating band VI is used, the "MCC" should be set to a value between 440 and 443. Otherwise a Release 5 UE (or lower) may fail to register in band VI. For reference see 3GPP TS 25.307 up to Release 5, section 6.1.2.

Performing measurements

The required settings vary depending on the measurement to be performed. However, the general procedure outlined below is applicable to most measurements performed without reduced signaling and without data application unit (no end to end connection).

For a detailed example of a connection setup see chapter 6.3.1.2, "Setting up a Connection", on page 471.

1. Connect your UE to the R&S CMW (see Test Setups).
2. Open the "WCDMA signaling" firmware application.
3. Configure the signaling application according to the test to be performed. For TX measurements it is recommended to disable measurement reporting.

4. To turn on the DL signal, click/press "ON | OFF" and wait until the "WCDMA-UE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.
5. Switch on the UE.

   The UE synchronizes to the DL signal and registers (attaches). Note the connection states displayed in the main view.
6. Set up a UE originated or UE terminated connection.
7. Use the "WCDMA RX Meas" or "WCDMA TX Meas" softkey to switch to the measurement application. The WCDMA RX measurements are provided by the "WCDMA Signaling" firmware application. The WCDMA TX measurements are available as option R&S CMW-KM400.
8. Configure and start the measurement.

Order of steps

Measurements provided by the signaling application can also be initiated before turning on the DL signal. In that case the measurement starts as soon as the preconditions for the measurement are fulfilled. A BER measurement for instance starts when a suitable RMC connection has been set up.

6.2.3 Reduced Signaling Mode

In the default mode (no reduced signaling) the "WCDMA signaling" application emulates a UTRAN cell and generates a downlink WCDMA signal. The UE can synchronize to the downlink signal, register to the Circuit Switched (CS) domain and attach to the Packet Switched (PS) domain. After registration/attach you can set up a connection.

In the reduced signaling mode, the R&S CMW also provides a WCDMA downlink signal, but it does not transfer layer 3 messages. There is no dialog between instrument and UE. No registration or attach procedure is performed and no call connection is set up, so that test times are reduced considerably. Only test mode connections are possible.

To use the reduced signaling mode ensure that the UE synchronizes to the received downlink signal and transmits an uplink WCDMA signal with correct timing relative to the downlink signal (1024 chips offset between DL DPCH and UL DPCH). The signal must contain all channels usually present during an established connection. Configure your UE accordingly. There are no messages sent from the instrument to the UE to configure it.

Please note that the UE must signal the used transport format via the TFCI field. The Calculated Transport Format Combination (CTFC) value to be signaled depends on the uplink transport channel configuration. If the uplink signal contains DTCH data only, CTFC=2 must be signaled. If it contains DCCH and DTCH data, CTFC=3 must be signaled. The following table shows the used mapping.

Table 6-1: Used mapping of CTFC values

CTFC	DTCH	DCCH
0	TF0	TF0
2	TF1	TF0
1	TF0	TF1
3	TF1	TF1

Initiating tests with reduced signaling

1. Connect your UE to the R&S CMW (see Test Setups).
2. Open the "WCDMA signaling" firmware application.
3. Enable the "Reduced Signaling" mode in the "Cell Setup" settings in the main view, see chapter 6.4.1.6, "Settings", on page 506.
4. Configure the signaling application. The settings at application side and UE side must match. The instrument does not configure the UE.
5. To turn on the downlink signal, click/press "ON | OFF" and wait until the "WCDMA-UE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.
   The generated signal contains the physical channels P-CPICH, P-SCH, S-SCH, P-CCPCH and PICH.
6. To turn on the additional channels only present during an established connection, click/press "Connection Setup On".

   Note the connection state, changing to "On" after completion.
7. Switch on and configure the UE, so that it synchronizes to the DL signal and provides a WCDMA uplink signal timed correctly relative to the downlink signal.
   The demodulation information displayed in the connection status pane indicates whether the power of the uplink signal is in range and the R&S CMW can synchronize to the uplink signal.
8. Perform measurements in the same way as with "normal" signaling.

Order of steps

The steps listed above describe one possible way how to initiate tests with reduced signaling. The order of the steps is not fixed. You can still vary many settings after switching on the cell, e.g. enable or disable reduced signaling or modify the RMC data rate. Even after switching on the dedicated channels you can still vary the power and channelization codes of some physical downlink channels.

Measurements of the uplink signal are largely analogous with and without reduced signaling. Any differences are stated in the corresponding sections. In both modes it is possible to send Transmit Power Control (TPC) commands to the UE and measure the resulting uplink power changes. Receiver quality tests are also supported in both modes.

Some parameters that can be configured without reduced signaling are not relevant for reduced signaling and are hidden while this mode is enabled. Corresponding hints are given in the parameter descriptions.

Troubleshooting

If the UE fails to synchronize to the downlink signal or the R&S CMW fails to synchronize to the uplink signal, check that all signaling settings and UE settings are compatible.

Check especially the following settings:

- used operating band and carrier frequency
- "Expected Nominal Power" and "Output Power"
- connection configuration settings, e.g. for RMC connections the UL RMC data rate
- channelization code number of downlink DPCH and for HSDPA test mode also of HS-SCCH
- downlink scrambling codes
- all settings influencing the selection of MAC-hs or MAC-ehs for HSDPA, see "MAC-hs / MAC-ehs selection" on page 435
  It is recommended to use the same MAC entity type both at the instrument and the UE, either MAC-hs or MAC-ehs.

Please note that depending on the configured HSPA test mode direction ("Direction" on page 551) enabled HSPA downlink channels are only present after successful synchronization:

- Direction = HSDPA: The enabled HSDPA related channels are present when the reduced signaling state On is reached. They are even present if the synchronization of the R&S CMW to the uplink signal is not yet complete or fails.
- Direction = HSPA: The enabled HSDPA and HSUPA downlink channels are only transmitted when the R&S CMW has successfully synchronized to the uplink signal.

6.2.4 End to End Packet Data Connections

To set up a WCDMA packet data connection you need the Data Application Unit (DAU) in addition to the "WCDMA signaling" application. The DAU itself is available as option R&S CMW-B450A and the DAU measurements as R&S CMW-KM050. For IPv4 option R&S CMW-KA100 is required, for IPv6 additionally option R&S CMW-KA150. However, the current software version supports only IPv4.

For configuration of the DAU, e.g. for initial configuration of the DAU IP settings, please refer to the DAU documentation.

To set up an end to end packet data connection, proceed as follows:

1. Before switching on the cell signal, ensure that the usage of the DAU is enabled, see "Enable Data end to end" on page 513
2. Configure the packet data parameters, see chapter 6.4.11.6, "Packet Data", on page 552

3. Configure any other settings as desired (as for a connection without the DAU) and switch on the cell signal.
4. Register / attach the UE.
5. Initiate a mobile originated packet data connection at the UE.
   It is not possible to initiate a mobile terminated packet data connection at the instrument.

When the packet data connection has been established, you can use the DAU to perform IP-based data tests (see DAU documentation).

You can also perform an "RLC Throughput" measurement, see chapter 6.2.19, "RLC Throughput Measurement", on page 463. Or you can perform other measurements that do not require a DAU, e.g. HSDPA ACK, E-HICH or TX measurements. The BER measurement can not be performed with a packet data connection.

Most measurements require the transmission of data. For a test mode connection the signaling application takes care of downlink data transmission. For a packet data connection the signaling application does not transfer data. So you must generate IP traffic by other means, e.g. using the DAU. You may for example initiate an IPerf measurement or an FTP data transfer. For details refer to the DAU documentation.

Some DAU measurements and applications require to enter the IP address(es) assigned to the UE. You can retrieve this information from the UE info section, see chapter 6.4.1.5, "UE Info", on page 505.

6.2.5 External Fading

An external fading scenario allows to route the downlink baseband signal to an R&S AMU200A that superimposes fading on the signal and routes it back. Thus fading can be added to the downlink signal.

Configuring and activating fading

1. Connect the DUT and the R&S AMU200A to the R&S CMW (see chapter 6.2.1.3, "Test Setup for External Fading Scenarios", on page 409).
2. Configure the signaling application according to the test to be performed, especially select an external fading scenario and configure the downlink settings.
3. In the configuration tree, section "IQ Settings > IQ Out", note the "Baseband PEP" and the "Crest Factor".
4. Configure the R&S AMU200A, especially the following settings:

   Reference oscillator settings:

   - Source = External
   - External Reference Frequency = 10 MHz

   Baseband input settings for all used connectors:

   - Sample Rate = User Defined, 100 MHz
   - Baseband Input Level: enter the crest factor and the PEP displayed in step 3.

Digital I/Q output settings for all used connectors:

- Sample Rate = User Defined, 100 MHz
- Set Level Via = PEP
- PEP = PEP value displayed in step 3

5. In the R&S AMU200A, activate fading and note the signal level. If you add noise to the signal, note the signal level without noise.
6. Configure the I/Q input of the R&S CMW:
   In the configuration tree, section "IQ Settings > IQ In > Baseband Level", enter the signal level noted in the previous step.
   Alternatively it is also possible, to specify the signal output level of the R&S AMU200A, to note the resulting PEP and to enter this PEP value at the R&S CMW for "Baseband PEP". But this is not recommended.
7. Turn on the downlink signal at the signaling application and set up a connection.

   The configuration is now complete. Fading is active.
   Note that a reconfiguration of the settings at the R&S AMU200A during an active connection to the DUT may result in the loss of the connection or in erroneous measurement results.
   After a reconfiguration of the baseband input settings of the R&S AMU200A, you must turn the downlink signal at the signaling application off and on again.

6.2.6 Internal Fading

Testing under realistic air interface conditions is important in order to verify the receiver performance and the correct operation of the DUT's protocol stack implementation. For example, block error rates, throughput performance and correct operation of layer 1 procedures like Hybrid Automatic Repeat Request (HARQ) retransmission can be evaluated.

The internal fading module comes with a fading simulator and AWGN generator that can be selectively enabled. It manipulates the generated downlink I/Q data stream to emulate typical signal conditions at the DUT's receiver.

The following options are required to use the internal fading simulator in WCDMA:

- one fader I/Q board R&S CMW-B510F or R&S CMW-B520F per signaling instance using internal fading
- one option R&S CMW-KS410 "WCDMA R99, advanced signaling" per signaling instance using fading
- a single option R&S CMW-KE100 "Basic Fading support: AWGN generator"
- a single option R&S CMW-KE400 "WCDMA Fading Profiles TS 25.101, excerpts"

6.2.6.1 Fading Simulator

Multi-path fading is an effect which occurs in real world situations. A signal sent from the base station may take different routes (direct line of sight and/or reflected) and reach the receiving antenna at different times leading to a sum of phase shifted and, if the receiver is moving, frequency shifted signals.

The internal fading simulator supports multipath propagation conditions defined in Annex B.2.2 of 3GPP TS 25.101.

A faded signal has a higher crest factor than an unfaded one. In order to avoid distortion, the baseband signal must be attenuated before entering the fading module, with the necessary attenuation (insertion loss) depending on the selected fading profile.

In WCDMA signaling, the insertion loss at the baseband level can be calculated automatically or set manually. It is automatically compensated on the HF level, which implies a shift of the allowed DL power level range to the same extent, but in opposite direction.

6.2.6.2 AWGN Generator

Additional White Gaussian Noise (AWGN) is typically modeled in receiver tests, because it may lead to a decrease of throughput. The quality of the received signal is affected by the ratio of the signal power to the surrounding traffic noise level (signal to noise ratio). The modulated signals from neighbor cells simply appear as noise. This effect is simulated by adding AWGN to the signal.

The internal fading module supports AWGN insertion with configurable noise level. Insertion loss at the baseband level is calculated and compensated automatically at the HF.

The properties of the AWGN interferer comply with the requirements of 3GPP TS 34.121, section 7.1.2 (minimum bandwidth 5.76 MHz, flatness less than ±0.5 dB, peak to average ratio at a probability of 0.001 % above 10 dB). It is needed for many of the performance tests and support of RRM tests described in 3GPP TS 34.121.

AWGN insertion via the signaling unit is disabled for fading scenarios (see "RF Power Downlink > AWGN Noise (Ioc)" on page 518).

6.2.7 Connection States

The UMTS core network consists of two service domains, the Circuit Switched (CS) and the Packet Switched (PS) domain. You can set up a connection in the CS domain and/or a connection in the PS domain. For supported connection types see chapter 6.2.10, "Connection Types", on page 430.

The connection schemes for the CS domain and the PS domain are mostly independent from each other. The downlink signal generated by the R&S CMW can emulate a UTRAN cell supporting both CS and PS services, or a UTRAN cell supporting CS services only.

6.2.7.1 CS Connection States

The main CS connection states are described in the following table.

CS State	Description
Off	No signal transmission / no connection to the UE
On	The R&S CMW emulates a UTRAN cell, transmitting a WCDMA signal to which the UE can synchronize. After synchronization the UE can initiate a registration towards the instrument, and the instrument can page the UE in order to attempt a connection.

CS State	Description
Registered	Synchronization and registration have been performed.
Alerting	The R&S CMW is attempting a connection to the UE. The UE is responding (ringing) but the connection is not yet established. This state is skipped for Connection Type = Test Mode.
Call Estab-lished	A Radio Resource Control (RRC) connection between the instrument and the UE has been established. This means that dedicated channels are allocated between the R&S CMW and the UE. Depending on the Radio Access Bearer (RAB) configuration, the dedicated channel can consist of the Signaling Radio Bearer (SRB) used to set up the connection or other RABs, e.g. a Reference Measurement Channel (RMC) or voice channel (AMR).

Control commands initiated by the R&S CMW or by the UE switch between the listed states. The following figure shows possible state transitions.

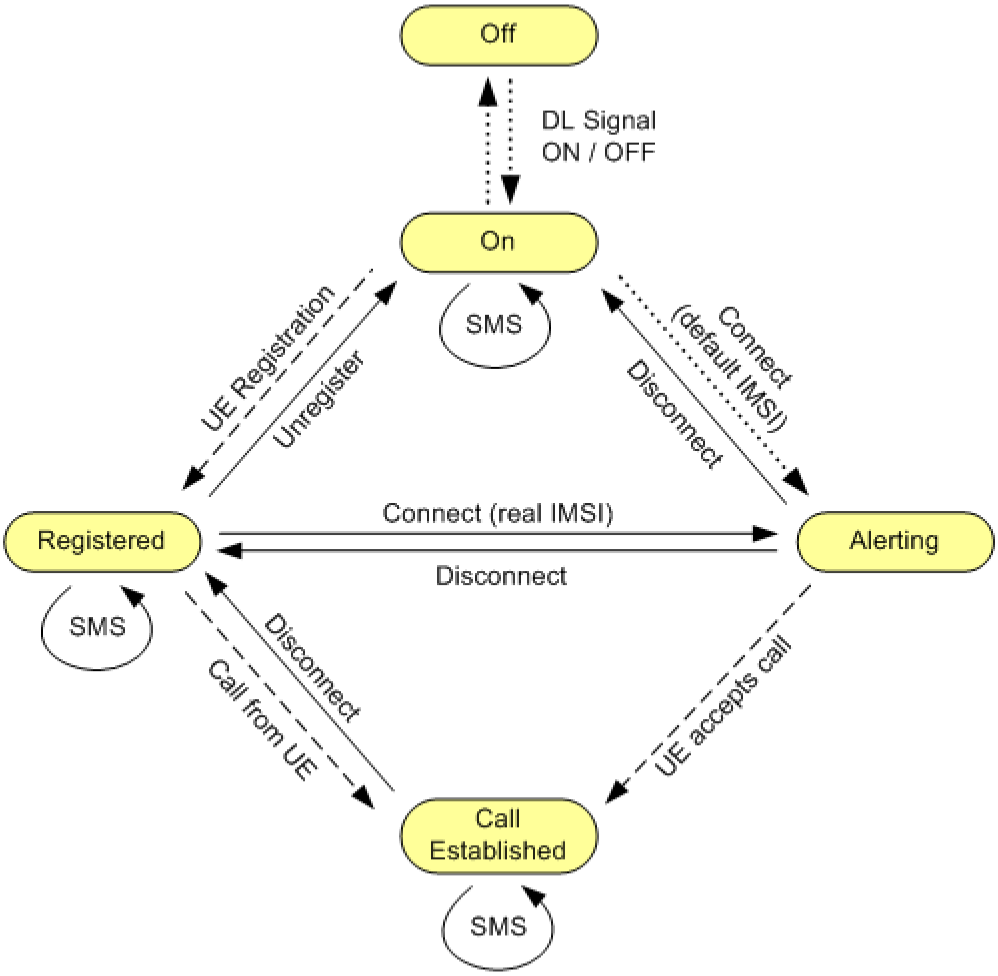


Fig. 6-3: Connection states CS domain

dotted line = action initiated by instrument
dashed line = action initiated by UE
solid line = action initiated by UE or instrument

In addition to the main states shown in the table and the figure the instrument indicates the following transitory states:

- **Signaling**
  Displayed e.g. during UE registration, while a short message is sent / received or when the channel changes during a cal
- **Paging**
  Displayed during MTC setup. When an answer from the UE is received, the state changes to "Call Setup in Progress".
- **Connecting**
  Displayed during MOC and MTC setup
- **Incoming Handover**
  Displayed while an inter-RAT handover from another signaling application is performed.
- **Outgoing Handover**
  Displayed while an inter-RAT handover to another signaling application is performed.
- **Disconnecting**

Additional transitions and handover

The transitions in the figure above are not complete. The "Off" state can be reached from any state by turning off the cell signal (ON | OFF). Moreover, incidents like an alerting timeout or a loss of the radio link cause additional transitions.

An inter-RAT handover to another signaling application can be performed in the "Call Established" CS state; see chapter 6.2.8, "Handover", on page 422.

6.2.7.2 PS Connection States

The main PS connection states are described in the following table.

PS State	Description
Off	No signal transmission
On (Idle)	The R&S CMW emulates a UTRAN cell, transmitting a WCDMA signal to which the UE can synchronize. After synchronization the UE can read the packet switched domain information. It learns that the instrument (representing the serving cell in a real network) supports packet switched services and can initiate a PS attach.
Attached	The UE is PS attached.
Connection Established	A connection has been set up, either a mobile terminated test mode connection or a mobile originated end to end packet data connection.

A number of control commands initiated by the instrument or by the UE switch between the listed states. The following figure shows possible state transitions.

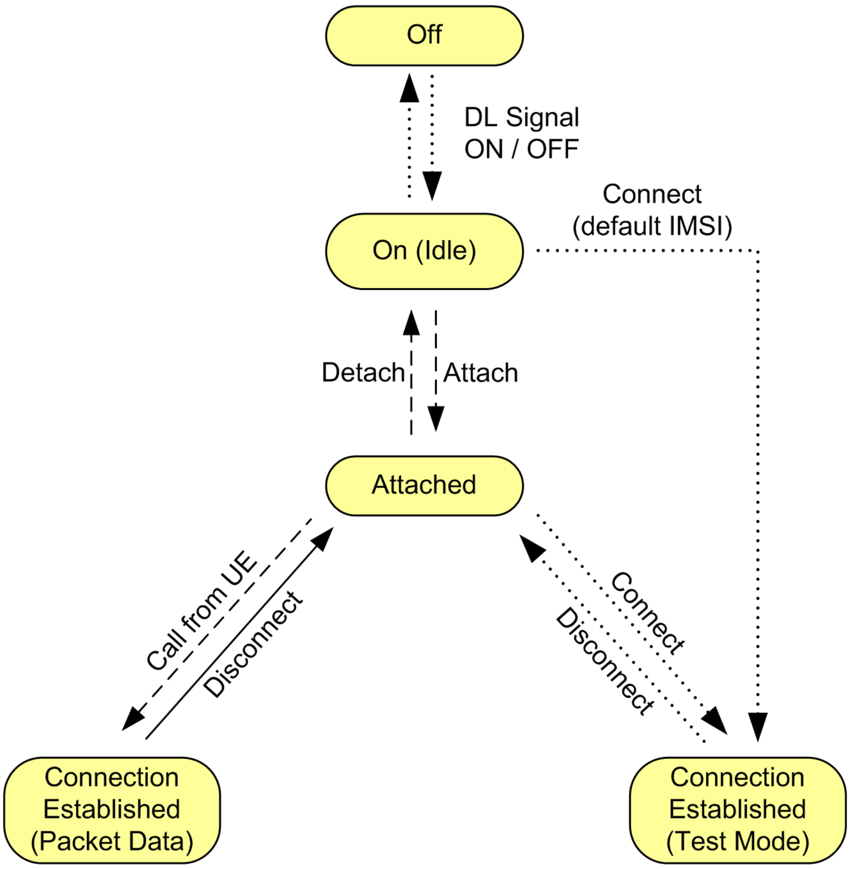


Fig. 6-4: Connection States PS domain

dotted line = action initiated by instrument
dashed line = action initiated by UE
solid line = action initiated by UE or instrument

In addition to the main states shown in the table and the figure the instrument indicates the following transitory states:

- **Signaling**
  Displayed e.g. during attach
- **Connecting**
  Displayed during state transition from "On" or "Attached" to "Connection Established"
- **Disconnecting**
  Displayed during state transition from "Connection Established" back to "On" or "Attached"

Additional transitions

The transitions in the figure above are not complete. The "Off" state can be reached from any state by turning off the cell signal (ON | OFF). Moreover, incidents like a timeout or a loss of the radio link cause additional transitions.

6.2.7.3 Connection States for Reduced Signaling

The main connection states in reduced signaling mode are described in the following table.

Cell State	Reduced Signaling State	Description
Off	Off	No signal transmission / no connection to the UE
On	Off	The R&S CMW provides a downlink signal containing the following physical channels: P-CPICH, P-SCH, S-SCH, P-CCPCH and PICH. The UE can synchronize to this downlink signal.
On	On	The physical channels relevant during a connection are provided by the downlink signal. The configured RF input connector is active, so that the uplink signal can be received. It is possible to set up a test mode connection. Please note that for HSPA test mode direction = HSPA ("Direction" on page 551) the enabled HSDPA and HSUPA downlink channels are only present when the R&S CMW has successfully completed synchronization to the UL signal.

Control commands initiated by the R&S CMW switch between the listed states. The following figure shows possible state transitions.

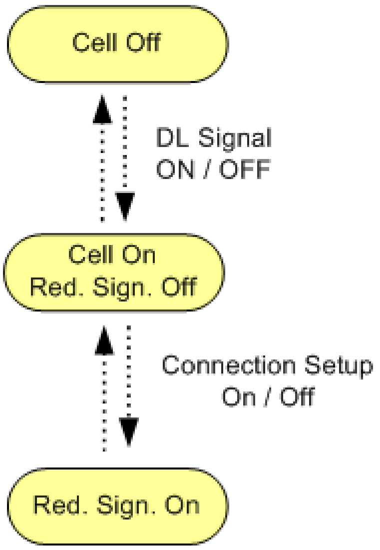


Fig. 6-5: Connection states in reduced signaling mode

In addition to the main states shown in the table and the figure the instrument indicates the following transitory states:

- **Switching Channels On/Off:**
  Displayed during transition from state "Reduced Signaling = Off" to "Reduced Signaling = On" and vice versa

Additional transitions

The transitions in the figure above are not complete. The "Cell Off" state can be reached from any state by turning off the cell signal (ON | OFF). Moreover, incidents like a timeout or a loss of the radio link cause additional transitions.

6.2.8 Handover

The WCDMA signaling application supports a handover within the signaling application and a handover to another signaling application.

- Handover within the signaling application:
  Within the WCDMA signaling application a blind handover is performed. It allows to change the operating band and the channels in a more efficient way than by direct reconfiguration.
  If you want to reconfigure only one parameter, e.g. only the channel number, you can also do this directly, without using the handover hotkey. Simply modify the parameter during an established connection.
- Handover to another signaling application:
  Depending on the target signaling application, either a blind handover or a redirection is performed.
  – A blind handover results in an established connection at the handover destination. This mechanism is used for example for a handover to GSM.
  – A redirection results in the registration of the UE at the handover destination. No new connection is set up. This mechanism is used for example for a handover to LTE.

To perform a handover, proceed as follows:

1. For a handover to another signaling application, ensure that the two signaling applications use different RX/TX modules ("Converter" setting).
2. In the WCDMA signaling application, establish a connection to the UE.
3. Press the hotkey "Handover" to open the handover configuration dialog.
4. In the dialog select the handover target - either the WCDMA signaling application or another signaling application.
   Configure the destination parameters. If you have selected another signaling application as target, the target cell is activated automatically (downlink signal switched on). Wait until the cell icon includes a RDY to indicate that the handover target is ready to receive the handover.
5. Press the button "Handover" to start the handover process.

   You can monitor the handover process in the "Event Log" area of the main view of the signaling applications.

As an example, the handover from WCDMA to GSM is described in more detail, see chapter 6.3.2, "Handover from WCDMA to GSM", on page 474.

6.2.9 Physical DL Channels

The radio resources in a WCDMA system are divided into physical channels characterized by a specific carrier frequency, scrambling code, channelization code and duration.

The time duration is defined in integer multiples of chips, slots and radio frames. With a chip rate of 3.84 Mcps, a slot corresponds to 2560 chips. A frame consists of 15 slots, i.e. 38400 chips or 10 ms. An HSPA subframe contains 3 slots.

The signaling application provides a set of downlink physical channels allowing the UE to synchronize to the signal, initiate a registration and set up a connection.

For details refer to the following sections.

6.2.9.1 Channel Overview

3GPP specifies different physical channel types. The channels are generated by mapping transport channel information into a physical channel and differ in their physical parameters.

Common channels carry messages that are not directed at a particular UE; they are point-to-multipoint channels. Dedicated channels carry information related to a particular connection; they are point-to-point channels. Shared channels are dedicated channels shared by several UEs. At a given time, a shared channel is assigned to one UE only, but the assignment may change within a few timeslots.

An overview of the physical channels of the generated downlink signal is given in the following table. The third column lists some channel properties. If not mentioned otherwise both primary and secondary scrambling code are allowed and the channelization code can be set. The Spreading Factor (SF) and the symbol rate are indicated.

Table 6-2: Physical DL channels

Channel type	Purpose	Properties
Primary Common Pilot Channel (P-CPICH)	Determination of the scrambling code out of a scrambling code group Phase reference for SCH and other downlink physical channels	SF = 256, 15 ksps Fixed channelization code $c_{256, 0}$ Primary scrambling code Predefined symbol sequence
Secondary Common Pilot Channel (S-CPICH)	Alternative phase reference for the cell; also used as a phase reference for some conformance tests	SF = 256, 15 ksps Predefined symbol sequence Zero or one S-CPICH channels per cell

Channel type	Purpose	Properties
Primary Synchronization Channel (P-SCH)	Slot synchronization between the instrument and the UE	Fixed 256-chip code (primary synchronization code) Time-multiplexed with P-CCPCH, 256 chips per slot No channelization, no scrambling
Secondary Synchronization Channel (S-SCH)	Frame synchronization between the instrument and the UE Provides the scrambling code group	256-chip code depending on the slot number and the scrambling code group Time-multiplexed with P-CCPCH, 256 chips per slot No channelization, no scrambling
Primary Common Control Physical Channel (P-CCPCH)	Transmits the System Frame Number (SFN) and is used as a timing reference for all physical channels Carries the BCH transport channel	SF = 256, 15 ksps Fixed channelization code $c_{256, 1}$ Primary scrambling code Time-multiplexed with SCH, 2304 chips per slot
Secondary Common Control Physical Channel (S-CCPCH)	Carries the Forward Access Channel (FACH) and the Paging Channel (PCH)	SF = 64, 60 ksps Primary scrambling code
Paging Indicator Channel (PICH)	Transfer of paging indicators to the UE	SF = 256, 15 ksps Primary scrambling code First 288 bits of radio frame carry paging indicators, remaining 12 bits no transmission (DTX).
Acquisition Indicator Channel (AICH)	Transfer of acquisition indicators to the UE	SF = 256, 15 ksps Primary scrambling code Repeated sequence of 15 access slots with 5120 chips each. First 4096 chips of access slot carry acquisition indicators, remaining 1024 chips no transmission (DTX).
Dedicated Physical Channel (DPCH)	Transfer of control information via Dedicated Physical Control Channel (DPCCH) and user data via Dedicated Physical Data Channel (DPDCH) to the UE. The DPCCH carries pilot bits, Transmit Power Control (TPC) bits and Transport Format Combination Indicators (TFCI).	Variable spreading factor depending on connection configuration (e.g. connection type and data rate). DPCCH and DPDCH time-multiplexed
Fractional Dedicated Physical Channel (F-DPCH)	Is a special case of downlink DPCCH, carries control information for the UL DPCCH associated with the F-DPCH. The F-DPCCH carries up to 10 TPC streams for 10 different HSDPA users.	SF = 256, 15 ksps

Channel type	Purpose	Properties
High Speed Shared Control Channel (HS-SCCH)	Transfer of downlink signaling information necessary for decoding the HS-PDSCH. Carries a UE ID identifying the target UE of the information. One HS-SCCH set with up to 4 HS-SCCHs can be allocated to one UE. UE monitors allocated HS-SCCHs. When receiving corresponding control information, it starts receiving the indicated HS-PDSCHs.	SF = 128, 30 ksps
High Speed Physical Downlink Shared Channel (HS-PDSCH)	Carries the High Speed Downlink Shared Channel (HS-DSCH)	SF = 16, 240 ksps (several codes can be assigned to the same UE)
Enhanced DCH Absolute Grant Channel (E-AGCH)	Transfer of uplink E-DCH absolute grants to the UE	SF = 256, 15 ksps
Enhanced DCH Relative Grant Channel (E-RGCH)	Transfer of uplink E-DCH relative grants to the UE	SF = 128, 30 ksps Same channelization code as E-HICH
Enhanced DCH HARQ Indicator Channel (E-HICH)	Transfer of uplink E-DCH HARQ acknowledgement indicators to the UE	SF = 128, 30 ksps Same channelization code as E-RGCH

The R&S CMW uses the scheme defined in 3GPP TS 25.213 to spread and combine the downlink channels (see figure below). For all physical channels except P-SCH and S-SCH, the real-valued symbols are mapped to an I and Q branch. The I and Q branches of each channel are spread to the chip rate using the same channelization code $c_{SF,m}$ for both branches.

The complex-valued chip sequences are scrambled with primary or secondary scrambling codes S^p or S^s, weighted with individual factors G and then combined using complex addition. The G factors are directly related to the individual channel levels set at the instrument. See also chapter 6.2.9.3, "Scrambling Codes", on page 426.

The complex-valued synchronization channels P-SCH and S-SCH are not spread but weighted separately and then added to the already combined signal.

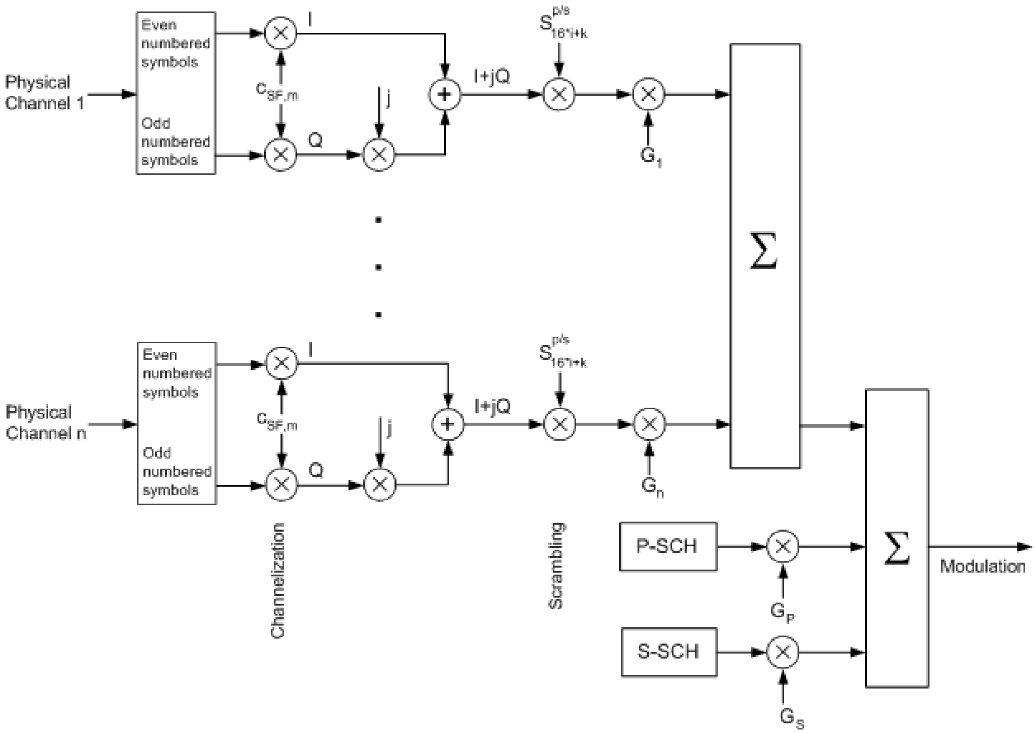


Fig. 6-6: Channelization, scrambling, weighting and combining of downlink channels

6.2.9.2 UE Synchronization and Scrambling Code Identification

With the channels of the generated DL signal, synchronization of the UE and scrambling code identification is a three-step process:

1. Slot synchronization
   The UE searches for the P-SCH and detects the primary synchronization code using correlation methods. The start of the P-SCH marks the beginning of a slot.
2. Frame synchronization and scrambling code group identification
   The UE detects the secondary synchronization code transmitted on the S-SCH to obtain the frame time and the scrambling code group. If needed, it also determines the System Frame Number (SFN) transmitted on the P-CCPCH.
3. Scrambling code identification and data evaluation
   The UE detects the P-CPICH to determine the primary scrambling code within the scrambling code group obtained in step 2. Using this information, it is possible to detect the scrambling code of the DPCH and to decode the data.

6.2.9.3 Scrambling Codes

Scrambling codes are defined in 3GPP TS 25.213. They are used in uplink and downlink.

DL Scrambling Codes

In the downlink scrambling codes are used to distinguish different cells. 512 primary scrambling codes and 15*512 secondary scrambling codes are defined, resulting in a total number of 8192 scrambling codes. The codes are numbered as follows: n = 16*i + k where i = 0 to 511 and k=0 for primary codes, k = 1 to 15 for secondary codes.

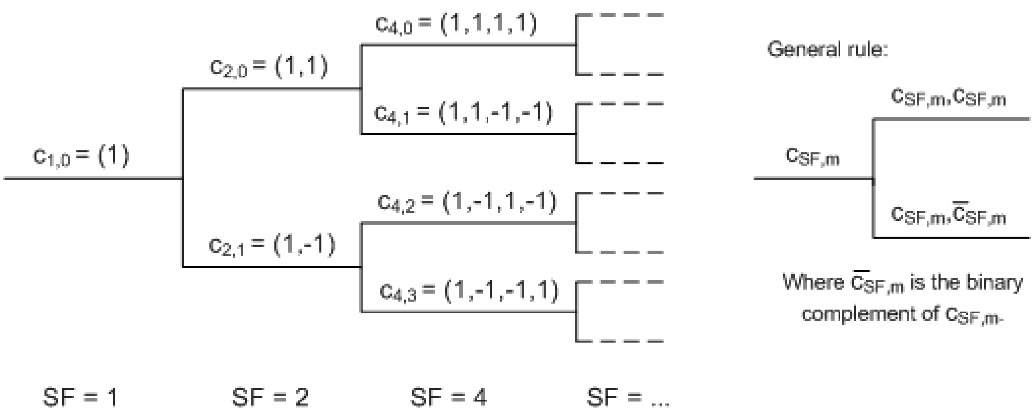
The cell is allocated one and only one primary scrambling code. Most channels are always transmitted using the primary scrambling code of the cell. Some channels can be transmitted with either the primary scrambling code or one of the secondary scrambling codes associated with the primary scrambling code (see table 6-2). The secondary scrambling code can be defined individually for each physical channel supporting secondary scrambling codes.

UL Scrambling Codes

In the uplink long scrambling codes are used to distinguish different users. 2^{24} long scrambling codes are defined, numbered 0 to 16777215 (or 0 to FFFFFF hex). Additionally 3GPP defines short scrambling codes for multiuser detection (not relevant in this context).

6.2.9.4 Channelization Codes

Channelization codes are used to separate different physical channels of the same carrier frequency, cell and user. They are defined in terms of the spreading factor (SF) and a code number m ranging from 0 to SF – 1. The codes $c_{SF,m}$ are called Orthogonal Variable Spreading Factor (OVSF) codes and are derived from a hierarchical tree:

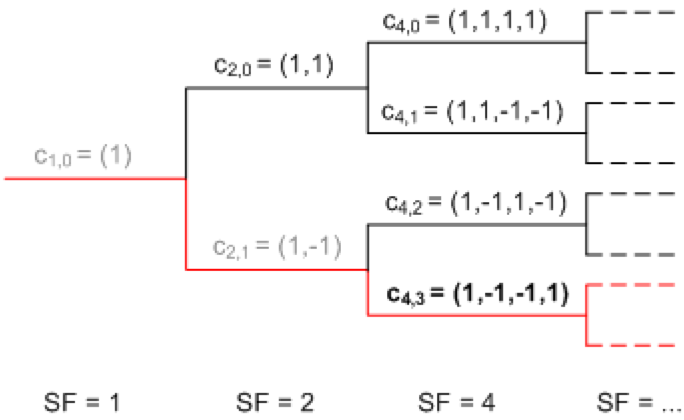


The following rule has to be observed for assignment of channelization codes in order to avoid code conflicts: Within each branch only one code can be used at the same time.

This means:

1. Other codes on the path between the code and the root of the tree must not be used.
2. Codes in sub-branches of the code (to the right of the code) must not be used.

For an example see the figure below. The red parts are blocked when $c_{4,3}$ is used.



6.2.9.5 Orthogonal Channel Noise Simulator (OCNS)

The OCNS is used to simulate the users or control signals on the other orthogonal channels of a downlink. The channelization code and relative level settings for OCNS signals are specified in 3GPP TS 34.121 and 3GPP TS 25.101. The spreading factor of the OCNS signal is 128. The DPCH data for each channelization code are uncorrelated with each other and with any wanted signal over the period of any measurement. The parameters are chosen to simulate a signal with realistic Peak to Average Ratio.

The following tables list the channelization codes and relative level settings for R99 to R7.

Table 6-3: OCNS channels for R99

Channelization Code (SF = 128)	Relative Level Setting (dB)	Channelization Code (SF = 128)	Relative Level Setting (dB)
2	-1	62	-4
11	-3	69	-6
17	-3	78	-5
23	-5	85	-9
31	-2	94	-10
38	-4	113	-6
47	-8	119	0
55	-7	125	-8

Table 6-4: OCNS channels for HSDPA tests (R5)

Channelization Code (SF = 128)	Relative Level Setting (dB)
122	0
123	-2
124	-2

Channelization Code (SF = 128)	Relative Level Setting (dB)
125	-4
126	-1
127	-3

For HSPA tests (R6) the OCNS uses only channelization code 6 (SF = 128).

Table 6-5: OCNS channels for HSDPA tests (R7)

Channelization Code (SF = 128)	Relative Level Setting (dB)
4	0
5	-2
6	-4
7	-1

The relative level setting specified in dB describes the relationship between the OCNS channels. The total power level of all OCNS channels depends on the power level of the other channels, see chapter 6.2.9.6, "Power Levels", on page 429.

6.2.9.6 Power Levels

The individual channel power levels and the OCNS power level are expressed relative to the RMS output power of the generator. The total power of all active channels is called "accumulated power" (including OCNS channels and excluding AICH and S-CCPCH that are not active during the actual call). It is calculated under consideration of the transmission duration of each channel within a timeslot or frame.

The transmission durations are as follows:

- SCH: first 256 chips of a slot (2560 chips)
- P-CCPCH: last 2304 chips of a slot (2560 chips)
- PICH: 288 bits of a frame (300 bits)
- AICH: 4096 chips out of 5120 chips (not relevant for accumulated power)
- All other channels: transmitted during entire timeslot / frame
  For HS-SCCH, HS-DSCH, E-AGCH, E-RGCH and E-HICH it is assumed that these channels are transmitted continuously, e.g. unscheduled subframes/slots filled with dummy data.

Example: For a configuration with active P-CPICH, DPCH, PICH, P-SCH and P-CCPCH the accumulated power is calculated according to the following formula:

$$P_{acc} = P_{P-CPICH} + P_{DPCH} + P_{PICH} \cdot \frac{288}{300} + P_{P-SCH} \cdot \frac{256}{2560} + P_{P-CCPCH} \cdot \frac{2304}{2560}$$

If the resulting accumulated power would be smaller than the RMS output power of the generator, this gap is filled by OCNS channels, see chapter 6.2.9.5, "Orthogonal Channel Noise Simulator (OCNS)", on page 428.

6.2.10 Connection Types

You can set up a connection in the CS domain and/or a connection in the PS domain.

The following connection types are supported:

- CS domain only:
  - Voice call or video call, call content (voice / video) is looped back to the UE
  - Signaling Radio Bearer (SRB)
  - Reference Measurement Channel (RMC)
- PS domain only:
  - Mobile terminated HSPA test mode connection
    UL/DL = R99/HSDPA or HSUPA/HSDPA
  - Mobile originated end to end packet data connection
    UL/DL = R99/R99 or HSUPA/R99 or R99/HSDPA or HSUPA/HSDPA
- CS + PS domain:
  - CS: RMC connection
    PS: mobile terminated HSPA test mode connection

In reduced signaling mode only RMC connections and mobile terminated HSPA test mode connections are supported.

For RMC, SRB and HSPA test mode connections additional information is provided in the following sections.

For end to end packet data connections see chapter 6.2.4, "End to End Packet Data Connections", on page 414.

6.2.10.1 Reference Measurement Channel (RMC)

The data content of the 3GPP downlink RMC is defined on transport channel level according to 3GPP TS 25.101. The data sequence to be transferred is directly fed into the Dedicated Traffic Channel (DTCH) and the Dedicated Control Channel (DCCH). The transport channels are channel coded, multiplexed and mapped onto a Dedicated Physical Channel (DPCH) with variable data rate (see figure below).

The downlink reference measurement channel generated in this way is to be used for various transmitter and receiver tests specified e.g. in 3GPP TS 25.101 and 34.121.

The following example illustrates the generation of a 3GPP reference measurement channel from the DTCH and DCCH transport channels and lists the physical and transport channel parameters for an information bit rate of 12.2 kbps. For other bit rates refer to specification 3GPP TS 25.101.

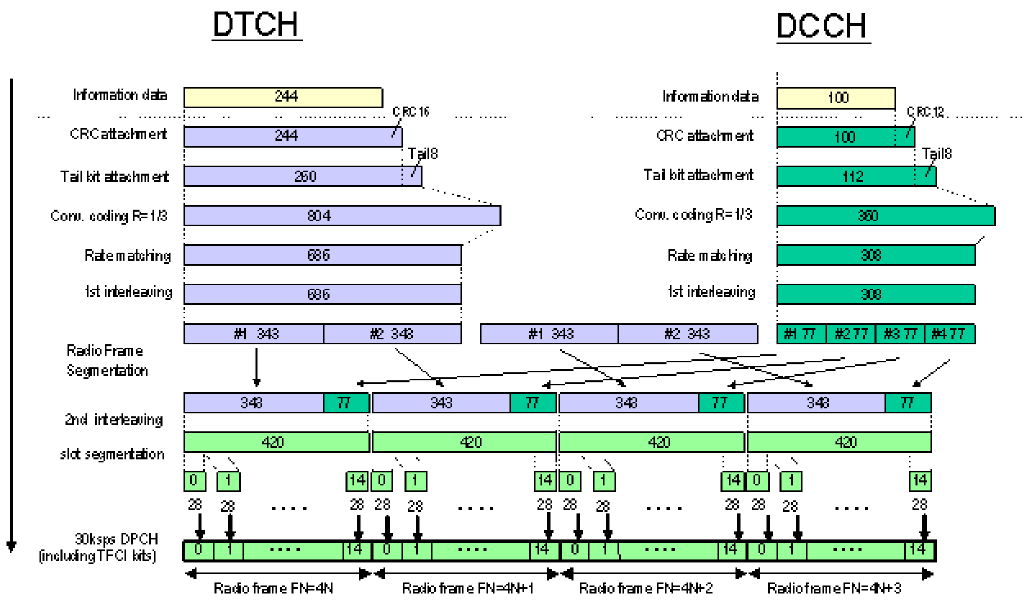


Fig. 6-7: Generation of RMC from DTCH and DCCH

Table 6-6: RMC physical parameters (12.2 kbps)

Physical Parameter	Value
Information bit rate	12.2 kbps
DPCH	30 ksps
Slot Format number	11
TFCI	On
Power offsets PO1, PO2 and PO3	0 dB
Puncturing	14.7 %

Table 6-7: RMC transport channel parameters (12.2 kbps)

Transport Channel Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	244	100
Transport Block Set Size	244	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	fixed

Test and loop modes

Various tests, especially receiver tests, require that data is looped back by the UE. Several loop modes are defined in 3GPP TS 34.109. Only loop mode 1 and 2 are relevant for bidirectional radio bearers. For reduced signaling only loop mode 2 is used. With or without loop, RMC connections are always set up in test mode, i.e. without alerting.

	Loop Mode 1	Loop Mode 2
Loopback point	Above layer 2	Effectively on transport layer (higher layers in Transparent Mode)
Data looped back	RLC/PDCP SDUs	Transport block data and CRC bits
Special settings	RLC modes "transparent" and "acknowledged" are available	UL CRC can be enabled or disabled, see below

UL Cyclic Redundancy Check (CRC) options:

- UL CRC disabled:
  UE performs no CRC. Received DL CRC bits are added to the UL transport block.
  Symmetric DL/UL data rate and asymmetric DL/UL transport block size.
- UL CRC enabled:
  UE performs CRC check and sends resulting UL CRC bits to the tester. Received DL CRC bits are discarded.
  Symmetric DL/UL data rate and symmetric DL/UL transport block size or asymmetric DL/UL data rate and asymmetric DL/UL transport block size.

Loops are required for the "WCDMA Signaling BER Measurement", see especially chapter 6.2.17.1, "BER, BLER and DBLER Tests", on page 455.

6.2.10.2 Signaling Radio Bearer (SRB)

The data content of the SRB is defined on transport channel level in 3GPP TS 34.108. The most important layer 1 parameters are shown in the following table, depending on the data rate.

	SRB 1.7 kbps	SRB 2.5 kbps	SRB 3.4 kbps	SRB 13.6 kbps
DPCH Slot Format	0	6	4	8
Transmission Time Interval	80 ms	40 ms	40 ms	10 ms
Coding Type	Convolution Coding	Convolution Coding	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3	1/3	1/3
Rate Matching attribute	155	256	155	155
Size of CRC	16 bits	12 bits	16 bits	16 bits
TFS (TF0, TF1)	0 x 148 bits, 1 x 148 bits	0 x 100 bits, 1 x 100 bits	0 x 148 bits, 1 x 148 bits	0 x 148 bits, 1 x 148 bits

6.2.10.3 High Speed Packet Access (HSPA)

R5 HSDPA and R6 HSUPA connections require option R&S CMW-KS401. R7 HSDPA+ connections require additionally option R&S CMW-KS403. R8 dual carrier HSDPA+ connections require option R&S CMW-KS404 in addition to the other options.

You can set up a mobile originated end to end HSPA packet data connection or a mobile terminated HSPA test mode connection. For end to end packet data connections see chapter 6.2.4, "End to End Packet Data Connections", on page 414. The following applies to mobile terminated HSPA test mode connections. An HSPA test mode connection can be HSDPA only or HSDPA plus HSUPA.

HSUPA UE Categories

The UE category relevant in the context of HSUPA is the E-DCH physical layer category. It indicates for example the maximum possible E-DCH channelisation code, the supported TTI length, the maximum number of bits in an E-DCH transport block per TTI and the resulting maximum UL data rate. The following table provides an overview. For more details refer to 3GPP TS 25.306, chapter 5.

Table 6-8: UE Categories for HSUPA (R6)

UE Category	Max Channel Code	TTI Length [ms]	Max Bits per TTI	Max UL Data Rate [Mbps]
1	SF4	10	7110	0.71
2	2xSF4	10	14484	1.45
		2	2798	1.4
3	2xSF4	10	14484	1.45
4	2xSF2	10	20000	2
		2	5772	2.89
5	2xSF2	10	20000	2
6	2xSF2 + 2xSF4[1)]	10	20000	2
		2	11484	5.74

[1)] Only possible for HSPA without RMC. With additional RMC in the CS domain, Max Channel Code is 2xSF2.

From the table you can see that the maximum HSUPA data rate equals 5.74 Mbps, reachable only with UE category 6 and an HSPA connection without parallel RMC.

A number of parameters must be configured appropriately to reach the maximum data rate supported by a UE. Use the wizard for this purpose, see chapter 6.2.16, "WCDMA Wizards", on page 451.

HSDPA UE Categories

The UE category relevant in the context of HSDPA is the HS-DSCH physical layer category. It indicates for example the support of MIMO and dual carrier, the supported modulation schemes, the maximum number of HS-PDSCH channelization codes per connection, the minimum supported inter TTI distance, the maximum number of bits in an HS-DSCH transport block per TTI and the resulting maximum DL data rate.

The UE categories 1 to 12 have been introduced in R5. MIMO and dual carrier operation are not supported. The following table provides an overview.

From the table you can see that the maximum HSDPA data rate for an R5 UE equals 13.98 Mbps.

Table 6-9: UE Categories for HSDPA (R5)

UE Category	Modulation	Max no of Codes	Min Inter TTI Distance	Max Bits per TTI	Max DL Data Rate [Mbps]
1	QPSK, 16-QAM	5	3	7298	1.22
2					
3			2		1.82
4					
5			1		3.65
6					
7		10		14411	7.21
8					
9		15		20251	10.13
10				27952	13.98
11	QPSK	5	2	3630	0.91
12			1		1.82

The UE categories 13 to 20 have been introduced in R7. Most categories support MIMO operation. The following table provides an overview.

From the table you can see that the maximum HSDPA data rate for an R7 UE with MIMO equals 42.19 Mbps.

Properties common for all R7 categories:

- no dual carrier operation
- maximum number of HS-PDSCH channelization codes = 15
- minimum inter TTI distance = 1

Table 6-10: UE Categories for HSDPA+ (R7)

UE Category	Mod. without MIMO	Mod. with MIMO	Max Bits per TTI	Max DL Data Rate [Mbps]
13	QPSK, 16-QAM, 64-QAM	–	35280	17.64
14			42192	21.10
15	QPSK, 16-QAM		23370	23.37
16			27952	27.95
17	QPSK, 16-QAM, 64-QAM	–	35280	17.64
	–	QPSK, 16-QAM	23370	23.37
18	QPSK, 16-QAM, 64-QAM	–	42192	21.10

UE Category	Mod. without MIMO	Mod. with MIMO	Max Bits per TTI	Max DL Data Rate [Mbps]
	–	QPSK, 16-QAM	27952	27.95
19	QPSK, 16-QAM, 64-QAM		35280	35.28
20			42192	42.19

The UE categories 21 to 24 have been introduced in R8. The following table provides an overview.

From the table you can see that the maximum HSDPA data rate for an R8 UE equals 42.19 Mbps. So the maximum DL data rate for R7 with MIMO and R8 with dual carrier is the same.

Properties common for all R8 categories:

- only dual carrier operation, no single carrier operation
- no MIMO operation
- maximum number of HS-PDSCH channelization codes = 15
- minimum inter TTI distance = 1

Table 6-11: UE Categories for dual carrier HSDPA+ (R8)

UE Category	Modulation	Max Bits per TTI	Max DL Data Rate [Mbps]
21	QPSK, 16-QAM	23370	23.37
22		27952	27.95
23	QPSK, 16-QAM, 64-QAM	35280	35.28
24		42192	42.19

For more details refer to 3GPP TS 25.306, chapter 5.

A number of parameters must be configured appropriately to reach the maximum data rate supported by a UE. Use the wizard for this purpose, see chapter 6.2.16, "WCDMA Wizards", on page 451.

MAC-hs / MAC-ehs selection

The WCDMA signaling application sets up an HSPA connection with MAC-hs or MAC-ehs, depending on the HSDPA UE category (manually configured UE category or highest UE category from capability report).

For UE category 1 to 12 the connection is set up with MAC-hs, bit aligned. For UE category 13 to 24 the connection is set up with MAC-ehs, either bit aligned for R5 fixed reference channels or octet aligned otherwise. The following table provides an overview of these statements.

Table 6-12: Selection of MAC-hs / MAC-ehs, bit aligned / octet aligned

HSDPA UE Category	MAC Type	Configuration Type	Alignment
1 to 12	MAC-hs	all configuration types	bit aligned
13 to 24	MAC-ehs	Fixed Reference Channel	The configured H-Set is evaluated: ● R5 H-Set: bit aligned ● R7/R8 H-Set: octet aligned
		CQI User Defined	octet aligned

H-Set selection for fixed reference channels

For HSDPA fixed reference channels the configured H-Set must be compatible to the HSDPA UE category. The following table provides an overview of the H-Sets.

Table 6-13: H-Set overview

Release	HSDPA UE Category	H-Set	Modulation	DL Carrier
R5	1 to 12	H-Set 1, 2, 3, 6, 10	QPSK, 16-QAM	single carrier
		H-Set 4, 5	QPSK	
		H-Set 1 Max Input	16-QAM	
R7	13 to 20	H-Set 8 H-Set 8 Max Input H-Set 8 Max Throughput	64-QAM	
R8	21 to 24	H-Set 1A Max Input	16-QAM	dual carrier
		H-Set 3A, 6A, 10A	QPSK, 16-QAM	
		H-Set 8A H-Set 8A Max Input	64-QAM	
		H-Set 12	QPSK	
		H-Set 12 Max Throughput	64-QAM	

6.2.11 Operating Bands

The carrier frequencies for WCDMA signals are defined in 3GPP TS 25.101 (except the S and L operating bands which are not standardized and require R&S CMW-KS425). Uplink and downlink carrier frequencies are defined as frequency pairs, located in separate uplink and downlink frequency bands. Each band contains a number of carrier frequencies identified by channel numbers (UARFCN, UTRA Absolute Radio Frequency Channel Number). The assignment between channel numbers N and carrier center frequencies F is defined as:

$N = 5 \times (F - F_{Offset}) / MHz$

The tables below provide an overview of all bands, for uplink and downlink signals. For each band they list the offset frequencies F_{Offset}, channel numbers N and carrier center frequencies F. For some operating bands a second row indicates additional center frequencies, which are shifted by 100 kHz relative to the normal 200 kHz raster.

The table for uplink signals lists also the separation between uplink carrier frequency and downlink carrier frequency (frequency pair for one UE).

Table 6-14: Operating bands for uplink signals

Band	$F_{Offset, UL}$ [MHz]	Channel No N_{UL}	F_{UL} [MHz]	F_{DL}-F_{UL} [MHz]
1	0	9612 to 9888	1922.4 to 1977.6	190
2	0 1850.1	9262 to 9538 12 to 287 (step 25)	1852.4 to 1907.6 1852.5 to 1907.5	80
3	1525	937 to 1288	1712.4 to 1782.6	95
4	1450 1380.1	1312 to 1513 1662 to 1862 (step 25)	1712.4 to 1752.6 1712.5 to 1752.5	400
5	0 670.1	4132 to 4233 782, 787, 807, 812, 837, 862	826.4 to 846.6 826.5 to 842.5	45
6	0 670.1	4162 to 4188 812, 837	832.4 to 837.6 832.5, 837.5	45
7	2100 2030.1	2012 to 2338 2362 to 2687 (step 25)	2502.4 to 2567.6 2502.5 to 2567.5	120
8	340	2712 to 2863	882.4 to 912.6	45
9	0	8762 to 8912	1752.4 to 1782.4	95
10	1135 1075.1	2887 to 3163 3187 to 3462 (step 25)	1712.4 to 1767.6 1712.5 to 1767.5	400
11	733	3487 to 3587	1430.4 to 1450.4	48
12	-22 -39.9	3612 to 3678 3702, 3707, 3732, 3737, 3762, 3767	700.4 to 713.6 700.5 to 713.5	30
13	21 11.1	3792 to 3818 3842, 3867	779.4 to 784.6 779.5, 784.5	-31
14	12 2.1	3892 to 3918 3942, 3967	790.4 to 795.6 790.5, 795.5	-30
19	770 755.1	312 to 363 387, 412, 437	832.4 to 842.6 832.5, 837.5, 842.5	45
20	-23	4287 to 4413	834.4 to 859.6	-41
21	1358	462 to 512	1450.4 to 1460.4	48
S	0 1000.1	10012 to 10088 5012 to 5087 (step 25)	2002.4 to 2017.6 2002.5 to 2017.5	180
S 170 MHz	0	10050 to 10100	2010.0 to 2020.0	170

Band	$F_{Offset, UL}$ [MHz]	Channel No N_{UL}	F_{UL} [MHz]	F_{DL}-F_{UL} [MHz]
S 190 MHz	0 1000.1	10000 to 10050 5012, 5037	2000.0 to 2010.0 2002.5, 2007.5	190
L	0 -30.1	8145 to 8290 8295 to 8441	1629.0 to 1658.0 1628.9 to 1658.1	-101.5

If two carriers are active in the downlink (dual carrier HSDPA), they use adjacent channels, i.e. the two center frequencies are separated by 5 MHz, the channel numbers are separated by 25.

With F_1 and F_2 indicating the center frequency of carrier 1 and carrier 2 and F_{max} indicating the highest center frequency of the operating band, the following rules apply:

$F_2 = F_1 + 5\ MHz,\ if\ F_1 \leq F_{max} - 5\ MHz$

$F_2 = F_1 - 5\ MHz,\ if\ F_1 > F_{max} - 5\ MHz$

Table 6-15: Operating bands for downlink signals

Band	$F_{Offset, DL}$ [MHz]	Channel No N_{DL}	F_{DL} [MHz]
1	0	10562 to 10838	2112.4 to 2167.6
2	0 1850.1	9662 to 9938 412 to 687 (step 25)	1932.4 to 1987.6 1932.5 to 1987.5
3	1575	1162 to 1513	1807.4 to 1877.6
4	1805 1735.1	1537 to 1738 1887 to 2087 (step 25)	2112.4 to 2152.6 2112.5 to 2152.5
5	0 670.1	4357 to 4458 1007, 1012, 1032, 1037, 1062, 1087	871.4 to 891.6 871.5 to 887.5
6	0 670.1	4387 to 4413 1037, 1062	877.4 to 882.6 877.5, 882.5
7	2175 2105.1	2237 to 2563 2587 to 2912 (step 25)	2622.4 to 2687.6 2622.5 to 2687.5
8	340	2937 to 3088	927.4 to 957.6
9	0	9237 to 9387	1847.4 to 1877.4
10	1490 1430.1	3112 to 3388 3412 to 3687 (step 25)	2112.4 to 2167.6 2112.5 to 2167.5
11	736	3712 to 3812	1478.4 to 1498.4
12	-37 -54.9	3837 to 3903 3927, 3932, 3957, 3962, 3987, 3992	730.4 to 743.6 730.5 to 743.5
13	-55 -64.9	4017 to 4043 4067, 4092	748.4 to 753.6 748.5, 753.5
14	-63 -72.9	4117 to 4143 4167, 4192	760.4 to 765.6 760.5, 765.5

Band	$F_{Offset, DL}$ [MHz]	Channel No N_{DL}	F_{DL} [MHz]
19	735 720.1	712 to 763 787, 812, 837	877.4 to 887.6 877.5, 882.5, 887.5
20	-109	4512 to 4638	793.4 to 818.6
21	1326	862 to 912	1498.4 to 1508.4
S	0 1000.1	10912 to 10988 5912 to 5987 (step 25)	2182.4 to 2197.6 2182.5 to 2197.5
S 170 MHz	0	10900 to 10950	2180.0 to 2190.0
S 190 MHz	0 1000.1	10950 to 11000 5962, 5987	2190.0 to 2200.0 2192.5, 2197.5
L	-30.1 0	7788 to 7933 7637 to 7783	1527.5 to 1556.5 1527.4 to 1556.6

6.2.12 Trigger Signals

The WCDMA signaling application provides trigger signals that can be used by other R&S CMW applications to synchronize to the generated WCDMA downlink signal. This is especially useful to trigger WCDMA TX measurements (option R&S CMW-KM400). The signals can also be routed to the BNC connectors at the rear of the instrument.

The available trigger signals are described below.

To address the trigger signals in remote commands, use the following strings, with <i> replaced by the instance number of the signaling application:

- "WCDMA Sig<i>: Change of TFC Trigger"
- "WCDMA Sig<i>: Frame Trigger"
- "WCDMA Sig<i>: HS-DPCCH Trigger"
- "WCDMA Sig<i>: PRACH Trigger"
- "WCDMA Sig<i>: Slot Trigger"
- "WCDMA Sig<i>: TPC Trigger"

Change of TFC Trigger

This trigger signal reacts on changes of the Transport Format Combination Indicator (TFCI) in the UL DPCH and is aligned to the next DL frame border after that change. It basically generates a trigger event for all such changes.

The "Change of TFC" trigger signal is especially useful to trigger WCDMA TPC measurements in "Change of TFC" measurement mode (option R&S CMW-KM400). For this use case, configure a downlink RMC with loopback and 50 % downlink resources and select the TPC pattern "Change of TFC".

The TFC of the resulting signal changes every two frames (30 slots), because the DPDCH is alternately switched on or off.

Frame Trigger

Trigger event at the beginning of each downlink frame. The trigger is aligned to the downlink DPCH if available. Otherwise it is aligned to the CPICH.

HS-DPCCH Trigger

Trigger event at the beginning of each UL DPCH slot during which an ACK or NACK is expected from the UE. The minimum delay between two trigger events is one HSDPA subframe (3 slots).

The HS-DPCCH trigger event is suppressed if the expected ACK/NACK slot is not directly followed by a CQI slot. The periodicity of ACK/NACK and CQI slots (and possible DTX periods between the slots) depends on the CQI feedback cycle, CQI repetition factor and ACK/NACK repetition mode.

PRACH Trigger

Trigger event for each PRACH preamble successfully received and detected by the "WCDMA Signaling" application. The trigger event is located at a CPICH frame boundary, within 2 slots to 16 slots after the preamble.

The PRACH trigger signal can be used to trigger WCDMA "PRACH" measurements (option R&S CMW-KM400).

Slot Trigger

Trigger event at the beginning of each downlink DPCH slot. If no downlink DPCH is available, the trigger is aligned to the CPICH instead.

TPC Trigger

Trigger event one slot before a TPC pattern is sent to the UE via the downlink DPCH. For details see chapter 6.2.13.8, "Generating TPC Trigger Signals", on page 447.

This trigger signal is only available when the downlink signal contains a DPCH.

6.2.13 Transmit Power Control (TPC)

In CDMA networks, control of the UE transmit power is essential to ensure stable transmission and an efficient radio resource management within the system. An output power of the UE transmitter that is too low decreases the coverage area while an excess output power may cause interference to other channels or systems. Both effects decrease the system capacity.

The Node B transmits a series of Transmit Power Control (TPC) commands on the DL DPCH. The UE receives the TPC commands and adjusts its transmit power according to one of the following algorithms for uplink power control (see 3GPP TS 25.214):

- **Algorithm 1**:
  One TPC command is received in each slot. If the received TPC command is equal to 1 (0), then the power control parameter TPC_cmd for that slot is +1 (–1). This implies that the UE transmitter output power changes after each slot.

- **Algorithm 2**:
  One TPC command is received in each slot. The slots are grouped into sets of 5 slots, aligned to the frame boundaries, so that there is no overlap between different sets of 5 slots.
  If the received TPC command is equal to 1 (0) in all 5 slots of a set, then the power control parameter TPC_cmd for the 5^{th} slot is +1 (–1). Otherwise TPC_cmd for the 5^{th} slot is 0. This implies that the UE transmitter output power only changes if the same TPC command is received in a complete set of 5 slots.

For both algorithms, the UE transmitter output power changes by TPC_cmd multiplied with the TPC step size of 1 dB or 2 dB. According to 3GPP, the TPC step size for Algorithm 2 is always 1 dB. The step size for Algorithm 1 can be 1 dB or 2 dB.

6.2.13.1 TPC Pattern Setups

The R&S CMW provides several predefined setups with different TPC patterns. Some of these setups are fixed, some can be modified according to the needs of a specific application. The UE power resulting from a TPC pattern sent to the UE can be measured using the "WCDMA measurement" firmware application (option R&S CMW-KM400).

The following table provides an overview of the predefined setups. <Pattern> refers to a user-definable bit sequence.

Pattern Setup Name	Transferred Pattern
Closed Loop	Pattern suitable to command the UE to a configured target power, followed by an alternating pattern when the target power is reached. The target power can be specified as total power or as DPCH power, see Closed Loop TPC Setup.
Alternating	(1)010101010... The first bit of the pattern is different from the last bit transferred before the start of the pattern.
All 1	1111111111...
All 0	0000000000...
Single Pattern + Alternating	<Pattern>(0)101010101... The first bit after <Pattern> is different from the last bit in <Pattern>
Single Pattern + All 1	<Pattern>1111111111...
Single Pattern + All 0	<Pattern>0000000000...
Continuous Pattern	<Pattern><Pattern><Pattern><Pattern>...
Change of TFC	Alternating pattern and algorithm 2, suitable for "Change of TFC" measurements, see Change of TFC TPC Setup
Max. Power E-DCH	Pattern suitable for measurement of maximum output power with E-DCH, see Max. Power E-DCH TPC Setup
TPC Test Step ...	see TPC Test Steps for Inner Loop Power Control

Pattern Setup Name	Transferred Pattern
Phase Discontinuity Up	111110000 (repeated up to 13 times, then alternating pattern)
Phase Discontinuity Down	000001111 (repeated up to 13 times, then alternating pattern) See also TPC Patterns for Phase Discontinuity Measurements

6.2.13.2 Closed Loop TPC Setup

The closed loop TPC setup allows to command the UE to a configurable target power.

When the setup is executed, the instrument measures the UL power, sends suitable TPC commands to the UE, measures the UL power again and so on until the target power is reached. Then it sends an alternating pattern.

You can define the target power either as maximum UL DPCH power or as maximum total UL power. "Maximum" because both the DPCH power and the total power may vary during a call, even if the UL power is not changed via TPC commands. The DPDCH power for example may vary during a voice call, causing a change of the DPCH power and the total power. Or the HS-DPCCH power may vary depending on the transmitted contents (CQI, ACK/NACK, DTX), causing a change of the total power.

Please note that the closed loop algorithms use the configured gain factors to calculate the maximum expected power from measured UL power values. If the UE fails to apply the gain factors correctly, this will result in a deviation of the reached target power.

Many conformance test cases in 3GPP TS 34.121 request that the "power level of UE" is set to a specific value. Applying a total target power is appropriate in that case. Some test cases also request a specific uplink DPCH power, so that the target power should be defined as DPCH power. An example is 3GPP TS 34.121, section 5.13.1AA.4.2, step 5, where -18 dBm are requested for the "half-slot period with the lowest output power" (no HS-DPCCH power, only DPCH power).

6.2.13.3 Change of TFC TPC Setup

The conformance test specification 3GPP TS 34.121, section 5.6 "Change of TFC" defines a test for verification of the UE power steps caused by switching the DPDCH on or off.

For this test, an RMC with 12.2 kbps, loopback and 50 % downlink resources in use must be set up. To prevent the power control mechanism from counterbalancing the induced power steps, a power control algorithm 2 with alternating TPC pattern is used.

The TPC setup "Change of TFC" provides such an alternating TPC pattern with algorithm 2. It has been introduced to simplify the configuration of "Change of TFC" tests according to 3GPP. The RMC settings are not influenced by the selected TPC setup and must be configured additionally. Remember to reset the usage of downlink resources to 100 % when you want to use another TPC setup.

"Change of TFC" measurements can be performed as combined signal path measurements with the "TPC measurement" (included in R&S CMW-KM400).

6.2.13.4 Max. Power E-DCH TPC Setup

The conformance test specification 3GPP TS 34.121, section 5.2B "Maximum Output Power with HS-DPCCH and E-DCH" defines a test for verification of the maximum UE power with active HS-DPCCH and E-DCH. The test comprises five subtests.

Subtest 1 to 4 verify the maximum UE power for different RMC plus HSPA signals. The test procedure is identical for all four subtests. It requires algorithm 2 and the test pattern "m*11111+n*00000...01...". So m times a +1 TPC_cmd is sent, then n times a -1 TPC_cmd and finally the UE power is kept constant via an alternating pattern. The numbers n and m are dynamic and depend on the E-TFCI values received from the UE during the subtest.

Subtest 5 verifies the maximum UE power for an SRB plus HSPA signal (no RMC). It requires algorithm 1 and an "All 1" TPC pattern.

The "Max. Power E-DCH" TPC setup sends a TPC pattern suitable for subtest 1 to 4, if an "RMC+HSPA" test mode connection is configured. If an "HSPA" test mode connection is configured, it sends a TPC pattern suitable for subtest 5.

The signaling application provides a wizard for comfortable configuration of the signals required for the individual subtests, see chapter 6.2.16, "WCDMA Wizards", on page 451.

Please note that measurement resources are required by the "Max. Power E-DCH" setup for monitoring of the E-TFCI. Do not execute an HSUPA measurement in parallel (for example the E-HICH measurement), as this may cause a resource conflict. In that case, execution of the "Max. Power E-DCH" setup will either be slowed down, or fail (TPC state "Missing Resource").

For a detailed description of a combined signal path measurement including subtest 1 to 5, see chapter 6.3.4, "Maximum Power Measurements with E-DCH", on page 482.

6.2.13.5 TPC Test Steps for Inner Loop Power Control

The conformance test specification 3GPP TS 34.121, section 5.4.2 "Inner Loop Power Control" defines the TPC test steps A to H inducing a power ramp of the following shape:

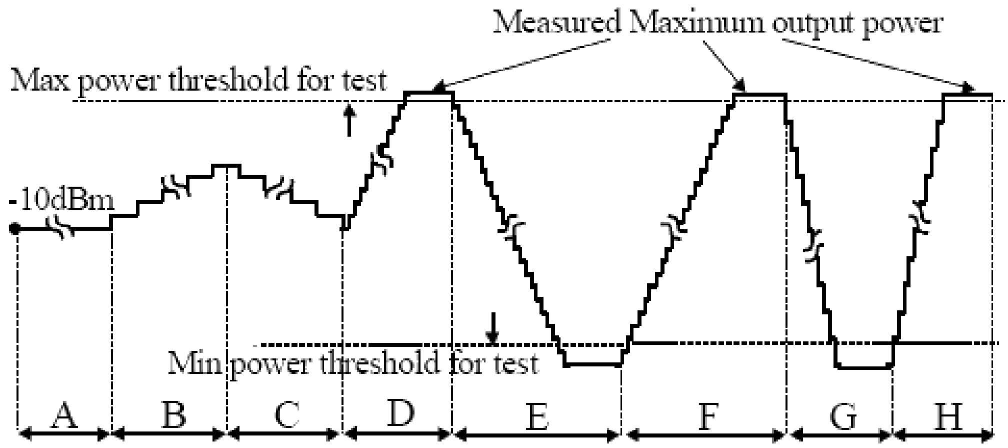


Fig. 6-8: TPC test steps A to H as defined by 3GPP

The R&S CMW offers most of these steps as fixed TPC pattern setups, see table below.

Pattern Setup Name	Transferred Pattern	Algorithm / Step Size
TPC Test Step ABC	A: 60-bit 3GPP pattern B: 50 x 1, C: 50 x 0 followed by alternating pattern	2 / 1 dB
TPC Test Step E	all 0	1 / 1 dB
TPC Test Step F	all 1	1 / 1 dB
TPC Test Step EF	n x 0, followed by all 1	1 / 1 dB
TPC Test Step GH	m x 0, followed by all 1	1 / 2 dB
	n and m are configurable. 3GPP requests "at least 10 more than ... required to ensure that the UE reaches ... minimum power"	

Segmented TPC Test Patterns

To improve the accuracy of the power steps, it is possible to split the TPC patterns for test steps E, F, G, and H into segments.

Segmentation means that inverse TPC commands are inserted into each of the four test step patterns: A …1111…1111… pattern changes to …11011…11011…, a …0000… 0000… pattern changes to …00100…00100…

The positions of the inverse TPC commands (segment borders) are fixed and known both by the signaling application and by the "TPC measurement" being available as part of R&S CMW-KM400. The measurement uses the inverse TPC periods to adjust the instrument hardware to the next input power range. The two UE power steps before and after each segment border are assumed to be equal. A difference in the measured UE power steps is attributed to the changed hardware settings and subtracted off:

- For the falling TPC patterns (E, G), the power steps after the segment borders are corrected.
- For the rising TPC patterns (F, H), the power steps before the segment borders are corrected.

As a consequence, the correction in the segment near the maximum UE output power is zero, and the segment near the minimum UE output power contains the sum of all corrections in the test step.

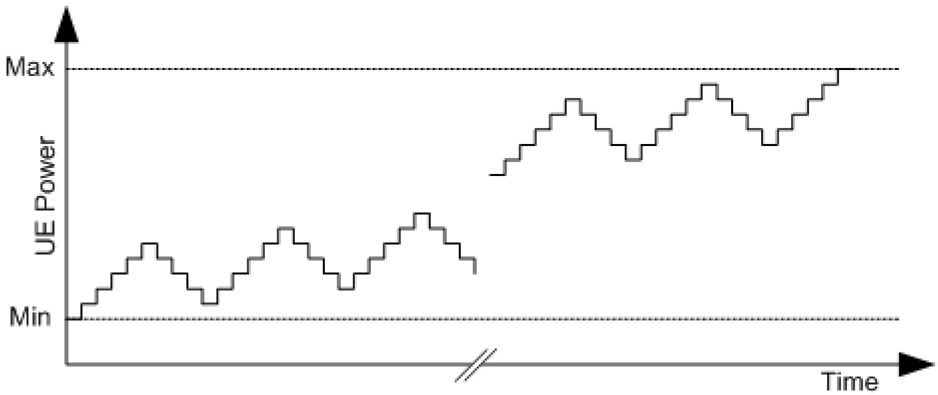
Unsegmented TPC test patterns correspond to the unmodified patterns described in 3GPP TS 34.121. However, segmented test patterns still comply with 3GPP specifications. Use segmented TPC test patterns to measure all power steps with maximum accuracy. Note that the corrections may add up to a systematic error of the measured absolute powers, especially in the segments near the minimum UE output power.

If the UE power steps are systematically above or below the specified values, the UE power towards the end of a test step may get outside the linear analyzer range, causing the TPC measurement to generate an "Overflow" or "Underflow" message. This can be due to the fixed segment borders and the correction method. It does not necessarily mean that any of the single UE power steps are out of their specified range.

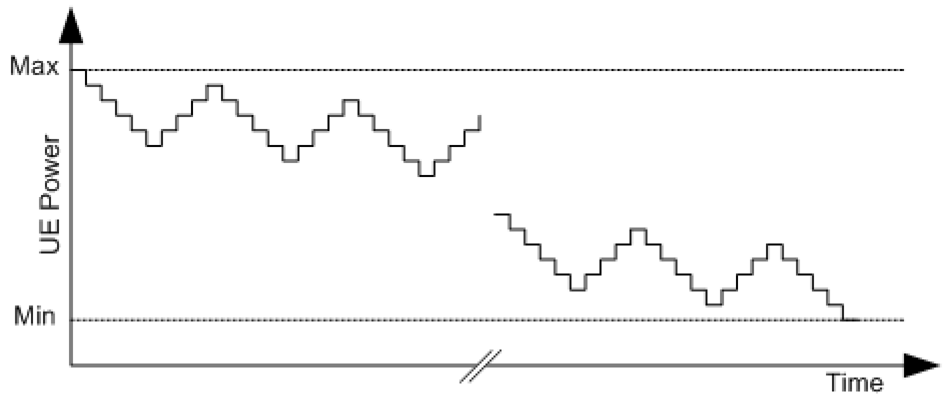
6.2.13.6 TPC Patterns for Phase Discontinuity Measurements

Phase discontinuity is the change in phase between any two adjacent timeslots. According to the conformance test specification 3GPP TS 34.121, a phase discontinuity measurement requires two special TPC patterns to be transmitted to the UE:

- **Phase Discontinuity Up**:
  Starting with minimum transmit power a sequence of five up and four down TPC commands has to be transmitted until the UE reaches maximum transmit power.



- **Phase Discontinuity Down**:
  Starting with maximum transmit power a sequence of five down and four up TPC commands has to be transmitted until the UE reaches minimum transmit power.



6.2.13.7 Rules for the Transfer of TPC Patterns

Administrable TPC patterns are transmitted via the downlink DPCH.

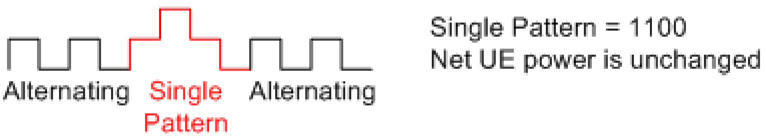
A pattern starts always at the beginning of a frame:

- A new pattern following an "All 0" or "All 1" pattern starts at the beginning of the first frame after the current frame.
- A new pattern following an "Alternating" pattern always starts at the next frame boundary where the last bit of the "Alternating" pattern is different from the first bit of the new pattern. This may be the first or second frame after the current frame.
- A running "Continuous Pattern" is immediately interrupted by a new pattern. The new pattern starts at the beginning of the first frame after the current frame.

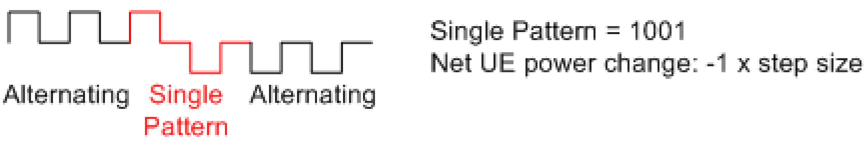
Example:

Single Pattern + Alternating can be used to first change the (average) UE power by a definite number of steps and then maintain the new (average) UE power. Due to the rules quoted above, the first and the last bit in <Pattern> cancel the effect of the preceding and the following bits. The rules tend to stabilize the net UE power and minimize the effect of <Pattern>.

It is easy to show this mechanism for power control algorithm 1 where the UE power changes after each slot by a definite step size. If the first and the last bits in <Pattern> are different, the net UE power change caused by these bits is zero. Example:



If both the first and the last bit in <Pattern> are 1 (0), then the net UE power change caused by these 2 bits equals the step size multiplied with 1 (–1); the effect of one bit is canceled. Example:



In contrast, each of the central 0 and 1 bits in <Pattern> (i.e. all bits except the first and the last bit) causes a UE power change of the step size multiplied with –1 and 1, respectively.

6.2.13.8 Generating TPC Trigger Signals

The WCDMA signaling application provides TPC trigger signals. These signals allow a measurement (e.g. a WCDMA TX measurement, option R&S CMW-KM400) to synchronize to the transferred TPC patterns, e.g. for measuring the resulting UE power.

For "Change of TFC" measurements, a dedicated trigger signal is available, see "Change of TFC Trigger" on page 439. The description below applies to "TPC Trigger" signals.

The trigger pulse related to a certain TPC pattern is generated one timeslot before the first TPC bit. Example: If the first TPC bit is transferred in the first timeslot (slot 0) of a frame, the trigger pulse is transmitted at the beginning of the last timeslot (slot 14) of the previous frame.

Depending on the pattern setup, a trigger pulse may be generated either once or it may be repeated periodically:

- Once: One trigger pulse is generated for the first TPC bit (slot 14 of previous frame) For the TPC setup "Max. Power E-DCH", one trigger pulse is generated when the maximum power has been reached. No trigger pulse is generated for the TPC bits sent to reach the maximum power.
- Periodic (10 Slot): The first trigger pulse is repeated every tenth bit/slot (slot 14, slot 9, slot 4, slot 14, ...)
- Periodic (Patt. Length), for Continuous Pattern only: Whenever the first bit of <Pattern> is transferred, a trigger pulse is generated in the previous timeslot. For a Continuous Pattern with length 1, a trigger pulse is generated in every second timeslot.

The assignment of one of these options to a pattern setup is fixed and displayed at the GUI, see chapter 6.4.10.4, "TX Power Control Settings", on page 539.

Trigger pulses are generated for pattern execution, not for reaching a precondition.

Configuring measurements for single trigger pulses

In order to use a trigger signal providing only one single trigger pulse ("Once" trigger) to trigger a measurement, you must configure the measurement so that it measures only one measurement interval - which is then triggered by the single trigger pulse.

If you configure more than one measurement interval, the second interval results in a trigger timeout.

Configuring only one measurement interval means setting the statistic counts to 1 and performing a single shot measurement.

6.2.13.9 Preconditions and Pattern Execution

For some measurements it is useful to command the UE to a specific precondition, e.g. the UE must transmit at maximum power.

Possible preconditions are:

- Min. Power: The UE is commanded to reach its minimum power.
- Max. Power: The UE is commanded to reach its maximum power.
- Target Power: The UE is commanded to the selected target power, followed by an alternating pattern when the target power is reached.
- Alternating: An alternating bit sequence is transmitted. The UE power is kept constant (for algorithm 1 alternating increase/decrease by one power step).

In order to reach the precondition of the active setup you can press the "Precond." button. But this is only required in exceptional situations. For maximum speed and convenience the precondition is reached automatically whenever possible. For the "Precond." button see chapter 6.4.10.4, "TX Power Control Settings", on page 539.

The pattern execution can be started by pressing the "Execute" button. If the precondition of the active TPC setup has not been reached when the "Execute" button is pressed, the precondition is reached first, then pattern execution is started. For TPC setups without precondition the pattern execution starts automatically whenever possible.

Events:

- When the signal is switched on:
  If the active TPC setup has a precondition, the precondition is reached automatically.
  If the active TPC setup has no precondition, pattern execution is started automatically.
- When the precondition of the active TPC setup is changed while the signal is on:
  The new precondition is reached automatically (if it is set to "None", pattern execution is started).
- When the active setup is changed while the signal is on:
  If the new TPC setup has a precondition, the precondition is reached automatically.
  If the new TPC setup has no precondition, pattern execution is started automatically.

Changes of the TX power control settings (including pressing the "Precond." or "Execute" button) may not be evaluated immediately while reaching a precondition or executing a pattern. Instead the changes are evaluated when pattern execution is finished or the minimum power, maximum power or target power has been reached. While an "Alternating" or "Continuous Pattern" TPC setup is executed, changes are evaluated at any time.

6.2.14 Random Access Procedure

Random access procedures are used when establishing the layer 1 communication between the UE and UTRAN, i.e. when the UE attempts a registration or connection towards the R&S CMW.

For this purpose the UE randomly selects access slots and transmits RACH preambles via the Physical Random Access Channel (PRACH) at increasing power until the Node B sends an ACK/NACK on the Acquisition Indicator Channel (AICH) or until the maximum number of preambles within one cycle is exceeded. After receiving an ACK the UE transmits a message, otherwise the ramping cycle is repeated.

The following figure shows a random access procedure where the UE receives an ACK after the fourth sent preamble.

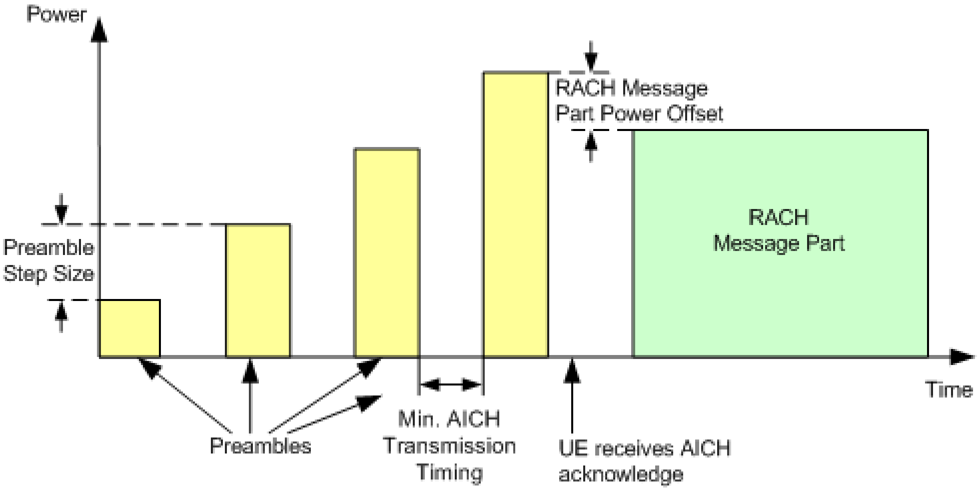


Fig. 6-9: Random access procedure

The minimum AICH transmission timing can be configured as part of the AICH settings, see chapter 6.4.9, "Physical Channel DL Settings", on page 523. For configuration of the other parameters related to the random access procedure see chapter 6.4.10.3, "PRACH Settings", on page 537.

Initial preamble power

According to 3GPP TS 25.331, the UE calculates the power of the first preamble of a preamble cycle using the following formula:

P = Minimum(<Max. allowed UE Power>, <UL Interference> + <Constant Offset Value> + <Signaled P-CPICH Level> – <CPICH_RSCP>)

with the following parameters:

- <Maximum allowed UE Power>, <UL interference>, <Constant Offset Value>, <Signaled P-CPICH Level>:
  These values are broadcasted to the UE. For configuration see:
  – "Maximum UE Power" on page 536
  – "UL Interference" on page 537
  – "Constant Offset Value" on page 537
  – "P-CPICH Enhanced > Signalized Level" on page 526
- CPICH_RSCP: denotes the CPICH Received Signal Code Power, i.e. the received signal power on one code, measured by the UE on the pilot bits of the P-CPICH.

The expected power of the first preamble is displayed at the GUI, see "Exp. Initial Preamble Power" on page 537.

6.2.15 Continuous Packet Connectivity (CPC)

By means of a CPC the UE is held online, so that the latencies occurred by a connection termination and reestablishment are avoided. In order to reduce the UE battery consumption at a time when no user data are transferred, there is a bundle of features that optimizes the support of packet data users in an R7 HSPA+ network. With increased acceptance of packet data services, a high number of users are supported in a cell. The main task of the CPC is to support control channels by reducing the control channel overhead for the Dedicated Physical Control Channel (DPCCH) in uplink, High Speed Dedicated Physical Control Channel (HS-DPCCH) in uplink and for the High Speed Shared Control Channel (HS-SCCH) in downlink. The next important task is to minimize the latency as perceived by the users in HSPA CELL_DCH state, and to avoid the frequent connection termination and re-establishment. R&S CMW supports the following CPC features:

- **UE Uplink Discontinuous Transmission (DTX)**
  Uplink DPCCH is transmitted from time to time according to a known activity pattern. This regular activity is needed to maintain synchronization and power control loop. The UE DTX is only active if there is no uplink data transmission on E-DCH or HS-DPCCH.
  Two uplink DPCCH activity patterns are possible per UE:
  – UE DTX cycle 1
    used temporarily, after an inactivity threshold UE changes from cycle 1 to 2
  – UE DTX cycle 2
    allows to transmit the uplink DPCCH less frequently than cycle 1

  On the picture below after the last uplink transmission on E-DCH, the UE waits for the duration of the "Inactivity Threshold" and then switches from UE DTX cycle 1 to the longer UE DTX cycle 2.

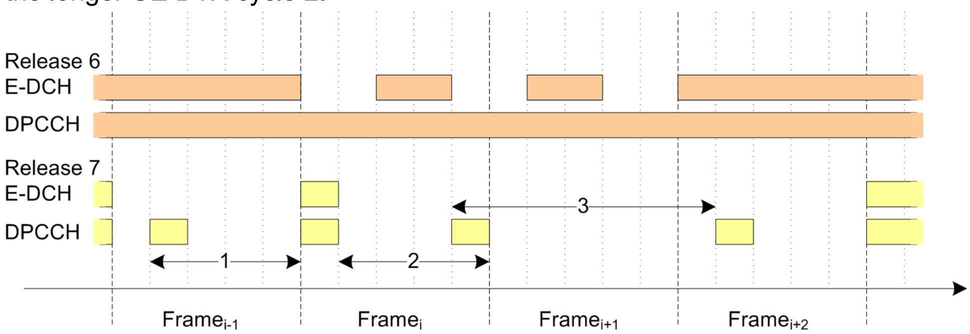


Fig. 6-10: Uplink DTX example, 2 ms TTI

  1 = DTX cycle 1
  2 = inactivity threshold for DTX cycle 2
  3 = DTX cycle 2

- **UE Downlink Discontinuous Reception (DRX)**
  DL DRX operation is only possible when the UL DTX operation is activated. Network limits the number of HS-SCCH subframes to be monitored by the UE in order to reduce UE battery consumption. Parameter UE_DRX_cycle sets which HS-SCCH subframes the UE has to monitor. The DRX also defines the monitoring of E-RGCH and E-AGCH downlink control channels, in general, when UE uplink data transmission is ongoing or has just stopped, the UE has to monitor these channels.

- **E-DCH TX start time restrictions**
  UE is forced to transmit only on pre-defined time instants, due that a MAC DTX cycle and a MAC inactivity threshold are introduced.
- **New UL-DPCCH slot format**
  For the new UL-DPCCH slot format no. 4 see the table below. This slot format contains four Transmit Power Control (TPC) bits in order to reduce DPCCH transmit power. Feedback Information (FBI) and Transport Format Combination Indicator (TFCI) bits are not sent.

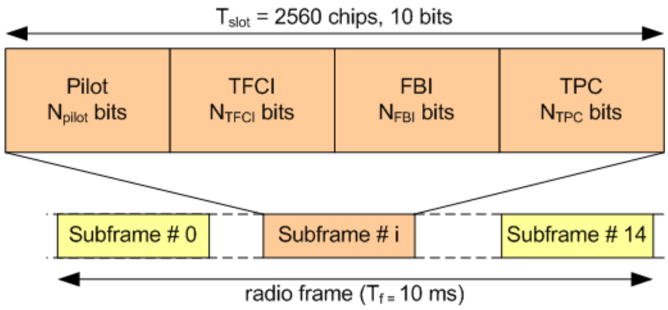


Table 6-16: Supported uplink DPCCH slot formats

Slot format	Channel Bit Rate [kbit/s]	Channel Symbol Rate [ks/s]	SF	N_{pilot}	N_{TPC}	N_{TFCI}	N_{FBI}	Transmitted slots per frame
1	15	15	256	8	2	0	0	8-15
2	15	15	256	5	2	2	1	15
3	15	15	256	7	2	0	1	8-15
4	15	15	256	6	4	0	0	8-15

6.2.16 WCDMA Wizards

The WCDMA wizards provide predefined sets of settings for HSDPA and HSUPA signals. Option R&S CMW-KS411 is required.

In general, using a wizard is the simplest and fastest way of configuring the instrument for maximum HSPA throughput or for "Max. Power E-DCH" tests. All settings can be further refined after the wizard has prepared a basic signal configuration.

Using the wizard

Before using a maximum throughput wizard, configure the relevant UE category correctly (for HSDPA see "UE Category" on page 565, for HSUPA see "UE Category" on page 573). If you want to use reported UE categories, register the UE, so that it sends a capability report. This is required because some HSPA settings are automatically configured compatible to the configured or reported UE category.

After registration or UE category configuration, execute the wizard (see chapter 6.4.4, "Using the WCDMA Wizards", on page 511).

Sets of settings

There are several sets of settings:

- "HSDPA Max. Throughput": HSDPA signal with maximum throughput
- "HSUPA Max. Throughput": HSUPA signal with maximum throughput
- "HSPA Max. Throughput": HSDPA and HSUPA signal with maximum throughput
- "HSUPA Maximum Output Power":
  Signal suitable for "Max. Power E-DCH tests" according to 3GPP TS 34.121, section 5.2B. The specification defines 5 subtests. The values set by the wizard depend on the selected subtest. RMC related parameters are only relevant for subtest 1 to 4 and not configured for subtest 5.

The following tables list the parameters configured by the wizards. You can configure additional required settings manually before or after executing a wizard.

Executing the "HSPA Max. Throughput" wizard has the same effect as executing first the "HSDPA Max. Throughput" wizard and then the "HSUPA Max. Throughput" wizard.

Table 6-17: Wizard settings for HSDPA maximum throughput

Parameter	Link to Parameter Description
All DL channel power levels	Table column "Level" in "Physical Downlink Settings", see chapter 6.4.9, "Physical Channel DL Settings", on page 523
UE terminating connection (Test Mode)	"UE term. Connection" on page 546
Test mode type (RMC + HSPA)	"Type" on page 548
Packet data DL data rate (HSDPA)	"Data Rate" on page 552
Packet switched domain (on)	"Packet Switched Domain" on page 554
HS-DSCH configuration type (User Defined)	"Configuration Type" on page 566
Inter TTI distance	"Inter TTI Distance" on page 570
Number of HARQ Processes (6)	"Number of HARQ Processes" on page 570
Transport block size index	"Transport Block Size Index" on page 571
Number of HS-PDSCH codes	"Number of Physical Channel Codes" on page 571
Modulation scheme	"Modulation" on page 571

Table 6-18: Wizard settings for HSUPA maximum throughput

Parameter	Link to Parameter Description
All DL channel power levels	Table column "Level" in "Physical Downlink Settings", see chapter 6.4.9, "Physical Channel DL Settings", on page 523
UE terminating connection (Test Mode)	"UE term. Connection" on page 546
Test mode type (HSPA)	"Type" on page 548
HSPA direction (HSPA)	"Direction" on page 551
UL RLC SDU size	"HSUPA UL RLC SDU Size" on page 551
Packet data UL data rate (HSUPA)	"Data Rate" on page 552

Parameter	Link to Parameter Description
Packet switched domain (on)	"Packet Switched Domain" on page 554
TTI mode	"TTI Mode" on page 573
Maximum channelisation code	"Maximum Channelisation Code" on page 574
Absolute grant pattern length (1)	"Pattern Length" on page 576
Absolute grant index (31)	"AG Index" on page 577

Table 6-19: Wizard settings for HSUPA maximum output power

Parameter	Link to Parameter Description
Downlink output power (-86 dBm)	"RF Power Downlink > Output Power (Ior)" on page 518
All DL channel power levels	Table column "Level" in "Physical Downlink Settings", see chapter 6.4.9, "Physical Channel DL Settings", on page 523
HS-SCCH selection (No. 1)	"Selection" on page 529
Number of HS-SCCH (4)	"Number of HSSCCH" on page 530
Unscheduled HS-SCCH subframes (Transmit Dummy UE ID)	"Unscheduled Subframes" on page 530
Maximum UE power (21 dBm)	"Maximum UE Power" on page 536
TPC setup (Max. Power E-DCH)	"Active TPC Setup" on page 540
Target power (0 dBm, total power)	"TPC Setup" on page 543
Gain factors for RMC 12.2 kbps and HSDPA	"βC, βD" on page 544
HSDPA power offset parameters	"ΔACK, ΔNACK, ΔCQI" on page 544
Signaled ΔE-DPCCH	"ΔE-DPCCH" on page 544
No of reference E-TFCIs, reference E-TFCIs	"No of Reference E-TFCIs, Reference E-TFCI" on page 544
UE terminating connection (Test Mode)	"UE term. Connection" on page 546
Test mode type (RMC + HSPA / subtest 5: HSPA)	"Type" on page 548
RMC data rate (12.2 kbps)	"Data Rate" on page 549
RMC loop mode (Loop Mode 1 RLC)	"Test Mode" on page 549
Test mode procedure (RMC on CS + HSPA 34.108)	"Test Mode Procedure" on page 550
HSPA direction (HSPA)	"Direction" on page 551
HSUPA UL RLC SDU size (2936)	"HSUPA UL RLC SDU Size" on page 551
Packet switched domain (on)	"Packet Switched Domain" on page 554
$Q_{qualmin}$ (-24 dB)	"Q qualmin" on page 559
$Q_{rxlevmin}$ (-115 dBm)	"Q rxlevmin" on page 559

Parameter	Link to Parameter Description
CQI feedback cycle (4 ms)	"CQI Feedback Cycle, CQI Repetition Factor" on page 565
CQI repetition factor (2)	"CQI Feedback Cycle, CQI Repetition Factor" on page 565
ACK/NACK repetition factor (3)	"ACK/NACK Repetition Factor" on page 565
Channel configuration (FRC)	"Configuration Type" on page 566
FRC H-Set (H-Set 1 QPSK)	"H-Set" on page 566
TTI mode (10 ms)	"TTI Mode" on page 573
E-TFCI table index (0)	"E-TFCI Table Index" on page 573
Minimum set E-TFCI	"Minimum Set E-TFCI" on page 574
Happy bit delay condition (100 ms)	"Happy Bit Delay Condition" on page 574
Puncturing limit (0.84)	"Puncturing Limit $PL_{non-max}$" on page 574
Maximum channelisation code	"Maximum Channelisation Code" on page 574
Initial serving grant (off)	"Initial Serving Grant" on page 575
HARQ power offset (0 dB)	"HARQ Power Offset" on page 575
Max retransmissions (7)	"Max Nr Of Retransmissions" on page 575
AG pattern length (1)	"Pattern Length" on page 576
AG index	"AG Index" on page 577
UE measurement reports (off)	"Report" on page 585

6.2.17 BER Measurement

The WCDMA Signaling BER Measurement tests the transmission performance on the complete signal path from the R&S CMW to the UE under test and back. To this end the UE is set to test loop operation where it returns the received and decoded data blocks back to the instrument. The R&S CMW compares its output signal with the received signal to derive the measurement results.

The measurement is especially suitable to assess the characteristics and the performance of the UE receiver at low RF power levels. Because of the higher signal level, transmission errors produced on the way back (from the UE to the instrument) can usually be neglected. To verify this assumption for UE receiver quality measurements, the uplink block error ratio (BLER) can be measured additionally.

UE test loops and bit error rates for conformance tests are specified in 3GPP TS 34.109.

BER Dialogs

The R&S CMW provides a separate tab and configuration dialog for BER tests, to be accessed from the "Measurement Controller" dialog, entry "RX Measurement...".

6.2.17.1 BER, BLER and DBLER Tests

To measure the Bit Error Rate (BER), Block Error Ratio (BLER) and Data Block Error Rate (DBLER) you must configure an RMC connection with test loop and without HSPA test mode. This section describes several suitable RMC and loop configurations.

The table below provides an overview of the configurations. For each configuration it lists the results that can be measured and the required RMC and loop settings. For a description of the corresponding parameters refer to chapter 6.4.11.5, "Test Mode Connection Settings", on page 548.

In reduced signaling mode, loop mode 2 with or without UL CRC is supported. Loop mode 1 is not supported.

Below the table the configurations are described in detail.

Configuration	Measured Results	Test Mode	RMC Data Rate	Loop Mode 1 RLC	Loop Mode 2 Sym. UL CRC
1	BER, DBLER, DL BLER	Loop Mode 2	UL=DL	n/a	Disabled
2	BER, DBLER, UL BLER	Loop Mode 2	UL=DL	n/a	Enabled
3	BER, DBLER	Loop Mode 2	UL < DL	n/a	Setting ignored, UL CRC enabled
		Loop Mode 1		Transparent	n/a

Acquisition error

If the UE does not close the loop and sends other data instead of looping back the received data, this results in an acquisition error (reliability indicator value 7). For the BER measurement an acquisition error indicates that the UL signal was decoded successfully, but the expected bit pattern was not found.

Configuration 1: Loop Mode 2 with symmetric data rate and disabled UL CRC

This configuration is described in 3GPP TS 34.109 for BLER measurements. Its purpose is to assess block errors originating in the downlink path. BER and DBLER can also be measured.

UL and DL data rate are equal. The UL transport block is bigger than the DL transport block. The UL CRC is disabled. The DL CRC' (including a possible error produced in the UE receiver) is incorporated into the UL transport block and received by the tester. This configuration is illustrated below for a 12.2 kbps RMC.

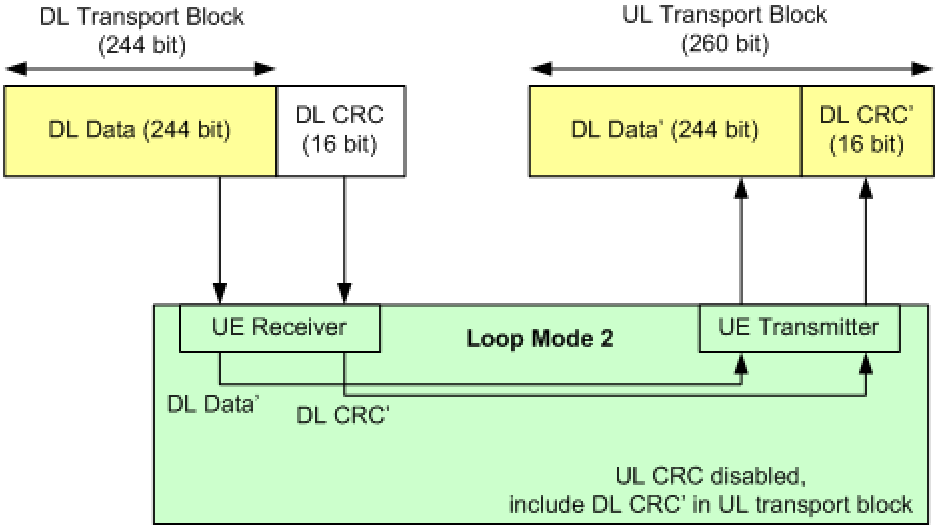


Fig. 6-11: Loop mode 2, UL CRC disabled (RMC with 12.2 kbps)

The results are calculated as follows:

- **DL BLER**: The R&S CMW checks whether the looped-back DL CRC' matches the looped-back DL Data' and divides the number of detected block errors by the total number of transferred blocks.
- **BER, DBLER**: The R&S CMW compares the looped-back DL Data' to the transmitted DL Data.

This configuration assumes that no errors are introduced in the uplink path. To verify this assumption the UL BLER can be measured using configuration 2.

Configuration 2: Loop Mode 2 with symmetric data rate and enabled UL CRC

This configuration can be used to assess block errors originating in the uplink path. BER and DBLER can also be measured.

UL and DL data rate are equal. The UL and DL transport block size are also equal. The UL CRC is enabled. This configuration is illustrated below for a 12.2 kbps RMC.

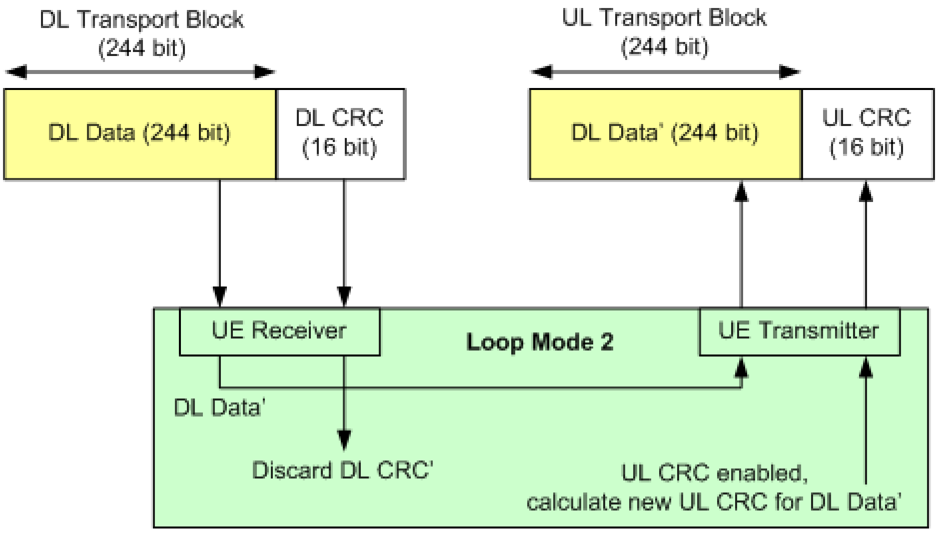


Fig. 6-12: Loop mode 2, UL CRC enabled (RMC with 12.2 kbps)

The results are calculated as follows:

- **UL BLER**: The R&S CMW compares the looped-back DL Data' with the UL CRC calculated by the UE (UL CRC check). The UL BLER is equal to the ratio of blocks with failed UL CRC check to the total number of blocks. The result is independent of errors introduced in the downlink path.
- **DBLER**: The R&S CMW checks whether the UL CRC calculated by the UE is equal to the DL CRC and divides the number of detected data block errors by the total number of transferred blocks.
- **BER**: The R&S CMW compares the looped-back DL Data' to the transmitted DL Data.

To ensure that the DL results BER and DBLER are not distorted by transmission errors in the UL, blocks with failed UL CRC check are not considered for the calculation of BER and DBLER.

Configuration 3: Asymmetric RMC data rates

Receiver quality tests at high data rates are to ensure that the UE receiver performance does not deteriorate under stress conditions. With asymmetric RMC data rates, the BER and DBLER can be measured even if the UE does not support high data rates in the uplink.

The transport block size increases with the data rate. Thus both the UL data rate and the UL transport block size are smaller than the DL data rate and DL transport block size. The UL CRC is enabled. Both loop mode 1 with RLC transparent mode and loop mode 2 can be used.

Assume that the DL data rate corresponds to N + n information bits per block, the smaller UL data rate to N information bits per block. Out of the N + n received bits, the UE loops back N bits plus a new UL CRC.

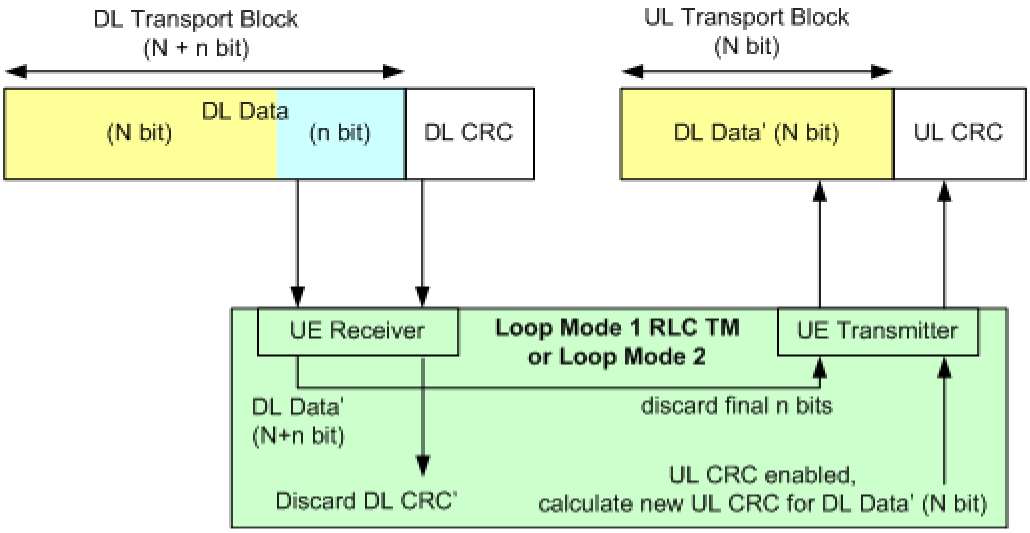


Fig. 6-13: Asymmetric RMC data rates, UL CRC enabled

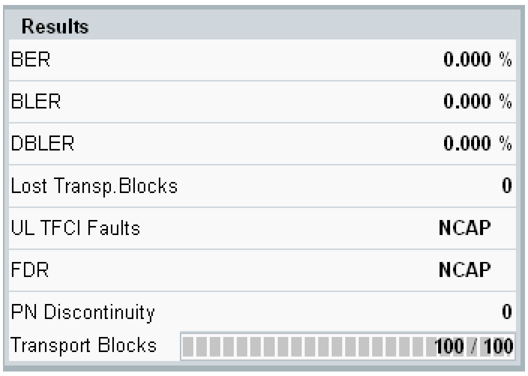
The results are calculated as follows:

- **BER**: The R&S CMW compares the looped-back DL Data' (N bit) to the transmitted DL Data (N bit). Assuming statistical independence of the bit errors the result is equal to the BER of all N + n data bits.
- **DBLER**: The DBLER is calculated as the ratio of the number of looped-back data blocks with bit errors to the total number of looped-back data blocks. The smaller UL block size means that this result is a lower limit for the DBLER that would be obtained by looping-back and evaluating all N + n data bits.

6.2.17.2 Measurement Results

All results of the Signaling BER measurement are shown in the lower left part of the "BER" tab of the RX measurements view.

The results are described briefly below. For additional information concerning the measurement procedures see chapter 6.2.17.1, "BER, BLER and DBLER Tests", on page 455.



Results	
BER	0.000 %
BLER	0.000 %
DBLER	0.000 %
Lost Transp.Blocks	0
UL TFCI Faults	NCAP
FDR	NCAP
PN Discontinuity	0
Transport Blocks	100 / 100

Fig. 6-14: WCDMA Signaling BER results

BER
Bit Error Rate, percentage of received erroneous data bits.

BLER
Block Error Ratio, percentage of received transport blocks with at least one erroneous bit in the data part or CRC field. The BLER can be determined for the downlink or for the uplink, depending on the UL CRC setting.

DBLER
Data Block Error Rate, percentage of received transport blocks with at least one erroneous bit in the data part (errors in CRC field are ignored).

Lost Transport Blocks
Difference between the number of blocks sent and the number of blocks received from the UE under test. Lost blocks do not enter into the calculation of BLER and DBLER, so the number of lost transport blocks is an additional indicator for the quality of the whole connection from the R&S CMW to the UE and back.

UL TFCI Faults
Percentage of transport blocks which the UE receiver detected with a wrong transport format, irrespective of the result of the CRC check(s).

This measurement result is not available in the current version, because BTFD RMCs are not yet supported.

FDR
False transmit format Detection Ratio; the percentage of transport blocks which passed the UE receiver's CRC check(s) but were detected with a wrong transport format.

This measurement result is not available in the current version, because BTFD RMCs are not yet supported.

PN Discontinuity
Number of transport blocks that the R&S CMW corrected (i.e. reordered) in the PN Resync procedure, see "PN Resync" on page 592.

Transport Blocks
During the first single shot after the start of the measurement, this value indicates the number of received transport data blocks and the total number of blocks to be measured per single shot. Two equal numbers indicate that the first shot is complete and the statistical depth has been reached. A measurement in continuous mode still continues and calculates results from the previous statistical cycle (e.g. the previous 100 transport blocks).

6.2.18 HSDPA ACK Measurement

The WCDMA Signaling HSDPA ACK measurement evaluates the demodulation of the downlink HS-DSCH by the UE and measures the data throughput. Thus it tests the UE receiver quality. Measurements can be performed in normal signaling mode and in reduced signaling mode. Option R&S CMW-KS401 is required.

HSDPA ACK Dialogs

The R&S CMW provides a separate tab and configuration dialog for HSDPA ACK tests, to be accessed from the "Measurement Controller" dialog, entry "RX Measurement...".

6.2.18.1 Performing HSDPA ACK Measurements

To perform a measurement you must set up an HSDPA connection (test mode or end to end data). The measurement supports standard cell scenarios and dual carrier scenarios.

If an HSDPA test mode connection is established, the signaling application sends data to the UE via the HS-DSCH, i.e. it sends HSDPA subframes to the UE. The UE shall confirm each successfully received subframe (successful CRC check) with a positive ACKnowledgement (ACK) returned via the HS-DPCCH. For unsuccessful transmissions the UE shall return a Negative ACKnowledgement (NACK).

If the UE fails to send a response to a transmission, this is counted by the measurement as Discontinuous Transmission (DTX). The probability of reporting DTX should be very low under the test conditions specified in 3GPP TS 25.101.

While the measurement is running, the R&S CMW evaluates the received ACKs/NACKs (and DTX) to calculate the measurement results. The UE must be synchronized to the downlink signal and provide a correctly timed uplink signal. Otherwise the ACK/NACK responses of the UE can not be evaluated correctly.

The redundancy and constellation version (RV) used by the R&S CMW for a transmission depends on the response of the UE to the previous transmission. The behavior is defined in 3GPP TS 25.101, section 9.1, see following table.

Table 6-20: Reaction to received ACK/NACK/DTX

HS-DPCCH ACK/NACK field state	R&S CMW behavior
ACK	New transmission using 1st RV
NACK	Retransmission using the next RV (up to the maximum permitted number or RVs)
DTX	Retransmission using the RV previously transmitted to the same H-ARQ process

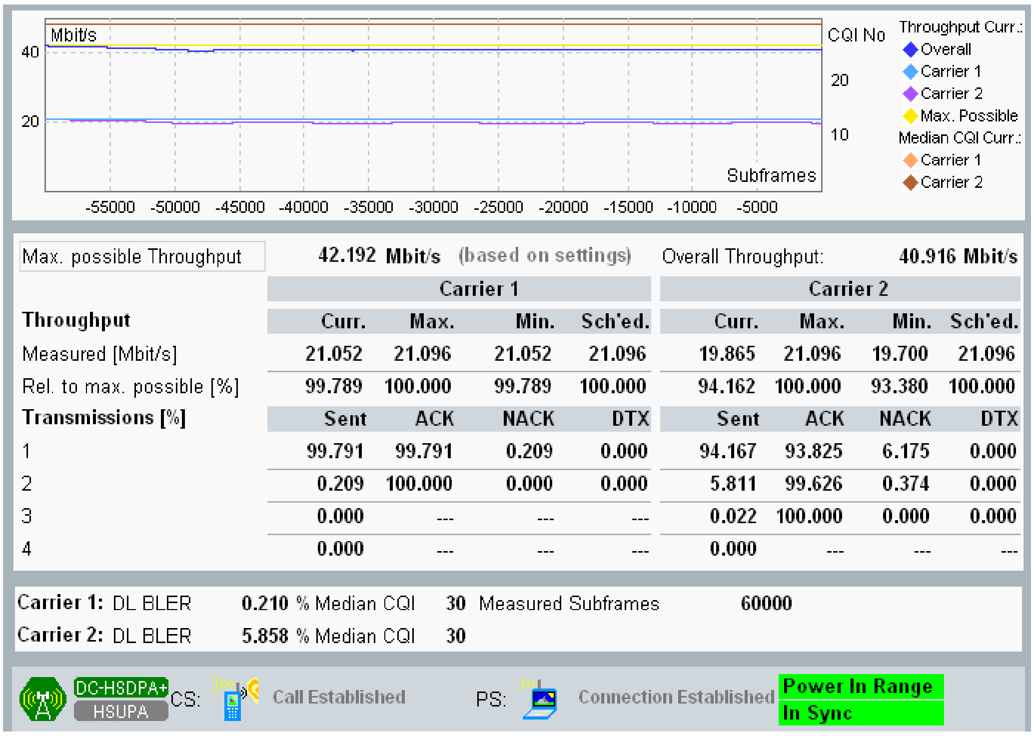
The most important HSDPA settings of the signaling application can be accessed directly from the measurement. Press the softkey "Signaling Parameter" to display the related hotkeys.

To configure the downlink HSDPA generator for ACK/NACK tests according to the conformance specification 3GPP TS 34.121, select a fixed reference channel as HSDPA configuration type in the HSDPA settings.

It is possible to insert wrong CRC values into the downlink data. For configuration see "Error Insertion" on page 551.

6.2.18.2 Measurement Results

All results of the measurement are shown on the "HSDPA ACK" tab of the RX measurements view. The results are described below.



Max. possible Throughput	42.192 Mbit/s	(based on settings)			Overall Throughput:			40.916 Mbit/s
	Carrier 1				Carrier 2			
Throughput	Curr.	Max.	Min.	Sch'ed.	Curr.	Max.	Min.	Sch'ed.
Measured [Mbit/s]	21.052	21.096	21.052	21.096	19.865	21.096	19.700	21.096
Rel. to max. possible [%]	99.789	100.000	99.789	100.000	94.162	100.000	93.380	100.000
Transmissions [%]	Sent	ACK	NACK	DTX	Sent	ACK	NACK	DTX
1	99.791	99.791	0.209	0.000	94.167	93.825	6.175	0.000
2	0.209	100.000	0.000	0.000	5.811	99.626	0.374	0.000
3	0.000	---	---	---	0.022	100.000	0.000	0.000
4	0.000	---	---	---	0.000	---	---	---

Fig. 6-15: WCDMA Signaling HSDPA ACK results

Diagram

The diagram provides a graphical presentation of selected results. The X-axis indicates the sent subframes, with the last sent subframe labeled 0, the previously sent subframe labeled -1 and so on. Each value is calculated per 100 measured subframes.

The traces indicate the current and maximum possible throughput in Mbit/s and the median CQI value. For a dual carrier scenario, there are separate current throughput traces per carrier and an overall trace. The median CQI trace is also available per carrier.

You can enable/disable the display of the individual traces via the softkey - hotkey combination "Display > Select Trace".

To scale the x-axis and the y-axis use the softkey - hotkey combination "Display > X Scale / Y Scale".

Max. possible Throughput

Maximum possible information bit throughput of the HSDPA link. This is not a measurement result, but a value calculated from the configured HS-DSCH parameters. It depends for example on the number of HARQ processes and the inter-TTI distance.

The value is calculated under the assumption that all transmission packets are acknowledged in the first transmission (no retransmissions necessary).

For a dual carrier scenario, it considers the sum of both carriers (maximum possible overall throughput).

Overall Throughput

This result is only available for dual carrier scenarios. It indicates the sum of the measured current throughputs of both carriers.

Throughput
Information bit throughput of the HSDPA link in Mbit/s and as percentage of the "Max. possible Throughput".

Several statistical results are provided per carrier:
- Current:
  Current throughput, updated in regular, non-configurable averaging intervals (smaller than a single shot statistics cycle). The averaging intervals are also used for the scheduled results.
  The current throughput is closely related to the DL BLER:
  Throughput [%] = 100 – DL BLER [%]
- Maximum/Minimum:
  Maximum and minimum "Current" throughput result since the start of the measurement
- Scheduled:
  Maximum effective throughput of the connection. This is the measured throughput of the downlink signal. It equals the current throughput assuming that all blocks are acknowledged in the first transmission.
  The scheduled throughput is relevant for data application tests on HSDPA connections. Here the scheduled throughput generally decreases because the MAC-d PDUs carrying the user bits do not always fill the complete MAC-hs payload. In addition, various limitations in the network and the application protocols can decrease the scheduled throughput.
  Thus the maximum possible throughput is usually not reached for data application tests. Instead the scheduled throughput can be reached if only ACKs are reported.
  In HSDPA test mode, the scheduled throughput is expected to be equal to the maximum possible throughput. Values larger than the maximum possible throughput are due to averaging effects, see below.

The fixed averaging intervals for the current and scheduled values have a variable overlap with the DL blocks. This causes the result to jitter around the average value.

Transmissions
The table rows refer to transmissions with the 1st to 4th Redundancy Version (RV). "Transmission" means, a sent HSDPA subframe.

It is recommended to select an RV coding sequence with up to four entries in the HSDPA settings. If you define a longer sequence, you will nevertheless only get results for the first four redundancy versions.

The "Sent" column indicates the percentage of transmissions with a certain redundancy version, e.g. 90% transmissions with first RV, 10% with second RV.

The columns "ACK", "NACK" and "DTX" indicate the percentage of transmissions with a certain redundancy version, that the UE has answered with ACK, NACK or not at all (sum of the values in each row = 100%).

All results are available per carrier.

DL BLER
Percentage of transmissions that were not acknowledged, irrespective of the used redundancy version.

*DL BLER = (#NACK + #DTX) / (#ACK + #NACK + #DTX) * 100%*

This result is available per carrier.

Median CQI
Median of the CQI values reported by the UE (i.e. the middle of the CQI distribution: half the reported CQIs are above and half below the median).

This result is available per carrier.

Measured Subframes
Total number of already measured transmission packets (HSDPA subframes).

In single shot mode both the number of already measured HSDPA subframes and the number of HSDPA subframes to be measured are displayed.

6.2.19 RLC Throughput Measurement

The WCDMA Signaling "RLC Throughput" measurement provides the total data throughput (PDU) and the useful data throughput (SDU) in the downlink and in the uplink.

RLC Throughput Dialogs
The R&S CMW provides a separate tab and configuration dialog for RLC Throughput tests, to be accessed from the "Measurement Controller" dialog, entry "RX Measurement...".

6.2.19.1 Performing RLC Throughput Measurements

You can perform the measurement either with an end to end data connection or with an RMC test mode connection.

The required steps are described below for both alternatives.

Measurement with end to end data connection

You must set up an end to end data connection and generate IP traffic. For these tasks you need a Data Application Unit (DAU) and related options.

1. Set up an end to end data connection as described in chapter 6.2.4, "End to End Packet Data Connections", on page 414.
   The required options are also listed there.
2. Use the DAU to generate IP traffic in the direction to be measured (uplink and/or downlink). You may for example perform an IPerf measurement. Or you could transfer data via FTP.
   For details refer to the DAU documentation.
3. Start the "RLC Throughput" measurement and evaluate the results.

Measurement with RMC test mode connection

You must set up an RMC test mode connection with specific loop settings. A DAU is not required.

1. Set up an RMC test mode connection with the following settings:
   - parameter Test Mode = "Loop Mode 1 RLC"
   - parameter Loop Mode 1 RLC = "Acknowledge"
2. Start the "RLC Throughput" measurement and evaluate the results.

6.2.19.2 Measurement Results

All results of the measurement are shown on the "RLC Throughput" tab of the RX measurements view. The results are described below.

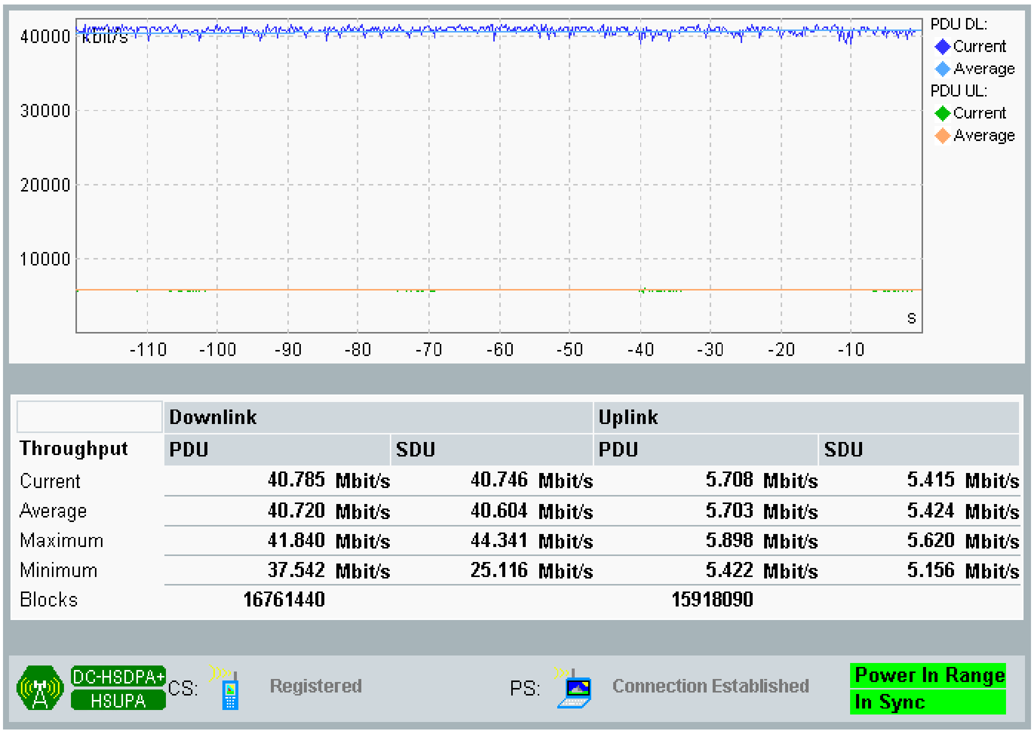


Fig. 6-16: RLC Throughput tab

Diagram

The diagram provides a graphical presentation of the PDU or SDU throughput results over the duration of a single-shot measurement.

The single-shot duration and the time interval used to derive a single result are configurable, see chapter 6.4.22.3, "Measurement Control Settings", on page 597.

You can enable/disable the display of the individual traces via the softkey - hotkey combination "Display > Select Trace".

To switch between PDU and SDU traces use the softkey - hotkey combination "Display > PDU | SDU".

Table

The throughput table indicates statistical throughput results for downlink and uplink, PDU and SDU.

In the downlink all sent blocks are considered, including retransmissions. The uplink results reflect all blocks that the R&S CMW could receive and take into account.

The data rates are calculated from the block size times the number of transmitted (PDU) or acknowledged (SDU) blocks per time unit. The PDU throughput corresponds to the nominal data rate of the connection; the SDU throughput is a measure for the useful data rate. If it is averaged over a sufficient period of time, the SDU throughput is always smaller than the PDU throughput.

The SDU throughput tends to jitter because the SDUs are not necessarily acknowledged immediately, which causes variable overlaps of the acknowledgement status reports from the UE and the evaluation periods for a single result. The jitter increases as the result interval is reduced. The PDU throughput is jitter-free because it is measured byte-wise on RLC level.

The "Blocks" value indicates the number of RLC PDUs that the R&S CMW transmitted (DL PDUs) or received (UL PDUs) since the beginning of the measurement.

Statistical Results

The statistical values are calculated as follows:

- **Current:** Value obtained in the last result interval.
- **Average:** Average of all "Current" values referenced to the last window size.
- **Minimum, Maximum:** Largest or smallest "Current" value that the R&S CMW obtained since the start of the measurement.

6.2.20 E-HICH Measurement

The purpose of the WCDMA Signaling "E-HICH" measurement is to test the detection of the E-DCH HARQ Indicator Channel (E-HICH). The R&S CMW transmits a selectable ACK/NACK pattern on the DL E-HICH and counts the number of correct and false responses of the UE.

The E-HICH measurement is suitable for the "Detection of E-DCH HARQ ACK Indicator Channel" test described in 3GPP TS 34.121, section 10.2.

E-HICH Dialogs

The R&S CMW provides a separate tab and configuration dialog for E-HICH tests, to be accessed from the "Measurement Controller" dialog, entry "RX Measurement...".

6.2.20.1 Performing E-HICH Measurements

To perform a measurement you must set up a connection with HSDPA and HSUPA (test mode or end to end data).

Conformance tests require that an all ACK and an all DTX pattern is transmitted via the E-HICH. To select these patterns see "HARQ Feedback (E-HICH)" on page 579.

While the measurement is running, the R&S CMW evaluates the Retransmission Sequence Number (RSN) that the UE transmits on the UL E-DPCCH:

- After receiving an ACK value, the UE is expected to indicate the transmission of a new data block (no retransmission).
- After receiving a NACK value or DTX, the UE is expected to indicate a retransmission.

In response to a received NACK or DTX value each block can be retransmitted several times until the maximum number of retransmissions is reached. After this limit, the UE will send new data, irrespective of the received HARQ indicator value. The first new data block after a complete retransmission cycle is not counted as a test sample.

6.2.20.2 Measurement Results

All results of the measurement are shown on the "E-HICH" tab of the RX measurements view. The results are described below.

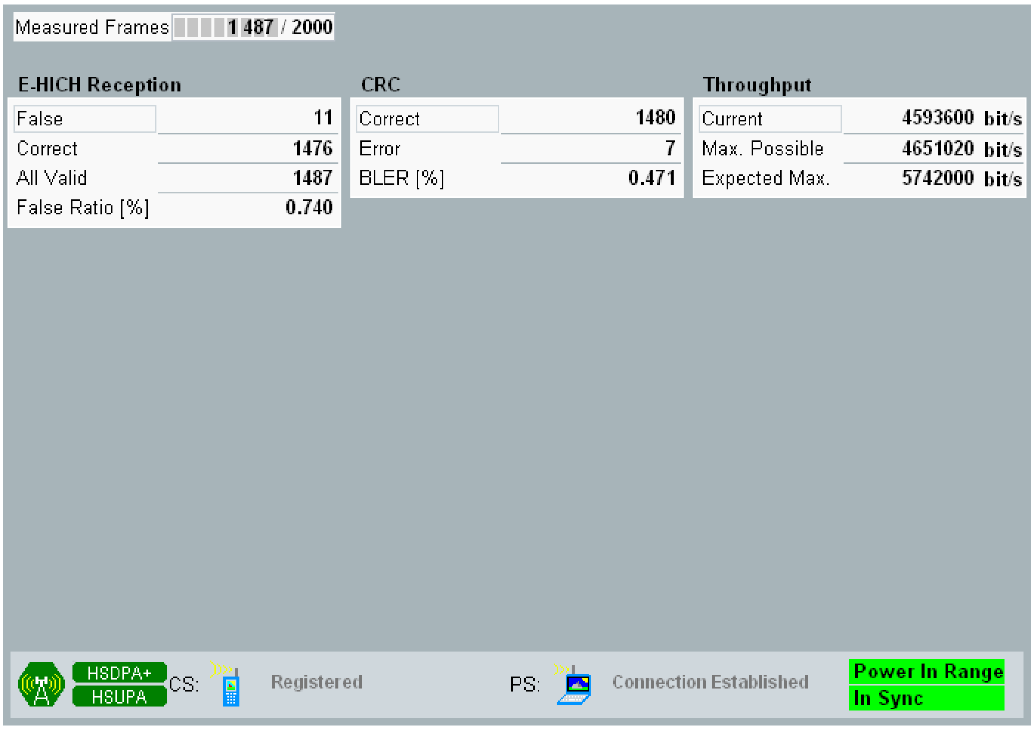


Fig. 6-17: E-HICH tab

Measured Frames

Total number of already measured transmission packets (subframes).

In single shot mode both the number of already measured subframes and the number of subframes to be measured are displayed.

E-HICH Reception

These results are based on the evaluation of the RSN field of the E-DPCCH and show the following values:

- **False**: Number of transmissions that the UE received incorrectly.

Two classes of events contribute to the false E-HICH reception:
  - The R&S CMW sends an ACK but the UE retransmits data (the "missed ACK" events from the conformance test specification).
  - The R&S CMW sends an NACK or DTX but the UE sends new data, although the maximum number of retransmissions is not yet reached (the "false ACK" events from the conformance test specification).
- **Correct**: Number of transmissions that the UE received correctly.
- **All Valid**: The sum of the previous two numbers.
  The first new data block after a complete retransmission cycle is not counted as a test sample. Therefore, the number of valid E-HICH receptions is possibly lower than the total number of "Measured Frames".
  Example: With an all NACK pattern transmitted to the UE and a maximum number of 7 retransmissions (8 transmissions in total), the ratio <All Valid E-HICH Receptions> to <Measured Subframes> is approximately 7/8.
- **False Ratio**: Ratio of "False" to "All Valid".

CRC

The CRC results are based on a CRC analysis of the E-DPDCH re-transmitted by the UE.

- **Correct**: Number of transmissions with correct CRC.
- **Error**: Number of transmissions with incorrect CRC.
- **BLER**: Block error rate; ratio of *<Error> / (<Correct> + <Error>)*.

Throughput

- **Current**: Data throughput on L1 level; number of E-DPDCH data bits (without CRC bits) that the R&S CMW could receive correctly per time unit.
  Transmissions with failed CRC check do not contribute to the current throughput.
  The R&S CMW calculates the current throughput from the number of packets received per time unit multiplied with the number of user data bits per packet, depending on the E-TFCI values received on the E-DPDCH.
- **Max.Possible**: "Current" throughput that would be measured if no CRC errors occured.
- **Expected Max.**: Expected maximum throughput, reachable if the UE sends at the maximum data rate (depends on the current settings) and no CRC errors occur. This value is greater or equal to the measured "Max.Possible" throughput.

6.2.21 UL Logging Measurement

The UL logging is applied on the following UL control channels:

- High Speed Dedicated Physical Control Channel (HS-DPCCH)
- Enhanced Dedicated Physical Control Channel (E-DPCCH)
- Dedicated Physical Control Channel (DPCCH)

UL logging dialogs

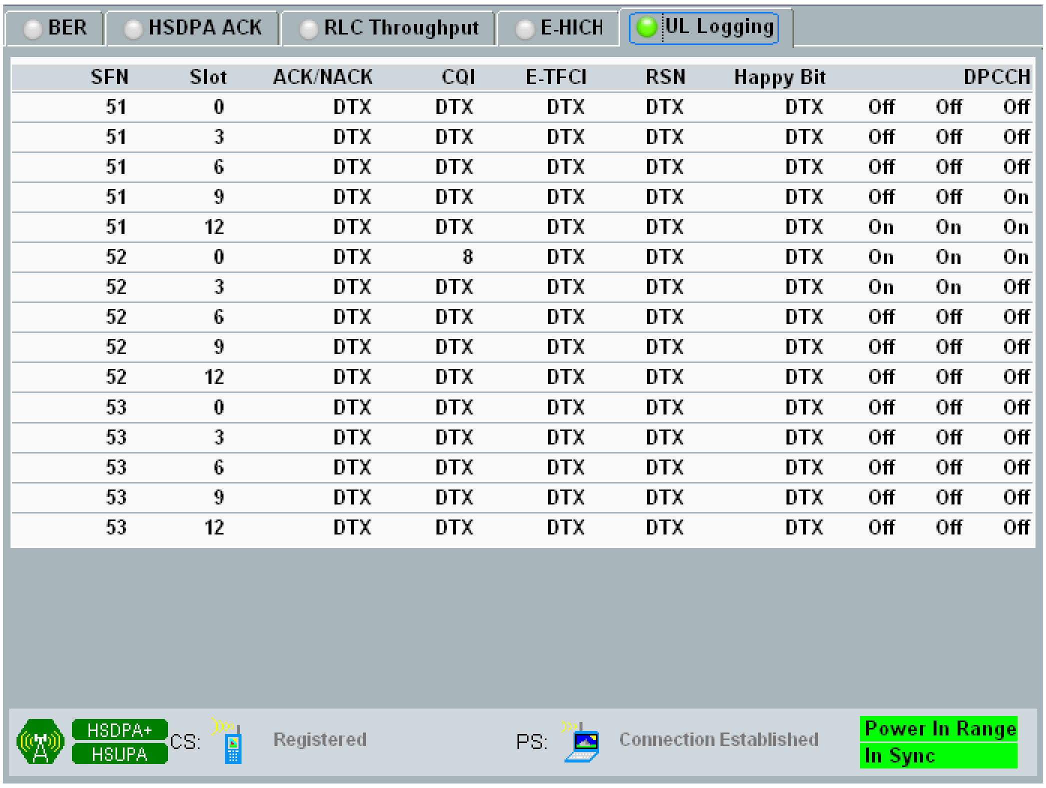
The R&S CMW provides a separate tab and configuration dialog for UL logging tests, to be accessed from the "Measurement Controller" dialog, entry "RX Measurement...".

6.2.21.1 Performing UL Logging Measurements

To perform a measurement you must set up a connection with HSDPA and HSUPA (test mode or end to end data). While the measurement is running, the R&S CMW evaluates information that the UE transmits on the UL HS-DPCCH, E-DPCCH and DPCCH.

6.2.21.2 Measurement Results

All results of the measurement are shown on the "UL Logging" tab of the RX measurements view. The results are described below.



SFN	Slot	ACK/NACK	CQI	E-TFCI	RSN	Happy Bit	DPCCH		
51	0	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
51	3	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
51	6	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
51	9	DTX	DTX	DTX	DTX	DTX	Off	Off	On
51	12	DTX	DTX	DTX	DTX	DTX	On	On	On
52	0	DTX	8	DTX	DTX	DTX	On	On	On
52	3	DTX	DTX	DTX	DTX	DTX	On	On	Off
52	6	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
52	9	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
52	12	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	0	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	3	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	6	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	9	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	12	DTX	DTX	DTX	DTX	DTX	Off	Off	Off

Fig. 6-18: UL logging tab

- **SFN:** System Frame Number (SFN) corresponding to the received UL HS-DPCCH/ E-DPCCH/DPCCH subframe number.
  Each line shows the results in the consecutive SFNs starting with the selected "Start SFN".
- **Slot:** first slot number of the received UL HS-DPCCH/E-DPCCH subframe.
  Each HS-DPCCH/E-DPCCH/DPCCH subframe contains three slots, so the first slot numbers are 0, 3, 6, 9, or 12.

The next two columns of the UL logging results provide information concerning HS-DPCCH:

- **ACK/NACK:** reported Hybrid Automatic Repeat Request Acknowledgment (HARQ-ACK) important for the transmission/retransmission process
- **CQI:** reported channel quality indicator in the range 0 to 30, 30 means the best quality

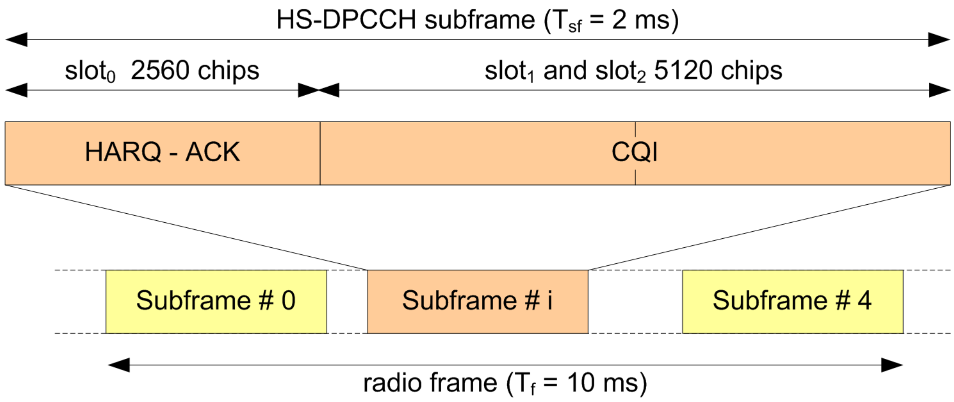


Fig. 6-19: HS-DPCCH frame structure

The E-DPCCH provides information required to decode Enhanced Dedicated Physical Data Control Channel (E-DPDCH) in HSUPA. The next three columns of the UL logging results provide information concerning E-DPCCH:

- **E-TFCI:** E-DCH Transport Format Combination Indicator (E-TFCI) indicates the transport block size on the E-DPDCH
  The table below shows the mapping between the E-TFCI value and the transport block size according to 3GPP TS 25.321 table B.1.

Table 6-21: 2ms TTI E-DCH transport block size

E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)
0	18	30	342	60	1015	90	3008	120	N/A
1	120	31	355	61	1053	91	3119	121	9241
2	124	32	368	62	1091	92	3234	122	9582
3	129	33	382	63	1132	93	3353	123	9935
4	133	34	396	64	1173	94	3477	124	10302
5	138	35	410	65	1217	95	3605	125	10681
6	143	36	426	66	1262	96	3738	126	11075
7	149	37	441	67	1308	97	3876	127	11484
8	154	38	458	68	1356	98	4019		
9	160	39	474	69	1406	99	4167		
10	166	40	492	70	1458	100	4321		
11	172	41	510	71	1512	101	4480		
12	178	42	529	72	1568	102	4645		
13	185	43	548	73	1626	103	4816		
14	192	44	569	74	1685	104	4994		
15	199	45	590	75	1748	105	5178		
16	206	46	611	76	1812	106	5369		

E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)	E-TFCI	TB Size (bits)
17	214	47	634	77	1879	107	5567		
18	222	48	657	78	1948	108	5772		
19	230	49	682	79	2020	109	5985		
20	238	50	707	80	2094	110	6206		
21	247	51	733	81	2172	111	6435		
22	256	52	760	82	2252	112	6672		
23	266	53	788	83	2335	113	6918		
24	275	54	817	84	2421	114	7173		
25	286	55	847	85	2510	115	7437		
26	296	56	878	86	2603	116	7711		
27	307	57	911	87	2699	117	7996		
28	318	58	944	88	2798	118	8290		
29	330	59	979	89	2901	119	8596		

- **RSN:** retransmission sequence number on the E-DPDCH
  – 0 - new transmission
  – 1 - first retransmission
  – 2 - second retransmission
  – 3 - higher than second retransmission
- **Happy bit:** indicator whether the UE is satisfied with the granted data rate allocated on the E-DPDCH

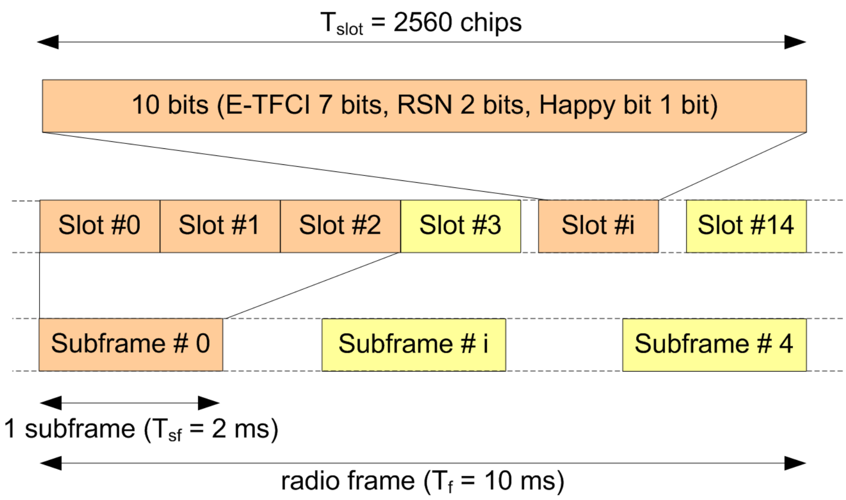


Fig. 6-20: E-DPCCH frame structure

The timing relationship between E-DPCCH and HS-DPCCH can be derived from the timing relationship between physical channels described in 3GPP TS 25.211.

- **DPCCH:** status of DPCCH.
Three columns present information read out from the first, second and third slot of the DPCCH subframe.

6.3 Application Sheets

Application sheets describe short application examples for select issues and provide related background information. The following application sheets are related to the "WCDMA Signaling" firmware application.

6.3.1 Combined Signal Path Measurements

This application sheet describes how to establish a Circuit Switched (CS) connection to a WCDMA User Equipment (UE) and perform TX measurements on the received uplink signal.

Sequencer tool R&S CMWrun

The automated test capabilities of R&S CMWrun make many measurement tasks easier. Option R&S CMW-KT053 provides configurable WCDMA and GSM test modules and test plans for R&S CMWrun.

6.3.1.1 Options and Equipment Required

A WCDMA combined signal path measurement requires the following equipment:

- Wideband Radio Communication Tester R&S CMW500 with software version ≥ V1.0.15.0 or R&S CMW280 with software version ≥ V1.0.15.20. The latest software version is recommended.
This application sheet describes software version V3.0.20.
- Option R&S CMW-KS400, "WCDMA Signaling" application
- Option R&S CMW-KM400, "WCDMA TX Measurements"

6.3.1.2 Setting up a Connection

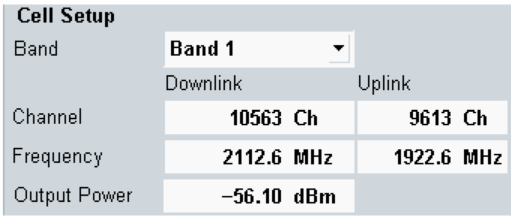
An established connection to the UE is a prerequisite for all signaling tests, including the combined signal path measurement described in this application sheet.

To set up a connection for the CS domain,

1. Preset your R&S CMW to ensure a definite instrument state.

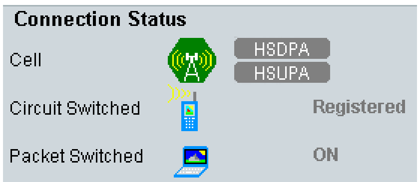
2. Open the "WCDMA Signaling" application, e.g. from the task bar (press "TASKS" to open the task bar).
   If the application is not present in the task bar, enable it in the "Generator/Signaling Controller" dialog (press "SIGNAL GEN" to open the dialog).
3. In the main view of the signaling application adjust the "Cell Setup" settings to the capabilities of your UE.

   The "Frequency" must be supported by the UE and the "Channel Output" power must be sufficient.

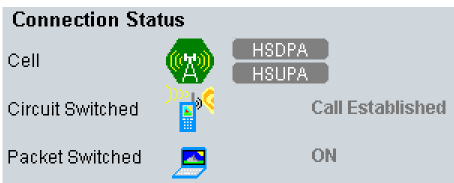
4. Press the "Config" hotkey to open the configuration dialog.
5. In section "RF Settings" select a bidirectional RF connector for input and output. In this example RF 1 COM is used.
   If necessary, also adjust the "External Attenuation" settings.
6. Close the configuration dialog.
7. Connect your UE to the RF 1 COM connector.
8. To turn on the DL signal press "ON | OFF" and wait until the "WCDMA-UE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.
9. Switch on the UE.

   The UE synchronizes to the DL signal and registers. Note the connection states displayed in the main view and wait until registration is complete.

   After the UE has registered, the main view provides UE information, UE capability information and the UE measurement report.
10. Press the "Connect Test Mode" hotkey to set up a connection.

    Note the connection states displayed in the main view and wait until the connection (the call) has been established.

11. With enabled measurement reporting, the properties of the uplink signal change whenever a report is received, resulting e.g. in power steps. So if you want to perform TX measurements, especially power measurements or tests expecting a continuous RMC signal, disable measurement reporting:
    a) Press the "Config" hotkey to open the configuration dialog.
    b) In section "UE Measurement Report" disable "Report".
    c) Close the configuration dialog.

Failed registration

Registration can fail if authentication or security is disabled but the UE expects/requires an authentication or security procedure. It can also fail if authentication or security is enabled but not supported by the UE or the SIM card type or secret key do not match. Related settings can be accessed via the configuration dialog, section "Network > Security Settings".

6.3.1.3 Analyzing the UL Signal from the UE

While an established connection is available, the UL signal of the UE can be monitored using a WCDMA measurement provided by option R&S CMW-KM400.

To ensure compatible measurement settings, the measurement must be coupled to the "WCDMA Signaling" application. This is done by selecting the combined signal path scenario in the measurement. As a result the measurement application uses the most important settings of the signaling application, e.g. the RF settings.

The following example applies to a multi evaluation measurement.

Proceed as follows:

1. Use the "WCDMA TX Meas" softkey to switch to the multi evaluation measurement.

   The measurement application is opened and the combined signal path scenario is selected automatically.
   If required, select the "Multi Evaluation" tab.
2. Press the "Trigger" softkey followed by the "Trigger Source" hotkey and select a trigger signal provided by the signaling application, e.g. the frame trigger signal.
3. Press "ON | OFF" to start the measurement.
   The main view provides an overview of the measurement results.
4. To enlarge a diagram presented in the main view perform one of the following actions:
   a) Double-click it using a connected mouse.
   b) Select it by turning the rotary knob and open it by pressing the rotary knob.

   The following example shows the enlarged "Emission Mask" view.

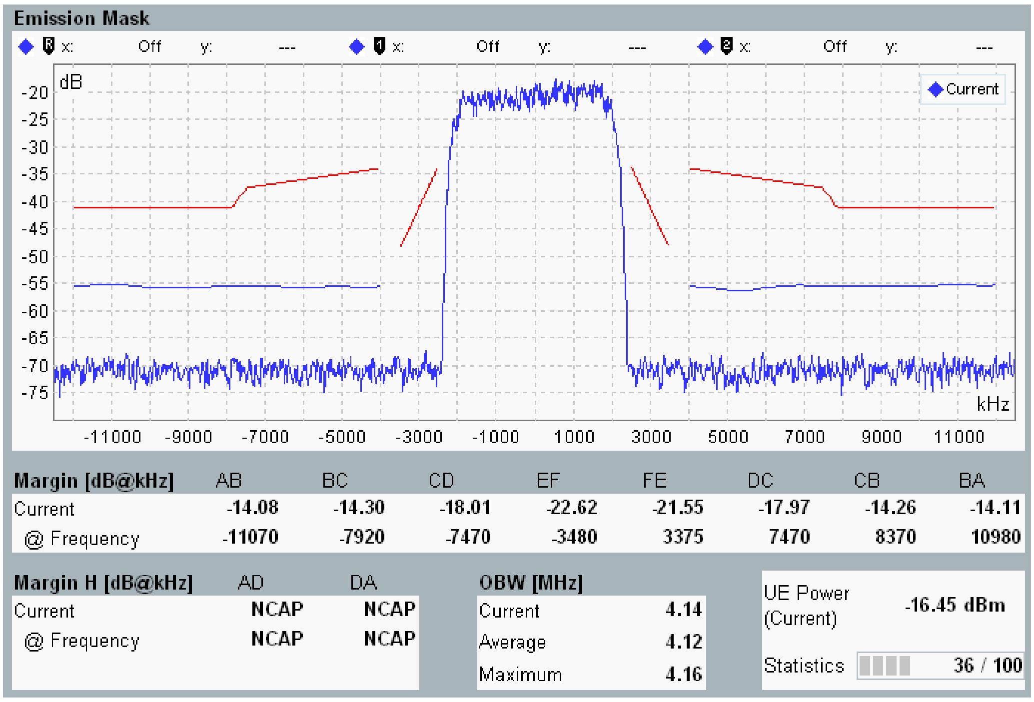


Fig. 6-21: Spectrum emission mask results

Other measurements can be used in a similar way. For a TPC or PRACH measurement you do not need to set the trigger source (step 2). The TPC measurement presents all results in a single view.

6.3.1.4 Possible Extensions

While the connection is established, you can vary "WCDMA Signaling" settings and observe the behavior of the UE under test using a measurement.

The WCDMA measurement and signaling applications can be enhanced by a number of options, e.g.:

- Options R&S CMW-KM401/-KS401 add R5/6 (HSPA) support to R&S CMW-KM400/-KS400.
- Options R&S CMW-KM403/-KS403 add R7 (HSPA+) support to R&S CMW-KM401/-KS401.

6.3.2 Handover from WCDMA to GSM

This application sheet describes how to perform an inter-RAT handover for a circuit switched WCDMA voice call or RMC connection. The connection is configured and established using the "WCDMA Signaling" application. Then a handover to the "GSM Signaling" application is performed.

6.3.2.1 Options and Equipment Required

A handover from WCDMA to GSM requires the following equipment:

- Wideband Radio Communication Tester R&S CMW500 with at least two RF RX/TX signal paths and one advanced frontend or two basic frontends.
  This application sheet assumes an instrument with two RX/TX modules and two frontends (6 RF connectors at the front panel).
- Software version ≥ V1.0.15.23. The latest software version is recommended.
  This application sheet describes software version V3.0.20.
- Option R&S CMW-KS200, "GSM Signaling" application (GSM R6 basic signaling)
- Option R&S CMW-KS400, "WCDMA Signaling" application (WCDMA R99 basic signaling)

6.3.2.2 Test Setup

An inter-RAT handover requires to emulate cells for both technologies in parallel. This is only possible if the two signaling applications use independent RF signal paths. For an instrument with two RX/TX modules and two frontends, one signal path uses module RX1/TX1 and the left frontend (RF 1/2 connectors), the other signal path uses module RX2/TX2 and the right frontend (RF 3/4 connectors).

Connect the mobile to both signal paths. If the mobile provides only one antenna connector, use an external combiner to connect the mobile to both frontends. If the mobile provides separate antenna connectors for GSM and WCDMA, you can connect each of them to one frontend.

In the following example the "WCDMA Signaling" application uses RF 1 COM (left frontend, RX1/TX1) and the "GSM Signaling" application uses RF 3 COM (right frontend, RX2/TX2).

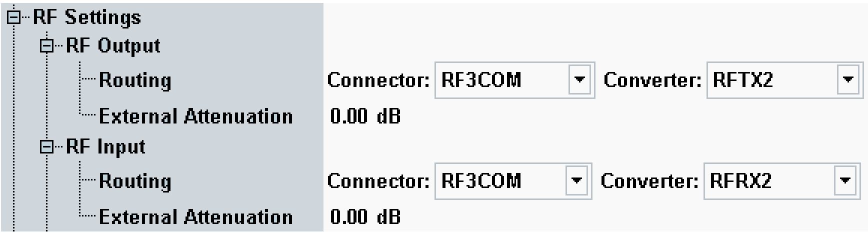
6.3.2.3 Preparing a Handover

To prepare a handover, both signaling applications must be configured and a WCDMA CS connection must be set up. These steps are described in detail below.

As a prerequisite the mobile must be connected, see section Test Setup.

1. Configure the "GSM Signaling" application:
   a) Open the application, e.g. from the task bar (press "TASKS" to open the task bar).
   If the application is not present in the task bar, enable it in the "Generator/Signaling Controller" dialog (press "SIGNAL GEN" to open the dialog).
   b) Press the "Config" hotkey to open the configuration dialog.

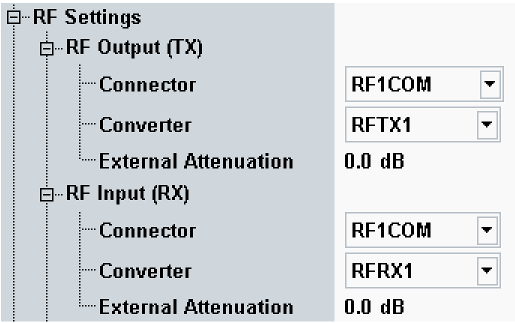
c) In section "RF Settings" select RF 3 COM for input and output.



d) Configure the other parameters as usual. No special settings are required for handover.
Ensure e.g. that the configured band is supported by the mobile and the configured downlink power is sufficient.

2. Configure the "WCDMA Signaling" application:

a) Open the application, e.g. from the task bar.
b) Press the "Config" hotkey to open the configuration dialog.
c) In section "RF Settings" select RF 1 COM for input and output.

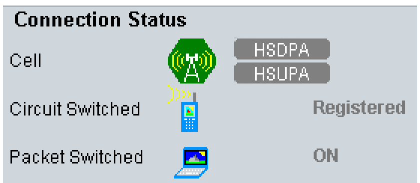


d) Configure the other parameters as usual for an RMC or voice connection. No special settings are required for handover.
Ensure e.g. that the configured band is supported by the mobile, the configured downlink power is sufficient, the expected nominal power setting is configured according to the uplink signal and the security settings are compatible to the mobile.

3. To turn on the WCDMA downlink signal press "ON | OFF" and wait until the "WCDMA-UE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.

4. Switch on the mobile.

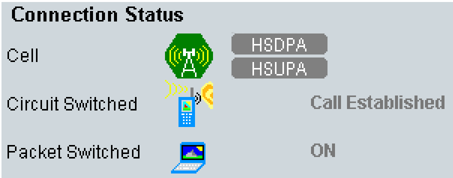
The mobile synchronizes to the DL signal and registers. Note the connection states displayed in the main view and wait until registration is complete.



The "GSM Signaling" application is still switched off at this point. Otherwise it could happen that the mobile synchronizes to the GSM signal instead of the WCDMA signal.

5. Press the "Connect ..." hotkey to set up a WCDMA CS voice or RMC connection.

   Note the connection states displayed in the main view and wait until the connection (the call) has been established.



6.3.2.4 Initiating the Handover

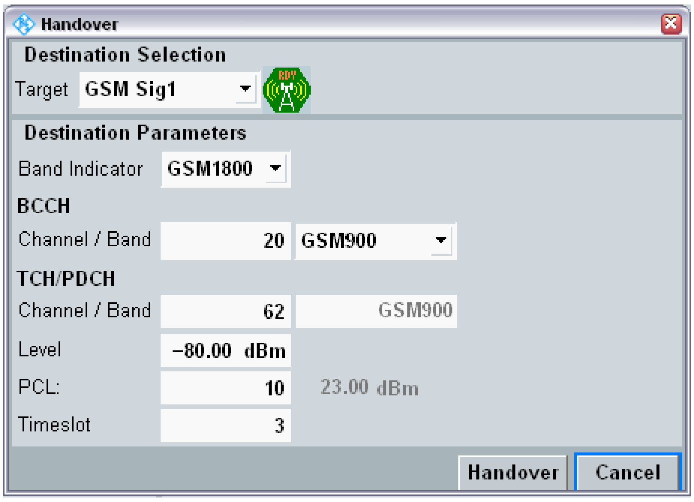
After you have completed the preparations described in the preceding section, perform the following steps to initiate a handover.

1. Press the "Handover" hotkey in the "WCDMA signaling" application.

   The handover configuration dialog opens.

2. Select the GSM Signaling application as handover target and configure the destination band and channel.

   As a result, the GSM downlink signal is turned on automatically. Wait until the cell icon in the handover dialog indicates RDY (ready for handover).



3. To initiate the handover press the "Handover" key in the dialog.

   The WCDMA CS connection state changes from "Call Established" to "Outgoing Handover in Progress", while the GSM CS connection state changes from "ON" to "Incoming Handover in Progress".

When the handover has been completed, the WCDMA CS state changes to "ON", the GSM CS state to "Call Established" and the GSM cell state to "ON".

6.3.3 Inner Loop Power Control Tests

This application sheet describes how to perform a WCDMA inner loop power control test, as defined in 3GPP TS 34.121, section 5.4.2.

6.3.3.1 Options and Equipment Required

A WCDMA inner loop power control test requires the following equipment:

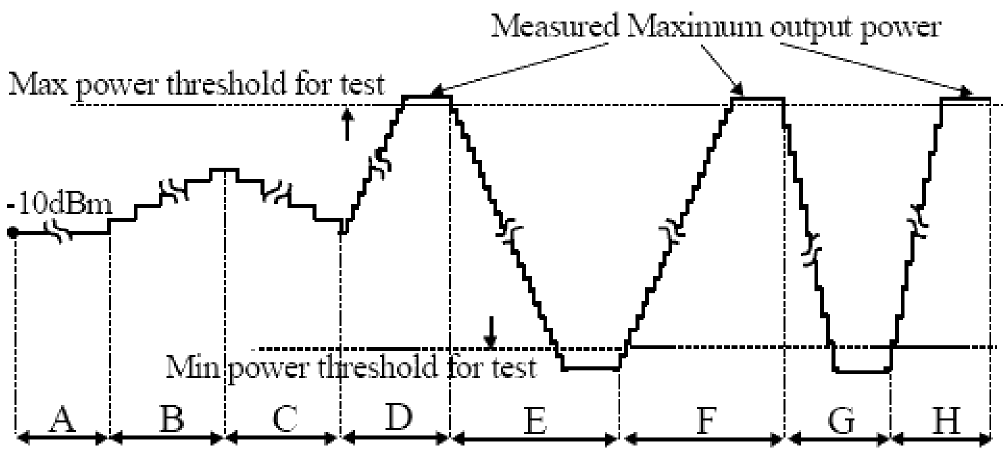
- Wideband Radio Communication Tester R&S CMW500 or R&S CMW280 with software version ≥ V2.1.20. The latest software version is recommended. This application sheet describes software version V3.0.20.
  The tester must be equipped with a wideband signaling unit (R&S CMWB300A).
- Option R&S CMW-KS400, "WCDMA R99, basic signaling"
- Option R&S CMW-KM400, "WCDMA R99, TX measurement, uplink"

6.3.3.2 Test Overview

In CDMA networks, control of the UE transmit power is essential to ensure stable transmission and an efficient radio resource management within the system.

For that reason the Node B controls the UE power via the transmission of Transmit Power Control (TPC) commands on the DL DPCH. The UE is expected to adjust its transmit power according to the received TPC commands.

The inner loop power control test specified in 3GPP TS 34.121, section 5.4.2 verifies the correct reaction of the UE to TPC commands. The test is divided into the TPC test steps A to H inducing a power ramp of the following shape:



3GPP defines tolerances for the power steps and power step groups expected in these test steps. For step D no conformance requirements are defined. It is only used for UE reconfiguration.

The R&S CMW allows to perform all test steps and to check the power step and power step group tolerances. The test is divided into three sections:

- Test step ABC (using algorithm 2, step size 1 dB)
- Test step EF (using algorithm 1, step size 1 dB)
- Test step GH (using algorithm 1, step size 2 dB)

The reconfiguration to be performed in test step D is included in test step EF.

Thus the entire test step sequence A to H can be performed by starting the TPC measurement three times only.

6.3.3.3 Performing an Inner Loop Power Control Test

For test preparation you configure the applications and set up a connection to the UE. Then you perform test step ABC, test step EF and finally test step GH.

Preparing the test

1. Set up an RMC connection. The general procedure for connection setup is described in the application sheet "WCDMA Combined Signal Path Measurements", see chapter 6.3.1.2, "Setting up a Connection", on page 471.
   Do not modify the expected nominal power mode setting (by default "According to UL Power Control Settings").
2. Switch to the "WCDMA TPC" measurement:
   In the signaling application press the "WCDMA TX Meas" softkey.

   The measurement application is opened and the combined signal path scenario is selected. As a consequence, the trigger source is automatically set correctly (TPC trigger signal) and the most important settings of the signaling application are taken over by the measurement application.
   If required, select the "TPC Measurement" tab.

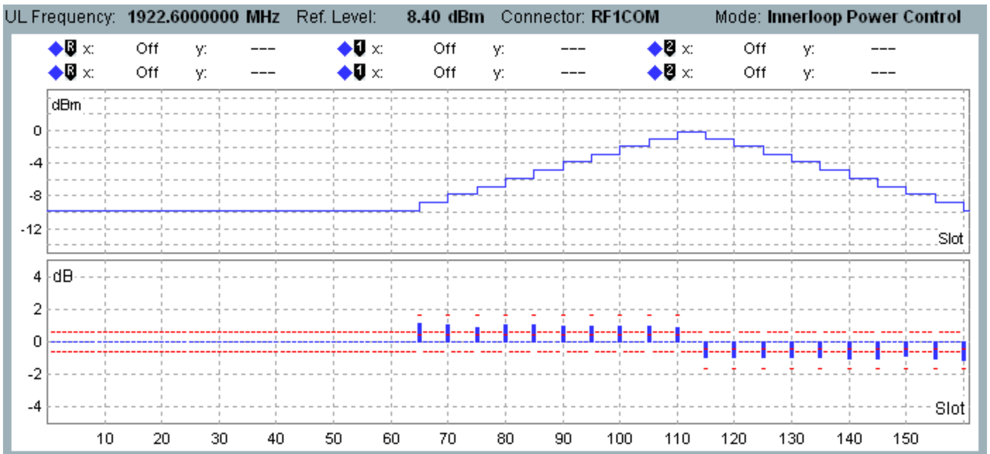
Performing test steps A, B and C

1. Configure the TPC settings:
   a) Press the "Signaling Parameter" softkey followed by the "TPC" hotkey.
   b) Set "Active TPC Setup" to "Closed Loop".
   c) Set "Configuration" to -10 dBm total target power.
   d) Set "Active TPC Setup" to "TPC Test Step ABC".
   e) Close the TPC dialog.
2. Press "ON | OFF" to start the measurement.

   TPC commands are sent to the UE until the UE power reaches -10 dBm. Then TPC commands for test step A, B and C are sent to the UE, using algorithm 2. The UE power is measured during the three test steps.
3. Evaluate the test results.

The upper diagram displays the UE power vs slot for all three test steps. The lower diagram displays the power steps between the slots. The red lines indicate configured limits.

The table shows statistical values, including power step and power step group results relevant for limit checks. The default limit settings are defined according to 3GPP TS 34.121. If a result value violates the configured limits, it is highlighted in the table.



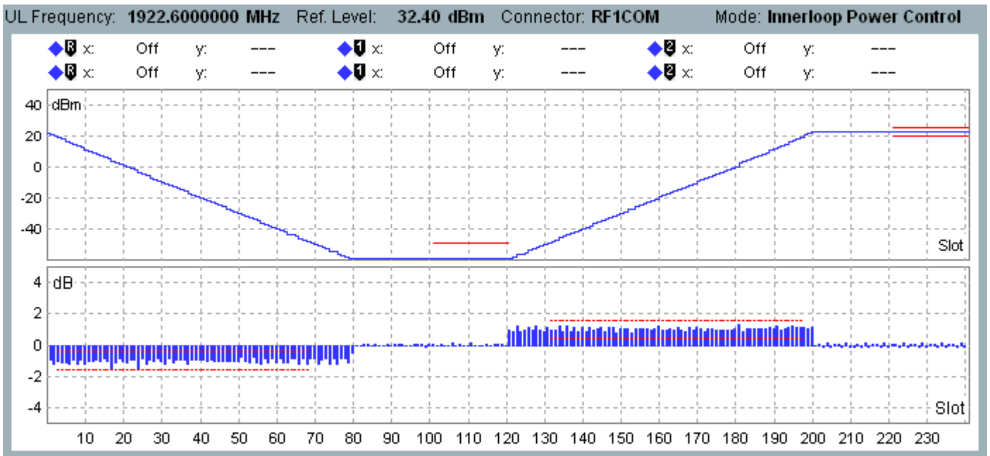
TPC Test Step ABC	Maximum	Minimum	Average	Statistics
UE Power [dBm]	−0.13	−9.91		
Power Steps 0 dB A,B,C [dB]	0.0	0.0	0.0	140
Power Steps +1 dB B [dB]	1.1	0.8	1.0	10
Power Steps -1 dB C [dB]	−0.8	−1.1	−1.0	10
Power Steps Group 0 dB A [dB]	0.0	0.0	0.0	51
Beginning @ Slot [Slot]	12	34		
Power Steps Group +10 dB B [dB]	9.8			
Power Steps Group -10 dB C [dB]	−9.8			

Performing test steps E and F

1. Configure the TPC settings:
   a) Press the "TPC" hotkey.
   b) Set "Active TPC Setup" to "TPC Test Step EF".
   c) Parameter "Configuration" indicates the number of 0 bits to be sent to the UE during test step E (and 1 bits sent during test step F).
   3GPP specifies that the number of transmitted TPC commands shall be at least 10 more than the number required to ensure that the UE reaches the minimum power threshold during test step E and the maximum power threshold during test step F.
   By default, the measurement expects 20 TPC commands more than the number required to reach the power threshold, to be able to evaluate the minimum output power and the maximum output power.
   120 bits are usually sufficient. Modify the parameter if required.
   d) Close the TPC dialog.
2. Press "RESTART | STOP" to restart the measurement.

The UE is ordered to maximum output power. Then TPC commands for test step E and F are sent to the UE, using algorithm 1 and a step size of 1 dB. The UE power is measured during the test steps.

3. Evaluate the test results.



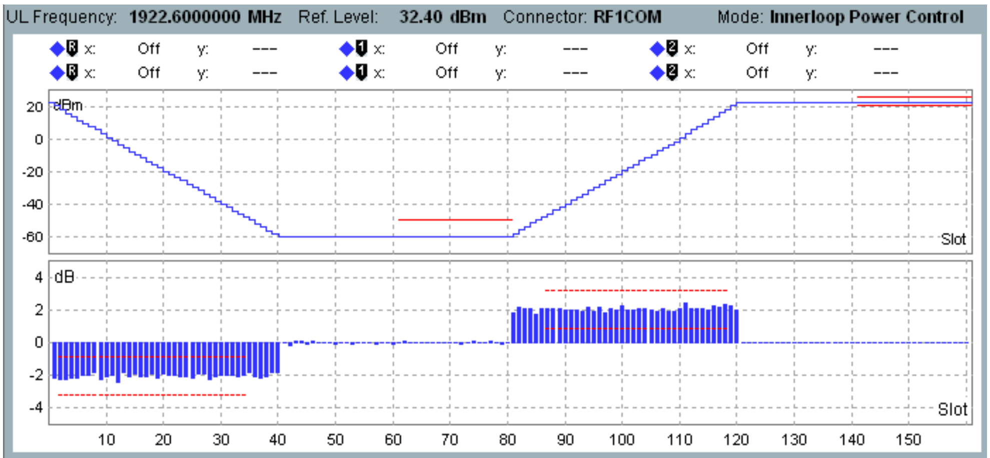
TPC Test Step EF	Maximum	Minimum	Average	Statistics
Maximum Output Power [dBm]	22.48	22.31	22.40	20
Minimum Output Power [dBm]	−59.64	−59.79	−59.73	20
Power Steps -1 dB E [dB]	−0.8	−1.3	−1.0	66
Power Steps +1 dB F [dB]	1.4	0.8	1.0	66
Power Steps Group -10 dB E [dB]	−9.8	−11	−10	57
Beginning @ Slot [Slot]	33	16		
Power Steps Group +10 dB F [dB]	11	9.7	10	57
Beginning @ Slot [Slot]	179	168		

Performing test steps G and H

1. Configure the TPC settings:
   a) Press the "TPC" hotkey.
   b) Set "Active TPC Setup" to "TPC Test Step GH".
   c) Parameter "Configuration" indicates the number of 0 bits to be sent to the UE during test step G (and 1 bits sent during test step H).
   3GPP specifies that the number of transmitted TPC commands shall be at least 10 more than the number required to ensure that the UE reaches the minimum power threshold during test step G and the maximum power threshold during test step H.
   By default, the measurement expects 20 TPC commands more than the number required to reach the power threshold, to be able to evaluate the minimum output power and the maximum output power.
   80 bits are usually sufficient. Modify the parameter if required.
   d) Close the TPC dialog.
2. Press "RESTART | STOP" to restart the measurement.

   The UE is ordered to maximum output power. Then TPC commands for test step G and H are sent to the UE, using algorithm 1 and a step size of 2 dB. The UE power is measured during the test steps.

3. Evaluate the test results.



TPC Test Step GH	Maximum	Minimum	Average	Statistics
Maximum Output Power [dBm]	22.45	22.42	22.43	20
Minimum Output Power [dBm]	−59.55	−59.68	−59.60	20
Power Steps -2 dB G [dB]	−1.8	−2.3	−2.1	33
Power Steps +2 dB H [dB]	2.3	1.8	2.1	32
Power Steps Group -20 dB G [dB]	−20	−22	−21	24
Beginning @ Slot [Slot]	12	2		
Power Steps Group +20 dB H [dB]	22	20	20	23
Beginning @ Slot [Slot]	108	100		

6.3.4 Maximum Power Measurements with E-DCH

This application sheet describes how to measure the maximum output power for a WCDMA signal with HS-DPCCH and E-DCH, as defined in 3GPP TS 34.121, section 5.2B.

6.3.4.1 Options and Equipment Required

The test procedure described in this application sheet requires the following equipment:

- Wideband Radio Communication Tester R&S CMW500 or R&S CMW280 with software version ≥ V3.0.30. The latest software version is recommended. This application sheet describes software version V3.0.30.
  The tester must be equipped with a wideband signaling unit (R&S CMWB300A).
- Option R&S CMW-KS400, "WCDMA R99, basic signaling"
- Option R&S CMW-KS401, "WCDMA R5/6, basic signaling"
- Option R&S CMW-KS411, "WCDMA R5/6, advanced signaling"
- Option R&S CMW-KM400, "WCDMA R99, TX measurement, uplink"

6.3.4.2 Test Overview

The conformance test specification 3GPP TS 34.121, section 5.2B "Maximum Output Power with HS-DPCCH and E-DCH" defines a test for verification of the maximum UE power with active HS-DPCCH and E-DCH. The test comprises five subtests with different signal configurations. The test procedure is common for subtest 1 to 4 and differs for subtest 5.

Subtest 1 to 4

The test procedure for subtest 1 to 4 requires a dynamic TPC pattern, reacting to the E-TFCI received from the UE. The basic test procedure is as follows:

1. Set the initial UE power to be at least 7.5 dB lower than the maximum UE power.
2. Increase the UE power via TPC commands until the UE sends a decreased E-TFCI. Use algorithm 2 and check the E-TFCI after each +1 TPC_cmd (11111 pattern).
3. Decrease the UE power via a single -1 TPC_cmd (00000 pattern, algorithm 2). If the UE still sends a decreased E-TFCI, repeat the -1 TPC_cmd once.
4. Check that the UE sends the expected target E-TFCI (for subtest 1 to 4: 75, 67, 92, 71). If the target E-TFCI is not reached, the UE has failed the test.
5. Keep the power constant (alternating pattern, algorithm 2) and measure the UE power (mean value over at least one slot).

The progress of the test can be monitored via the displayed TPC state, target E-TFCI and monitored E-TFCI as listed in the legend of the following figure.

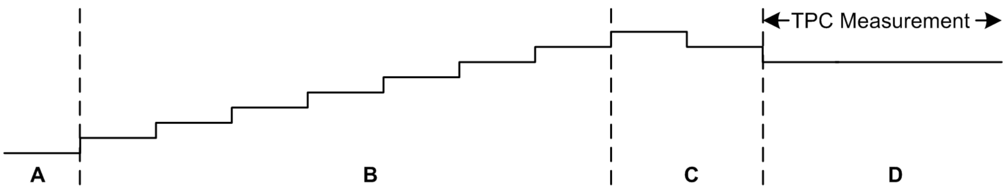


Fig. 6-22: UE power variation during test procedure (subtest 1 to 4)

A = state "Target Power Locked", initial target power reached, monitored E-TFCI = target E-TFCI
B = state "Searching", 11111 pattern, monitored E-TFCI = target E-TFCI
C = state "Searching", 00000 pattern, monitored E-TFCI < target E-TFCI
D = state "Max Power", alternating pattern, monitored E-TFCI = target E-TFCI

Subtest 5

The test procedure for subtest 5 requires only a static "All 1" TPC pattern. The basic test procedure is as follows:

1. Set the initial UE power to be at least 7.5 dB lower than the maximum UE power.
2. Send an "All 1" TPC pattern, using algorithm 1.
   When the maximum power is reached, the signaling application monitors the sent E-TFCI for 150 ms.
3. Measure the UE power (mean value over at least one slot).

The progress of the test can be monitored via the displayed TPC state, target E-TFCI and monitored E-TFCI as listed in the legend of the following figure.

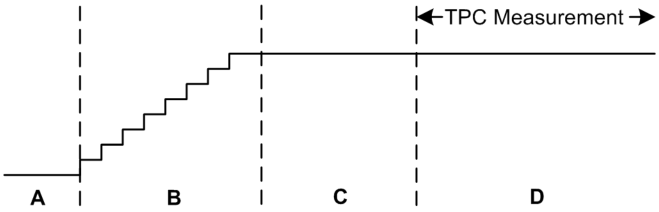


Fig. 6-23: UE power variation during test procedure (subtest 5)

A = state "Target Power Locked", initial target power reached, monitored E-TFCI = target E-TFCI
B = state "Searching", all 1 pattern, no monitored E-TFCI
C = state "Searching", all 1 pattern, monitored E-TFCI = target E-TFCI
D = state "Max Power", all 1 pattern, monitored E-TFCI = target E-TFCI

The signal configurations defined by 3GPP for the individual subtests are quite complex. For comfortable configuration, a wizard is provided. You can configure all settings for a specific subtest by simply selecting the subtest and pressing a button.

3GPP defines tolerances for the measured maximum UE power. The following table provides an overview of the requirements. You can configure both the nominal maximum power and a pair of tolerance values via the limit settings of the TPC measurement.

Table 6-22: Nominal maximum power and tolerances, depending on subtest and power class

Subtest	Power Class 3		Power Class 4	
	Power [dBm]	Tolerance [dB]	Power [dBm]	Tolerance [dB]
1	24	+1.7 / -6.7	21	+2.7 / -5.7
2	22	+3.7 / -5.2	19	+4.7 / -4.2
3	23	+2.7 / -5.2	20	+3.7 / -4.2
4	22	+3.7 / -5.2	19	+4.7 / -4.2
5	24	+1.7 / -3.7	21	+2.7 / -2.7

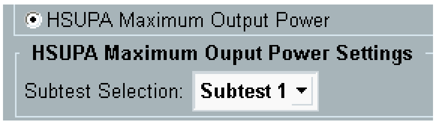
6.3.4.3 Performing Subtest 1 to 5

The following description assumes that you are familiar with basic tasks like accessing a firmware application or opening the main configuration dialog of an application. If required, refer to Combined Signal Path Measurements for an introduction.

Performing subtest 1

1. Preset your R&S CMW to ensure a definite instrument state.
2. Open the "WCDMA Signaling" application.
3. In the configuration dialog ("Config" hotkey), configure the "RF Settings" as desired, especially the RF connectors, the external attenuations and the RF frequency.
   Do not modify the "RF Power Uplink" settings.
4. Connect your UE to the configured RF connector(s).
5. At the (soft-)front panel press "WIZARD" to open the "CMW Wizard" dialog.

6. Select "HSUPA Maximum Output Power", "Subtest 1".

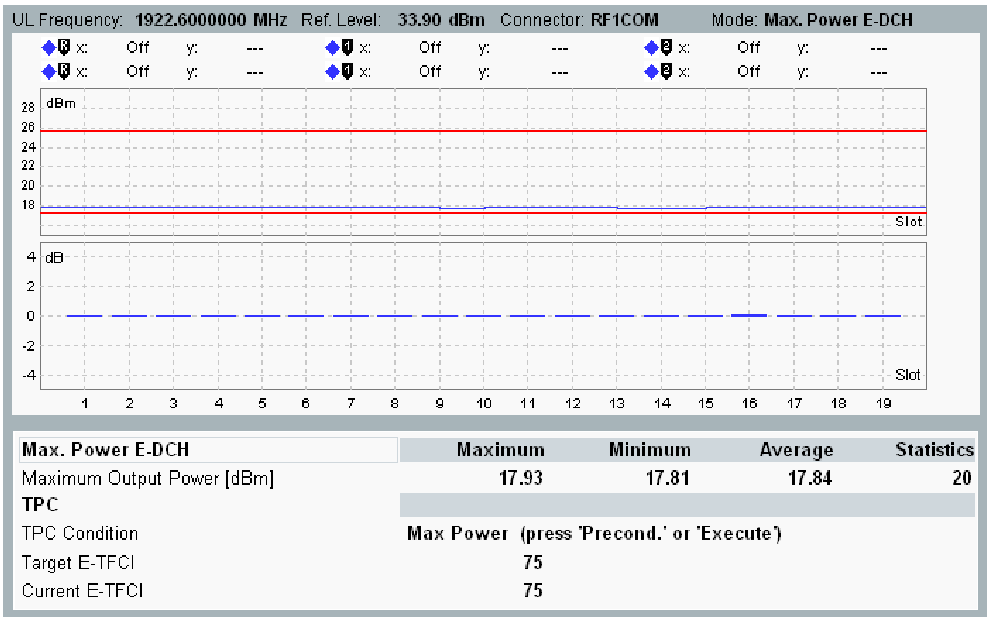


7. Press "Finish" to execute the wizard.

   The dialog is closed and the wizard configures suitable settings for subtest 1.
8. To turn on the DL signal press "ON | OFF" and wait until the "WCDMA-UE Signaling" softkey indicates the "ON" state and the hour glass symbol has disappeared.
9. Switch on the UE and wait until registration is complete.
10. Press the "Connect Test Mode" hotkey and wait until the connection has been established (for subtest 5 the hotkey is named "Connect HSPA TM").
11. Switch to the "WCDMA TPC" measurement:
    In the signaling application press the "WCDMA TX Meas" softkey.

    The measurement application is opened, the combined signal path scenario is selected and the trigger source is set correctly. The most important settings of the signaling application are taken over by the measurement application.
12. Select the "TPC Measurement" tab (if it is not yet selected).
13. In the configuration dialog, configure the "Max. Power E-DCH" limits as desired.
14. Press "ON | OFF" to start the TPC measurement.

    The "Max. Power E-DCH" TPC setup is executed automatically.
    Note the TPC output state, the expected target E-TFCI and the monitored E-TFCI displayed below the diagrams.
15. When the measurement is finished (measurement state "RDY"), evaluate the test results.
    The upper diagram displays the measured maximum output power vs slot. The lower diagram displays the power steps between adjacent slots. The red lines indicate the configured maximum UE power limits.
    The table provides a statistical evaluation for the UE power values in the upper diagram. If a result violates the configured limits, it is highlighted in the table.



Performing subtest 2 to 5

After you have performed subtest 1, you can continue with subtest 2 to 5. For this purpose repeat the following steps for each subtest.

1. Switch to the WCDMA signaling application:
   In the TPC measurement press the "WCDMA-UE Signaling" softkey two times.
2. Press the "Disconnect ..." hotkey to release the connection.
3. Open the "CMW Wizard" dialog, select the desired subtest and execute the wizard.
4. Perform step 10 to step 15 of the subtest 1 procedure.
   That means, set up a connection, configure the limits, start the measurement and evaluate the results.

6.3.5 CS Phase Discontinuity Measurements

This application sheet describes how to perform a WCDMA UE phase discontinuity measurement for a circuit switched connection.

6.3.5.1 Options and Equipment Required

A WCDMA phase discontinuity measurement requires the following equipment:

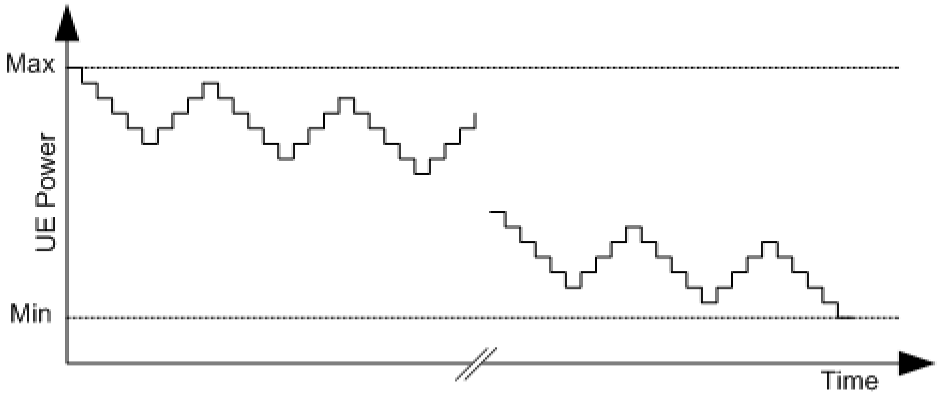
- Wideband Radio Communication Tester R&S CMW500 with software version ≥ V1.0.15.0 or R&S CMW280 with software version ≥ V1.0.15.20. The latest software version is recommended.
  This application sheet describes software version V3.0.20.
- Option R&S CMW-KS400, "WCDMA Signaling" application
- Option R&S CMW-KM400, "WCDMA Multi Evaluation" measurement

6.3.5.2 Test Method

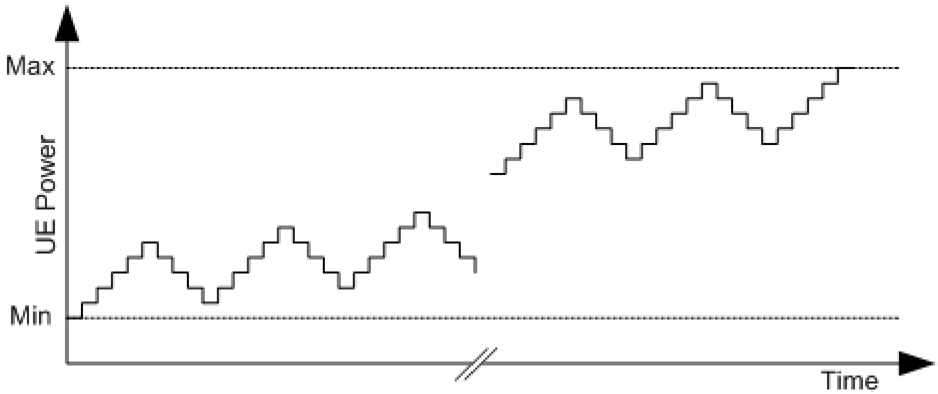
Phase discontinuity is the change in phase between two adjacent timeslots. According to 3GPP TS 34.121, the phase discontinuity for circuit switched connections has to be measured as follows.

A linear best-fit to the phase error curve in each timeslot (excluding the 25 µs transient periods on either side of the timeslot boundaries) and an extrapolation onto the slot boundaries yields an estimate of the phase error at the beginning and at the end of each slot. The phase discontinuity is defined as the difference between the extrapolated phase at the end of the timeslot preceding the slot boundary and the extrapolated phase at the start of the timeslot following the slot boundary.

For 3GPP conformance tests the phase discontinuity measurement has to be performed for the entire UE output power range. The output power is changed from maximum to minimum power, sending repeatedly five down and four up TPC commands. The following figure shows the resulting UE output power.



When the minimum power is reached, the output power has to be changed back to maximum power, sending repeatedly five up and four down TPC commands, as shown in the following figure.



6.3.5.3 Performing a Phase Discontinuity Measurement

To perform a phase discontinuity measurement you need to configure the signaling application, set up a circuit switched RMC connection and configure the measurement.

Then you start the TPC pattern execution and the measurement. The required steps are described in detail below.

Proceed as follows:

1. Set up an RMC connection. The general procedure for connection setup is described in the application sheet "WCDMA Combined Signal Path Measurements", see chapter 6.3.1.2, "Setting up a Connection", on page 471.
2. Switch to the "WCDMA Multi Evaluation" measurement:
   In the signaling application press the "WCDMA TX Meas" softkey.

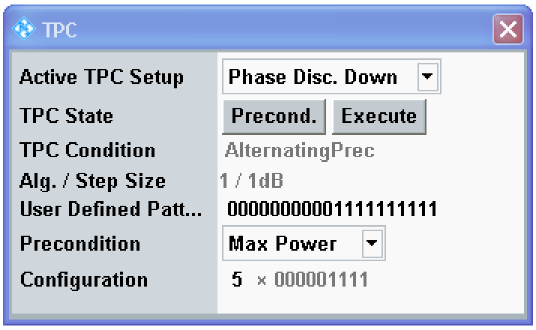
   The measurement application is opened and the combined signal path scenario is selected automatically.
   If required, select the "Multi Evaluation" tab.
3. Press the "Trigger" softkey followed by the "Trigger Source" hotkey and select "WCDMA Sig... TPC Trigger", i.e. the TPC trigger signal provided by the WCDMA signaling application.
4. Configure the overview to show only the "UE Power" and "Phase Discontinuity" measurements:
   a) Press the "Multi Evaluation" softkey followed by the "Assign Views" hotkey.
   b) Press "Off" to disable all measurements, then enable the "UE Power" and "Phase Discontinuity" measurements.
   c) Press the "Display" softkey followed by the "Select View" hotkey.
   d) Select the overview.
5. Configure the measurement so that it measures only one measurement interval:
   a) Press the "Multi Evaluation" softkey followed by the "Statistic Count" hotkey.
   b) Set the statistic count for "Modulation" measurements to 1.
      In this example only "UE Power" and "Phase Discontinuity" are active. If also a spectrum or BER measurement is active, set the corresponding values also to 1.
   c) Press the "Repetition" hotkey and select "Single Shot".

   Note: This step is required because only one trigger pulse will be generated by the signaling application. Thus a statistic count > 1 or a continuous measurement would result in a trigger timeout for the second measurement interval.
6. Press the "Measurement Length" hotkey and enter 46 to configure the measurement length compatible to the sent TPC patterns.

   Note: The measurement length should be bigger than the number of sent TPC bits, so that you see the phase discontinuity for all power steps. In this example 5 TPC patterns with 9 TPC bits each are sent, resulting in 45 TPC bits. For the maximum of 13 TPC patterns a measurement length of 120 slots is recommended.
7. Press "ON | OFF" to start the measurement.

   A trigger timeout is indicated, because there is not yet a TPC trigger signal.
8. Configure the power control settings. These signaling application settings can be accessed from the measurement via a hotkey:

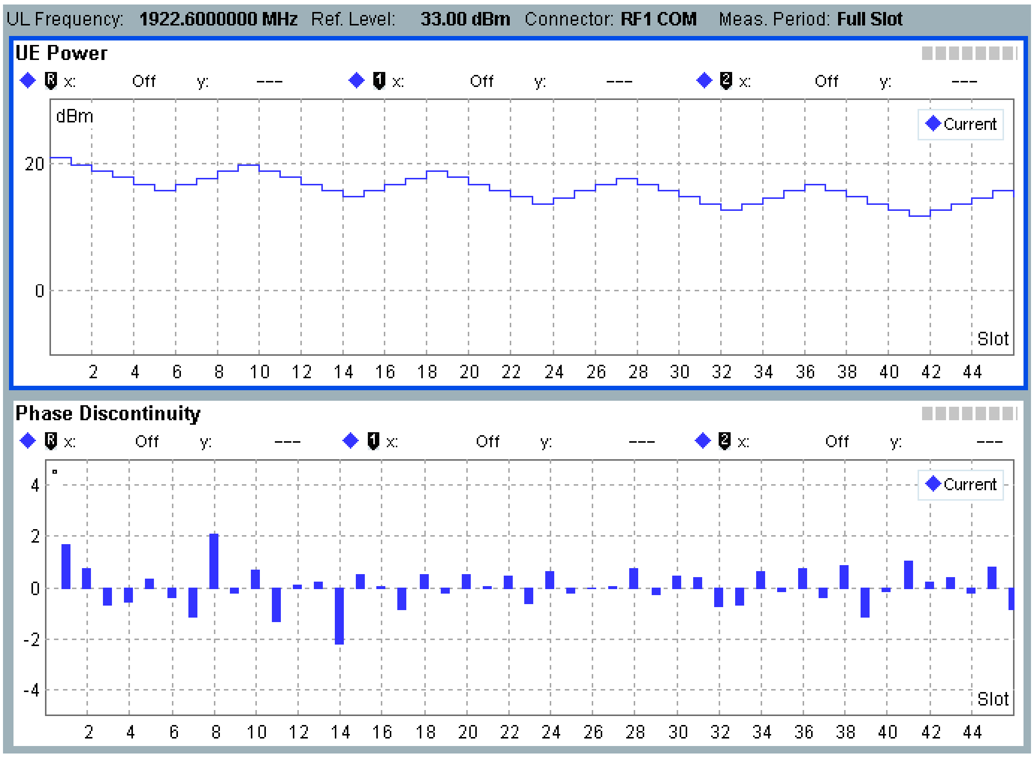
a) Press the "Signaling Parameter" softkey followed by the "TPC" hotkey.
b) Set "Active TPC Setup" to "Phase Disc. Down"
c) Set "Precondition" to "Max Power"
d) Set "Configuration" to "5 x 000001111"
This example uses 5 patterns. You can use up to 13 patterns, resulting in 117 TPC bits.



9. Press the "Execute" button to start the execution of the TPC pattern.

   A TPC trigger pulse is generated and the 000001111 TPC patterns are sent.

10. The overview now displays the measurement results.



The example screenshot shows the measured UE power in the upper part. Starting with the maximum UE power of about 20 dBm, the power is reduced five times by 1 dB and then increased four times by 1 dB. This corresponds to one 000001111 TPC pattern. The pattern is sent five times.

In the lower part the measured phase discontinuity is shown. Each bar is located at a slot boundary.

Repeating the measurement until the minimum power is reached

If you use the maximum of 13 TPC patterns, the UE output power is only reduced by 13 dB within 117 timeslots. So obviously the measurement has to be performed repeatedly to cover the entire power range of a UE.

After having performed the steps described above, continue as follows:

1. Reconfigure the power control settings, so that the next measurement starts with the already reduced UE power:
   a) Press the "Signaling Parameter" softkey followed by the "TPC" hotkey.
   b) Set the precondition to "Alternating".
2. Press "RESTART | STOP" to restart the measurement.

   A trigger timeout is indicated, because there is not yet a TPC trigger signal.
3. Start the execution of the TPC pattern:
   a) Press the "Signaling Parameter" softkey followed by the "TPC" hotkey.
   b) Press the "Execute" button.
4. Evaluate the measurement results.
5. Repeat the previous steps except step 1 until the minimum UE power is reached.

Repeating the measurement to go back to maximum power

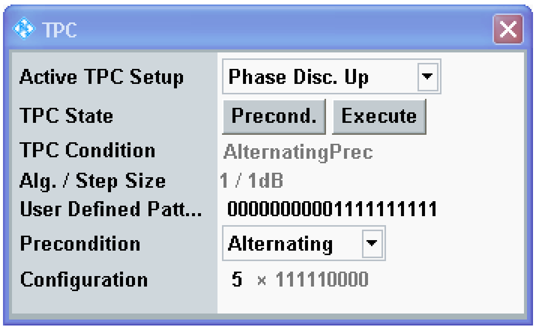
The measurement of the reverse direction from minimum to maximum power is performed similarly. The following procedure assumes that the previous steps have been executed and the minimum power has been reached.

Continue as follows:

1. Press "RESTART | STOP" to restart the measurement.

   A trigger timeout is indicated, because there is not yet a TPC trigger signal.
2. Reconfigure the power control settings:
   a) Press the "Signaling Parameter" softkey followed by the "TPC" hotkey.
   b) Set "Active TPC Setup" to "Phase Disc. Up"
   c) Set "Configuration" to "5 x 111110000"

   The default precondition is correct, assuming that the minimum power has already been reached.



3. Press the "Execute" button to start the execution of the TPC pattern.
4. Evaluate the measurement results.
5. Repeat the previous steps except step 2 until the maximum UE power is reached.

6.4 GUI Reference

The following sections provide detailed reference information on the parameters of the WCDMA signaling application (option R&S CMW-KS400). Most parameters can be configured via a single configuration dialog. Additional dialogs allow to configure the measurements included in the signaling application.

Parameter changes that have no effect in the current connection state are not possible. The corresponding parameters are dynamically grayed out, depending on the current connection state.

The screenshots in this chapter show the GUI with all available options installed and reduced signaling disabled. Depending on the installed options some parameters may not be configurable (display the default value) or may not be visible at all. For reduced signaling irrelevant parameters are hidden. This is indicated in the parameter description.

The GUI reference is structured as follows.

6.4.1 Signaling View

The signaling view shows status information, information derived from the uplink signal and the most important settings. Most settings in this view can also be accessed via the configuration dialog.

For the shortcut softkeys refer to chapter 6.4.3, "Using the Shortcut Softkeys", on page 510.

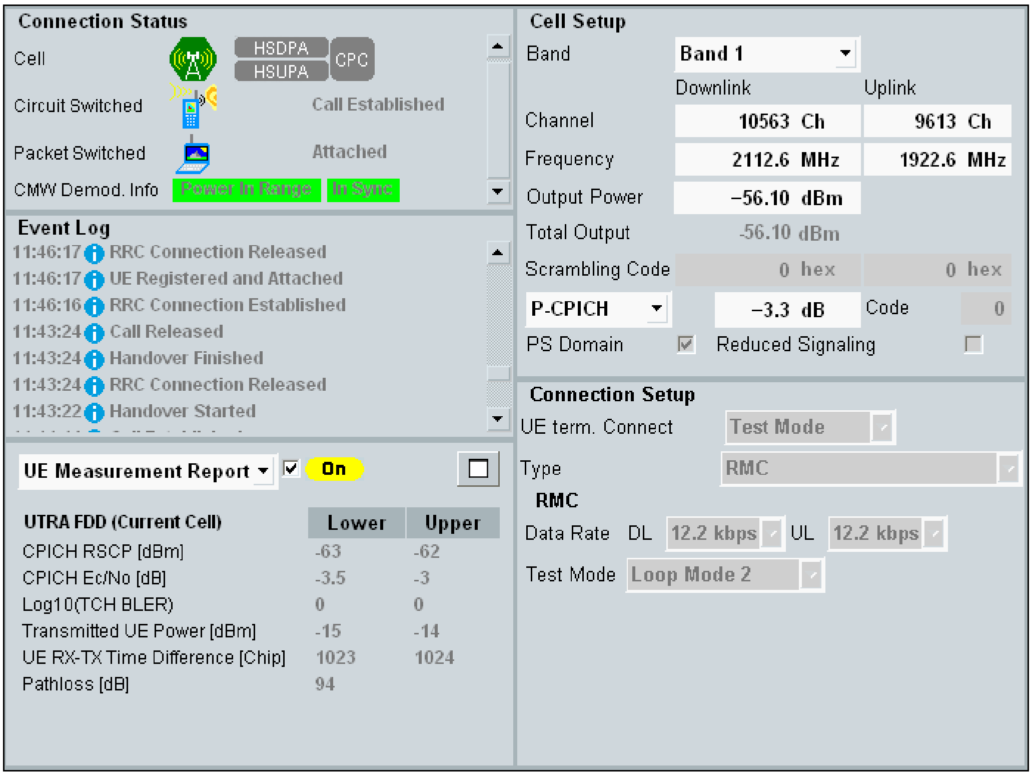


Fig. 6-24: WCDMA signaling view

In reduced signaling mode the UE does not register and does not send measurement reports. The information normally displayed in the lower left part is not available (UE Measurement Report, UE Capabilities, UE Info).

Instead, a quick access to the physical channel downlink settings is provided (see chapter 6.4.9, "Physical Channel DL Settings", on page 523). Alternatively you can display the event log.

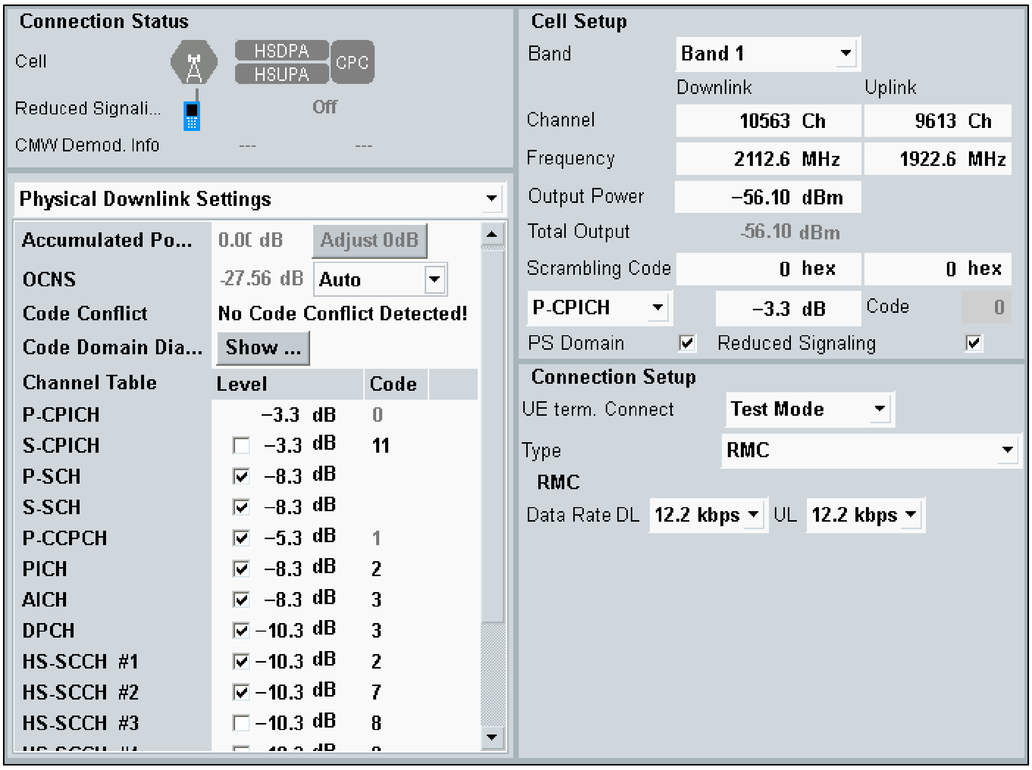


Fig. 6-25: WCDMA signaling view for reduced signaling

For descriptions of the individual areas of the view, refer to the subsections.

6.4.1.1 Connection Status

The connection status area displays the current connection states and information for troubleshooting.

For related hotkeys refer to chapter 6.4.2, "Signaling and Connection Control", on page 508.

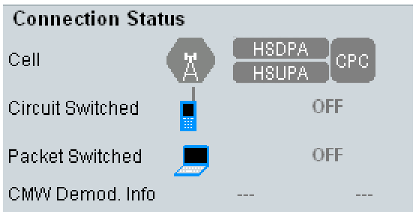


Fig. 6-26: Connection status area of the main view

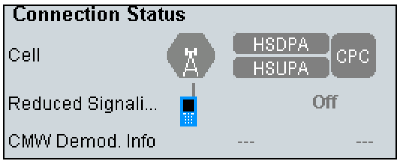


Fig. 6-27: Connection status for reduced signaling

Cell

The cell icon indicates the overall state of the cell (green = on, gray = off, additional = pending).

When a packet switched connection has been established, additional icons indicate the type of the connection. There are separate icons for downlink and uplink direction, showing the following texts:

- "HSDPA" gray: R99 signal (no HSDPA)
- "HSDPA" green: R5 signal with HSDPA
- "HSDPA+" green: R7 signal with HSDPA+
- "DC-HSDPA+" green: R8 signal with dual carrier and HSDPA+
- "HSUPA" gray: R99 signal (no HSUPA)
- "HSUPA" green: R6 signal with HSUPA
- "CPC" gray: no CPC feature active
- "CPC" green: R7 HSPA+ CPC feature active

Remote command:

`SOURce:WCDMa:SIGN<i>:CELL:STATe`

`SOURce:WCDMa:SIGN<i>:CELL:STATe:ALL?`

`SENSe:WCDMa:SIGN<i>:CELL:CONFig?`

Circuit Switched, Packet Switched, Reduced Signaling

Displays the corresponding connection states, see also chapter 6.2.7, "Connection States", on page 417.

Additional information about established connections is provided in the UE Info, see "Connection Type Established" on page 505.

Remote command:

`FETCh:WCDMa:SIGN<i>:CSWitched:STATe?`

`FETCh:WCDMa:SIGN<i>:PSWitched:STATe?`

`FETCh:WCDMa:SIGN<i>:RSIGnaling:STATe?`

CMW Demod. Info

This information is available while the demodulator stage of the instrument perceives an uplink signal and can be used for troubleshooting.

The text to the left indicates whether the uplink signal power is in range, too high (overflow) or too low (underflow). The text to the right indicates whether the R&S CMW was able to synchronize to the uplink signal (In Sync) or not (No Sync).

Remote command:

SENSe:WCDMa:SIGN<i>:UESinfo:DINFo?

6.4.1.2 Event Log

The event log area reports events and errors like connection state changes, RRC connection establishment/release and authentication failure.

The type of each entry is indicated by an icon: = information, warning and error.

Fig. 6-28: Event Log in the main view

6.4.1.3 UE Measurement Report

To display the measurement report information, select "UE Measurement Report" in the field below the event log area.

Use the checkbox to enable/disable measurement reports. Press the button to the right to maximize the UE measurement report area.

This section is not relevant for reduced signaling.

The individual report values are defined in 3GPP TS 25.133, chapter 9.

Measurement report information is only available when a connection to the UE has been established. You can enable, disable and configure the measurement report, see chapter 6.4.16, "UE Measurement Report Settings", on page 585.

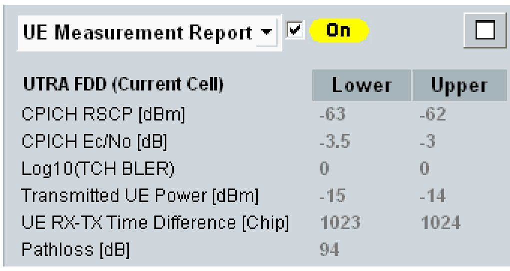


Fig. 6-29: Measurement report for current cell

The measurement report for the current cell is available independent of the active scenario.

The dual carrier scenario provides two measurement reports: one for the current cell (carrier 1) and one for carrier 2. To switch between them, select "Carrier 1" or "Carrier 2" in the "Cell Setup" section. The maximized measurement report area shows both reports.

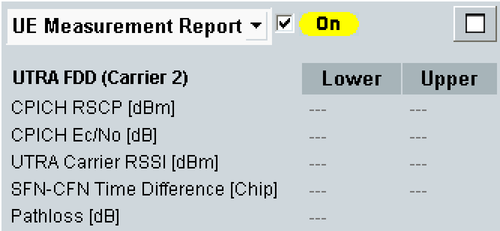


Fig. 6-30: Measurement report for carrier 2

UTRA FDD (Current Cell)

- **CPICH RSCP:**
  Integer 1-dB interval for the received signal code power of the CPICH of carrier 1. For CPICH RSCPs below –120 dBm (above –25 dBm), no lower (upper) limit is indicated.
- **CPICH Ec/No:**
  0.5-dB interval for the ratio of the received energy per PN chip for the CPICH of carrier 1 to the total received power spectral density at the UE antenna connector for carrier 1. For Ec/No below –24 dB (above 0 dB), no lower (upper) limit is indicated.
- **Log$_{10}$(TCH BLER):**
  Estimate of the transport channel block error rate. 64 intervals for the logarithm of the TCH BLER are available. The maximum logarithmic TCH BLER is 0, corresponding to a BLER of 1. For values below –4.03 the lower limit is $-\infty$, corresponding to a BLER of 0.
- **Transmitted UE Power:**
  Integer 1-dB interval for the total UE transmitted power on one uplink carrier measured at the antenna connector of the UE. The power must be in the range between –50 dBm and above +34 dBm.
- **UE RX-TX Time Difference:**
  Interval for the difference in time between the UE uplink DPCCH/DPDCH frame transmission and the first detected path (in time) of the downlink DPCH frame from the measured radio link. The time difference is expressed in multiples of a chip period. For time differences below 768 chips (above 1280 chips), no lower (upper) limit is indicated.
- **Pathloss:**
  Downlink pathloss in dB for carrier 1 = Reported P-CPICH Power - CPICH RSCP. Values below +46 dB (above +158 dB) are reported as +46 dB (+158 dB). The CPICH RSCP is measured by the UE; the reported P-CPICH power is configurable (see "P-CPICH Enhanced > Signalized Level" on page 526).

To simulate real propagation conditions the reported P-CPICH power must be much larger than the actual power of the BS signal.

Remote command:
SENSe:WCDMa:SIGN<i>:UEReport:CCELl?

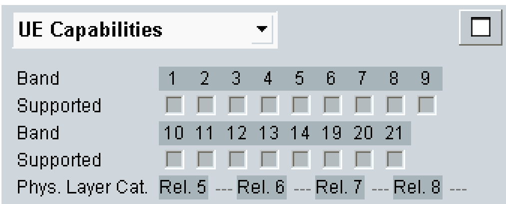
UTRA FDD (Carrier 2)

- **CPICH RSCP:**
  Integer 1-dB interval for the received signal code power of the CPICH of carrier 2. For CPICH RSCPs below –120 dBm (above –25 dBm), no lower (upper) limit is indicated.
- **CPICH Ec/No:**
  0.5-dB interval for the ratio of the received energy per PN chip for the CPICH of carrier 2 to the total received power spectral density at the UE antenna connector for carrier 2. For Ec/No below –24 dB (above 0 dB), no lower (upper) limit is indicated.
- **UTRA Carrier RSSI:**
  Received Signal Strength Indicator (RSSI) defining a 1-dB interval for the wideband power received via carrier 2, including thermal noise and noise generated in the receiver.
- **SFN-CFN Time Difference:**
  Time difference between the System Frame Number (SFN) and the Connection Frame Number (CFN) in chip units. The connection frames are related to the transmission from the UE. The system frames are related to the signal received at the UE via carrier 2.
- **Pathloss:**
  Downlink pathloss in dB for carrier 2 = Reported P-CPICH Power - CPICH RSCP. Values below +46 dB (above +158 dB) are reported as +46 dB (+158 dB). The CPICH RSCP is measured by the UE; the reported P-CPICH power is configurable.
  To simulate real propagation conditions the reported P-CPICH power must be much larger than the actual power of the BS signal.

Remote command:
SENSe:WCDMa:SIGN<i>:UEReport:NCELl?

6.4.1.4 UE Capabilities

To display the most important UE capabilities, select "UE Capabilities" in the field below the event log area. Press the button to the right of the field to display all capability information.



The displayed information comprises the following extracts from the UE capability report:

- Supported WCDMA operating bands
- Physical layer categories of the UE for HS-DSCH (Rel.5, Rel.7, Rel.8) and E-DCH (Rel.6)

This section is not relevant for reduced signaling.

The UE capabilities characterize the radio access capabilities of the UE. This information is received from the UE during registration. The radio access capabilities are described in 3GPP TS 25.306 and the references given therein.

The provided UE capabilities information is described in the subsections.

PDCP UE Capabilities

The UE capability information in the PDCP section indicates in which way the UE supports the Packet Data Convergence Protocol (PDCP) described in 3GPP TS 25.323.

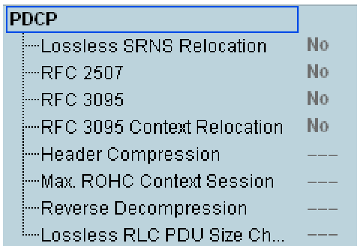


Fig. 6-31: PDCP UE capabilities

PDCP

- **Lossless SRNS Relocation:**
  Support of lossless SRNS relocation
- **RFC 2507:**
  Support of IP header compression according to RFC 2507
- **RFC 3095:**
  Support of robust header compression according to RFC 3095
- **RFC 3095 Context Relocation:**
  Support of context relocation applied to the RFC 3095 header compression protocol
- **Header Compression:**
  Maximum header compression context size supported by the UE. This parameter is only applicable if the UE supports header compression according to RFC 2507.
- **Max. ROHC Context Session:**
  Maximum number of header compression context sessions supported by the UE. This parameter is only applicable if the UE supports header compression according to RFC3095.
- **Reverse Decompression:**

Number of packets that can be reverse decompressed by the decompressor in the UE.
- **Lossless RLC PDU Size Change:**
Support of lossless DL RLC PDU size change.

Remote command:
SENSe:WCDMa:SIGN<i>:UECapability:PDCP?

RLC UE Capabilities

The UE capability information in the RLC section indicates in which way the UE supports the Radio Link Control Acknowledged Mode (RLC AM).

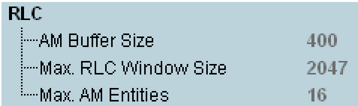


Fig. 6-32: RLC UE capabilities

RLC
- **AM Buffer Size:**
Maximum total buffer size across all RLC AM entities supported by the UE
- **Max. RLC Window Size:**
Maximum RLC window size supported by the UE
- **Max. AM Entities:**
Maximum number of AM entities supported by the UE

Remote command:
SENSe:WCDMa:SIGN<i>:UECapability:RLC?

Physical Downlink UE Capabilities

The UE capability information in the PHY Downlink section describes the capacity of the UE to process and store downlink channels.

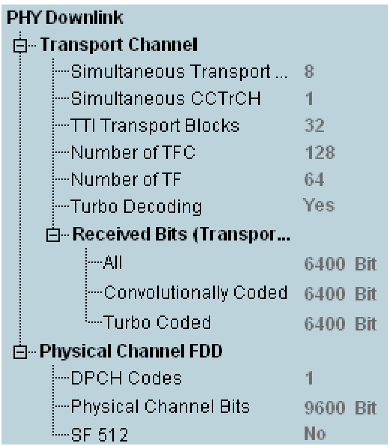


Fig. 6-33: PHY DL UE capabilities

PHY Downlink
- **Simultaneous Transport Channel:**

Maximum number of downlink transport channels that the UE is capable to process simultaneously, not taking into account the rate of each transport channel

- **Simultaneous CCTrCH:**
  Maximum number of downlink Coded Composite Transport Channels (CCTrCHs) that the UE is capable to process simultaneously. CCTrCH should be interpreted as consisting of DCH, FACH or DSCH.
- **TTI Transport Blocks:**
  Maximum total number of transport blocks received within Transmission Time Intervals (TTIs) that end within the same 10 ms interval. This includes all transport blocks that are to be simultaneously received by the UE on DCH, FACH, PCH and DSCH transport channels.
- **Number of TFC:**
  Maximum number of Transport Format Combinations (TFC) in a downlink transport format combination set that the UE can store
- **Number of TF:**
  Maximum number of downlink Transport Formats (TF) that the UE can store, where all transport formats for all downlink transport channels are counted
- **Turbo Decoding:**
  Support of turbo decoding
- **Received Bits (Transport Blocks):**
  Maximum number of bits of all transport blocks being received at an arbitrary time instant. This section comprises three values, corresponding to bits that are Convolutionally Coded, bits that are Turbo Coded and the sum of All bits.
- **DPCH Codes:**
  Maximum number of DPCH codes to be simultaneously received. For DPCH in soft/softer handover, each DPCH is only calculated once. The capability does not include codes used for S-CCPCH.
- **Physical Channel Bits:**
  Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH). For DPCH in soft/softer handover, each DPCH is only calculated once.
- **SF 512:**
  Support for Spreading Factor (SF) 512 in downlink

Remote command:
`SENSe:WCDMa:SIGN<i>:UECapability:PDOWnlink?`

Physical Uplink UE Capabilities

The UE capability information in the PHY Uplink section describes the capacity of the UE to process and store uplink channels.

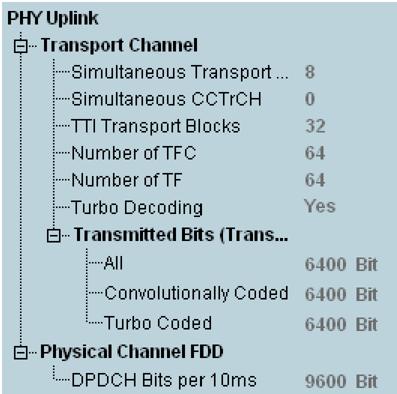


Fig. 6-34: PHY UL UE capabilities

PHY Uplink

- **Simultaneous Transport Channel:**
  Maximum number of uplink transport channels that the UE is capable to process simultaneously, not taking into account the rate of each transport channel
- **Simultaneous CCTrCH:**
  Maximum number of uplink Coded Composite Transport Channels (CCTrCHs) that the UE is capable to process simultaneously
- **TTI Transport Blocks:**
  Maximum total number of transport blocks transmitted within Transmission Time Intervals (TTIs) that start at the same time
- **Number of TFC:**
  Maximum number of Transport Format Combinations (TFC) in an uplink transport format combination set that the UE can store
- **Number of TF:**
  Maximum number of uplink Transport Formats (TF) that the UE can store, where all transport formats for all uplink transport channels are counted
- **Turbo Decoding:**
  Support of turbo decoding
- **Transmitted Bits (Transport Blocks):**
  Maximum number of bits of all transport blocks being transmitted at an arbitrary time instant. This section comprises three values, corresponding to bits that are Convolutionally Coded, bits that are Turbo Coded and the sum of All bits.
- **DPDCH Bits per 10 ms:**
  Maximum number of DPDCH bits the UE can transmit in 10 ms. The value applies to UE operation in non-compressed mode (if the value is <9600) or in both compressed and non-compressed mode (if the value is ≥9600).

Remote command:
`SENSe:WCDMa:SIGN<i>:UECapability:PUPLink?`

RF UE Capabilities

The UE capability information in the RF Parameters section indicates the supported operating bands.

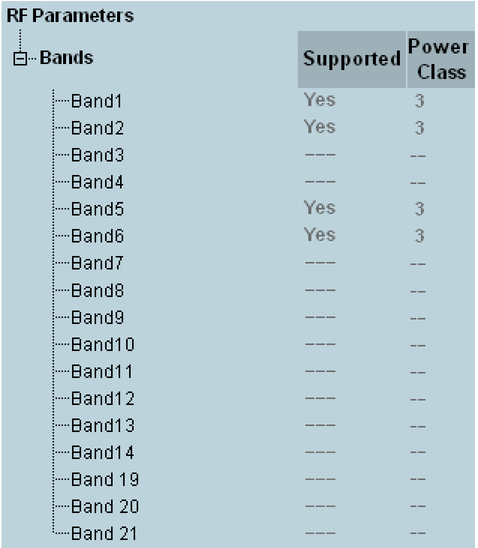


Fig. 6-35: RF parameters section

RF Parameters

- **Band Supported:**
  Support of the individual WCDMA operating bands
- **Power Class:**
  Indicates the UE power class for each supported band as defined in 3GPP TS 25.101

Remote command:
`SENSe:WCDMa:SIGN<i>:UECapability:RFParameter?`

Multi Mode and Multi RAT UE Capabilities

The UE capability information in the Multi Mode and Multi RAT sections indicates the duplex modes and radio access technologies that the UE supports.

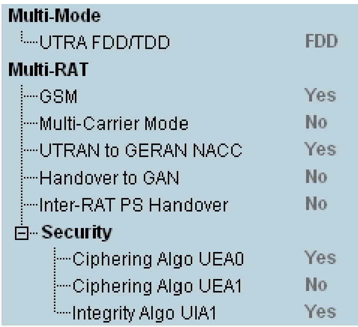


Fig. 6-36: Multi Mode / RAT UE capabilities

Multi Mode / RAT

- **UTRA FDD/TDD:**
  Indicates whether the UE supports UTRA FDD and/or TDD
- **GSM:**
  Indicates whether the UE supports GSM
- **Mult-Carrier Mode:**

Indicates whether the UE supports multi carrier mode
- **UTRAN to GERAN NACC:**
  Indicates whether the UE supports UTRAN to GERAN NACC
- **Handover to GAN:**
  Indicates whether the UE supports CS Handover to GAN
- **Inter-RAT PS Handover:**
  Indicates whether the UE supports Inter-RAT PS Handover
- **Security:**
  Indicates which ciphering and integrity algorithms the UE supports

Remote command:
`SENSe:WCDMa:SIGN<i>:UECapability:MMODe?`
`SENSe:WCDMa:SIGN<i>:UECapability:MRAT?`

Positioning UE Capabilities

This section provides the UE capabilities for positioning.

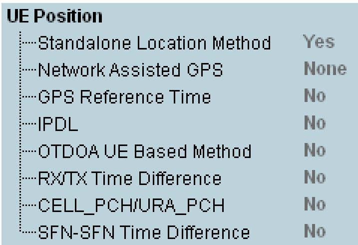


Fig. 6-37: UE positioning capabilities

UE Position
- **Standalone Location Method:**
  Indicates if a UE can measure its location by some means unrelated to UTRAN (e.g. if the UE has access to a standalone GPS receiver)
- **Network Assisted GPS:**
  Indicates if a UE supports the assisted GPS schemes "Network based" and/or "UE based"
- **GPS Reference Time:**
  Indicates if a UE has the capability to measure GPS reference time as defined in 3GPP TS 25.215
- **IPDL:**
  Indicates if a UE has the capability to use Idle Periods in the DownLink (IPDL) to enhance its "SFN-SFN observed time difference – type 2" measurement
- **OTDOA UE Based Method:**
  Indicates if a UE supports the Observed Time Difference Of Arrival (OTDOA) UE based schemes
- **RX/TX Time Difference:**
  Indicates if a UE has the capability to perform the Rx-Tx time difference type 2 measurement
- **CELL_PCH/URA_PCH:**
  Indicates whether the UE positioning measurements using the assisted GPS method are valid in CELL_PCH and URA_PCH RRC states
- **SFN-SFN Time Difference:**

Indicates whether the UE has the capability to perform the SFN-SFN observed time difference type 2 measurement

Remote command:

SENSe:WCDMa:SIGN<i>:UECapability:UEPosition?

General UE Capabilities

This section provides general UE capabilities.

Fig. 6-38: General UE capabilities

General

- **Release Indicator:**
  Access Stratum Release Indicator, e.g. Rel. 99, Rel. 5
- **Battery Consumption Optimization:**
  Indicates whether or not the UE benefits from NW-based battery consumption optimization

Remote command:

SENSe:WCDMa:SIGN<i>:UECapability:GENeral?

HSDPA UE Capabilities

This section provides HSDPA-related UE capabilities.

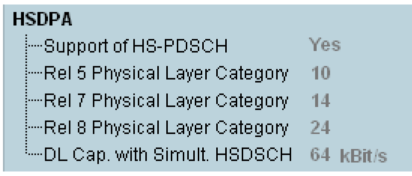


Fig. 6-39: HSDPA UE capabilities

HSDPA

- **Support of HS-PDSCH:**
  Indicates whether the UE supports the HS-PDSCH
- **Rel 5 / Rel 7 / Rel 8 Physical Layer Category:**
  HS-DSCH physical layer category of the UE for R5 (HSDPA), R7 (HSDPA+) and R8 (DC-HSDPA+) connections
- **DL Cap. with Simult. HSDSCH:**
  Supported DPCH data rate in case an HS-DSCH is configured simultaneously

Remote command:

SENSe:WCDMa:SIGN<i>:UECapability:HSDPa?

HSUPA UE Capabilities

This section provides HSUPA-related UE capabilities.

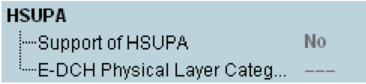


Fig. 6-40: HSUPA UE capabilities

HSUPA

- **Support of HSUPA:**
  Indicates whether the UE supports HSUPA
- **E-DCH Physical Layer Category:**
  E-DCH physical layer category of the UE (R6)

Remote command:

`SENSe:WCDMa:SIGN<i>:UECapability:HSUPa?`

6.4.1.5 UE Info

To display the "UE Info" area, select "UE Info" in the field below the event log.

The UE info area shows UE related information after registration or when a connection to the UE has been established.

This section is not relevant for reduced signaling.

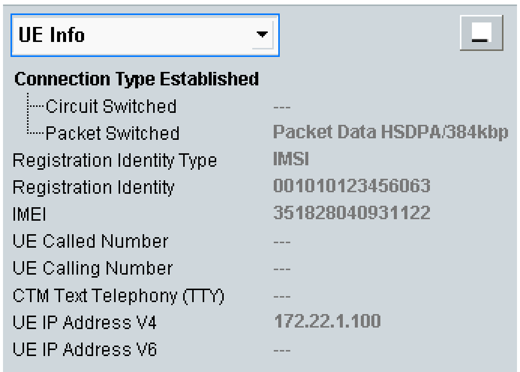


Fig. 6-41: UE info area of the main view

Connection Type Established

Established connection types, e.g. UE terminated voice call

Remote command:

`SENSe:WCDMa:SIGN<i>:UESinfo:CONNection:CIRCuit?`

`SENSe:WCDMa:SIGN<i>:UESinfo:EMERgency?`

`SENSe:WCDMa:SIGN<i>:UESinfo:CONNection:PACKet?`

Registration Identity (Type)

UE registration identity information received from the UE. This information is also displayed in the configuration dialog (see chapter 6.4.12.4, "UE Identity", on page 557).

Remote command:

`SENSe:WCDMa:SIGN<i>:UESinfo:RIType?`

`SENSe:WCDMa:SIGN<i>:UESinfo:RIDentity?`

IMEI

International Mobile Equipment Identity (IMEI) received from the UE. It is administrable whether this information is requested from the UE or not, see chapter 6.4.12.5, "Requested UE Data", on page 557.

Remote command:
`SENSe:WCDMa:SIGN<i>:UESinfo:IMEI?`

UE Called / Calling Number

For UE originated calls: dialed number (called number) and number of the UE (calling number)

Remote command:
`SENSe:WCDMa:SIGN<i>:UESinfo:DNUMber?`
`SENSe:WCDMa:SIGN<i>:UESinfo:CNUMber?`

CTM Text Telephony

Information whether the UE supports Cellular Text Telephony (CTM). In general this information is available during a voice or video call.

Remote command:
`SENSe:WCDMa:SIGN<i>:UESinfo:TTY?`

UE IP Address V4/V6

Display the IPv4 address and/or the IPv6 prefix that have been assigned to the UE by the R&S CMW.

The UE indicates whether it supports IPv4 only or IPv6 only or both. Depending on this information the R&S CMW assigns either an IPv4 address or an IPv6 prefix or both and displays the assigned values.

The current software version supports only IPv4.

Remote command:
`SENSe:WCDMa:SIGN<i>:UESinfo:UEADdress:IPV<n>?`

6.4.1.6 Settings

The main view provides only the most important settings for fast access while the configuration dialog provides all settings.

Exception: Parameter "Reduced Signaling" is not available in the configuration dialog.

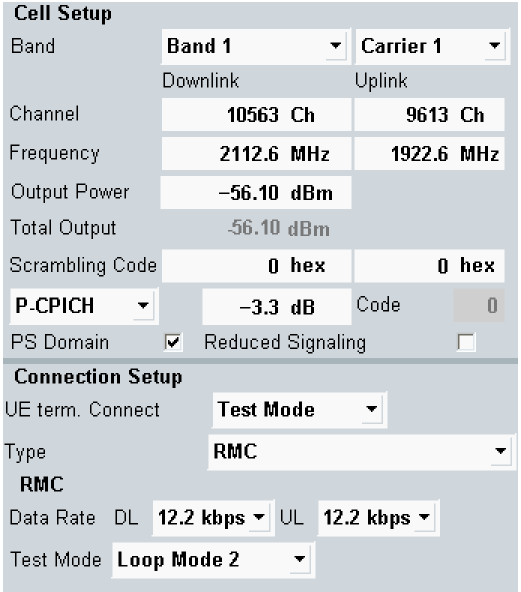


Fig. 6-42: Settings in the main view

Cell Setup

If the dual carrier scenario is active, most settings can be configured per carrier. The cell setup area shows settings of the currently selected carrier and common settings.

If the dual carrier scenario is inactive, the carrier selection field is hidden.

The area contains the following settings:

- Most important RF settings (downlink per carrier)
  See chapter 6.4.7, "RF Settings", on page 515
- Scrambling codes (downlink per carrier)
  See "Primary Scrambling Code" on page 553
  and "Uplink Scrambling Code" on page 537
- Downlink physical channel settings (per carrier, select a channel to access its settings)
  See chapter 6.4.9, "Physical Channel DL Settings", on page 523
- PS Domain (common setting)
  See "Packet Switched Domain" on page 554
- Reduced Signaling (common setting)
  Enables or disables the reduced signaling mode. For an introduction to this mode see chapter 6.2.3, "Reduced Signaling Mode", on page 412.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:RSIGnaling`

Connection Setup

Contains the most important connection configuration settings. Select a connection type (e.g. Voice, Test Mode, ...) to show the related settings in the lower part.

See chapter 6.4.11, "Connection Configuration", on page 545

6.4.2 Signaling and Connection Control

The individual connection states are controlled via the ON | OFF key, via hotkeys and via the UE.

The available hotkeys depend on the current connection state. Below all possible hotkeys are described.

For background information refer to chapter 6.2.7, "Connection States", on page 417.

ON | OFF (key) / WCDMA-UE Signaling (softkey)

The ON | OFF key is used to turn the DL signal transmission on or off. The current state is shown by the softkey. The signal transmission can be switched off any time, independent of the current connection state. A yellow sandglass symbol indicates that the signaling generator is currently turned on or off.

The state "RDY" means that the signaling application is ready to receive an inter-RAT handover from another signaling application (e.g. from LTE). This state is initiated by the application acting as source of the handover.

Remote command:

SOURce:WCDMa:SIGN<i>:CELL:STATe

SOURce:WCDMa:SIGN<i>:CELL:STATe:ALL?

Connection control hotkeys

Any interaction with a UE requires a WCDMA downlink signal (cell). As soon as the signal is available (state ON, no sandglass), connection control hotkeys appear in the hotkey bar. The available hotkeys depend on the current connection state which is visualized in the "Connection Status" panel of the "WCDMA Signaling" view.

The possible hotkeys are described in the following tables.

Table 6-23: Connection control hotkeys (reduced signaling disabled)

Hotkey	Description
"Connect Voice/ Video/SRB"	Initiate a CS connection setup. The instrument pages the UE. When the UE answers paging, the transitory state "Call Setup in Progress" is reached. When the UE starts ringing, the connection state "Alerting" is reached. As soon as the connection is accepted at the UE the CS connection state changes to "Call Established".
"Connect Test Mode"	Initiate a test mode connection in the CS domain. If the HSPA test mode is enabled and the test mode procedure is "...HSPA 34.108", set up also an HSPA test mode connection in the PS domain.
"Connect HSPA TM"	Initiate a HSPA test mode connection in the PS domain.
"Disconnect Voice/Video/SRB"	Release the connection and return to the previous connection state, e.g. "Registered".

Hotkey	Description
"Disconnect Test Mode"	If established, release the HSPA connection. Then release the test mode connection in the CS domain. Return to the previous connection states, e.g. "Registered" and "Attached".
"Disconnect HSPA TM"	Release the HSPA test mode connection and return to the previous connection state, e.g. "Attached". If a test mode connection in the CS domain has been established, it remains established.
"Unregister"	Unregister the UE completely (CS unregister and PS detach), i.e. change to state "Off". Afterwards the UE can attempt a new registration / attach or initiate a connection setup. This feature can be useful if the UE is replaced without switching the WCDMA DL signal off.
"Send SMS"	Send an SMS message to the UE.
"Handover"	See "Handover (hotkey)" on page 509

Table 6-24: Connection control hotkeys for reduced signaling

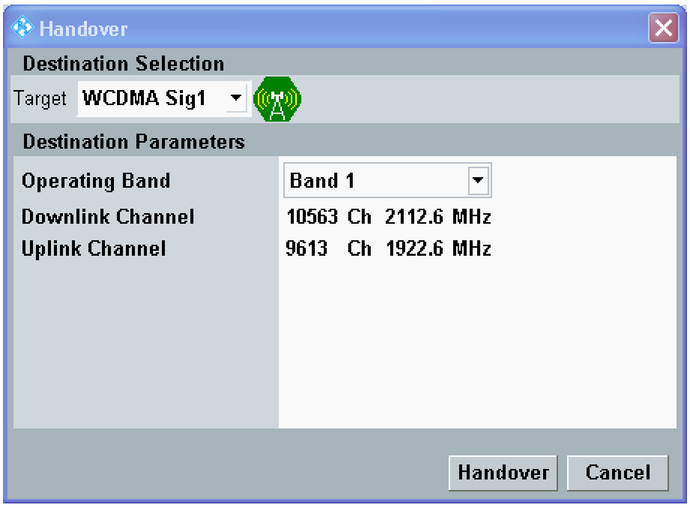
Hotkey	Description
"Connection Setup On"	Switch on the reduced signaling connection. This results in a downlink signal containing also dedicated physical channels and (if enabled) shared physical channels like during an established connection. The configured RF input connector is active and an uplink signal can be received. Please note that for HSPA test mode direction = HSPA ("Direction" on page 551) the enabled HSDPA and HSUPA downlink channels are only present when the R&S CMW has successfully completed synchronization to the UL signal.
"Connection Setup Off"	Switch off the reduced signaling connection. This results in a downlink signal containing only common channels and synchronization channels. The configured input connector is deactivated.

Remote command:
CALL:WCDMa:SIGN<i>:CSWitched:ACTion
CALL:WCDMa:SIGN<i>:PSWitched:ACTion
CALL:WCDMa:SIGN<i>:RSIGnaling:ACTion

Handover (hotkey)

The hotkey opens a dialog for selection and configuration of the handover destination and initiation of the handover. As a prerequisite for a handover, a connection must be established.

The WCDMA signaling application supports a handover within the signaling application, e.g. to another operating band, as well as a handover to another signaling application. The two signaling applications must use different RF paths. If they use the same RF path, an error message is displayed.



The parameter "Target" selects the handover destination. The cell icon indicates the cell state of the currently selected destination. When you select another signaling application, e.g. "GSM Sig1", the destination cell is switched on automatically and the target cell state changes to RDY (ready for handover).

The "Destination Parameters" display current settings of the selected signaling application target, typically operating band and channel(s). You can modify these settings before starting the handover. To configure the settings via remote control commands, use the commands provided by the signaling application target. There are no special handover commands for this purpose.

To initiate a handover, press the "Handover" button.

Please note that the operating band and channels of the currently used WCDMA signaling application can be reconfigured directly. It is not required to open the handover dialog for that purpose.

For a detailed step-by-step description of a handover, see chapter 6.3.2, "Handover from WCDMA to GSM", on page 474.

Remote command:

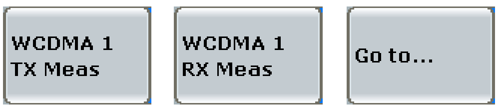
PREPare:WCDMa:SIGN<i>:HANDover:DESTination

PREPare:WCDMa:SIGN<i>:HANDover:CATalog:DESTination?

CALL:WCDMa:SIGN<i>:CSWitched:ACTion

6.4.3 Using the Shortcut Softkeys

When using the WCDMA signaling application and a WCDMA measurement in parallel, it is recommended to use a shortcut softkey to switch to the measurement.



Using one of these softkeys ensures that the measurement is configured compatible with the settings of the signaling application. When you use the softkeys to switch to the "TX

Measurements", the combined signal path scenario is activated automatically in the measurement.

Consequences:

- The measurement and the signaling application can be used in parallel, i.e. both DL signal transmission and measurement can be switched on.
- The signaling RF settings are also used for the measurement.
- The UE Signal Info settings of the measurement are configured compatible with the signaling application.
- Additional softkeys and hotkeys are displayed in the measurement, so that the signaling application can be controlled and configured from the measurement.

If the softkey label equals "Go to...", the softkey opens a dialog box with a list of all available WCDMA measurements. If the softkey label indicates a measurement name, this measurement has been assigned to the softkey as fixed target, see Select as fixed Target.

Three shortcut softkeys are available and can be set to different fixed targets.

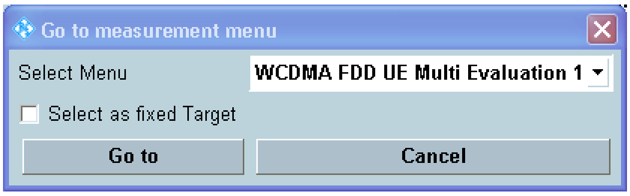


Fig. 6-43: Dialog box opened by "Go to..." softkey

Select Menu

Selects the target measurement you want to switch to.

Select as fixed Target

Sets the selected measurement as fixed target of the softkey. The softkey label indicates the measurement name and switches directly to the selected target without opening the dialog box.

When the dialog box has been disabled, you can still change the target measurement or re-enable the dialog box using the configuration menu, see chapter 6.4.18, "Shortcut Configuration", on page 587.

Go to / Cancel

Press "Go to" to switch to the selected measurement or "Cancel" to abort.

6.4.4 Using the WCDMA Wizards

The WCDMA wizards provide predefined signal settings for HSPA tests.

To open the wizard dialog press the WIZARD key at the (soft-)front panel or use the keyboard shortcut CTRL + W.

As a result, the "CMW Wizard" dialog opens. The tab "Application Wizards" is related to the currently displayed firmware application, so display the main view of the WCDMA signaling application before opening the dialog.

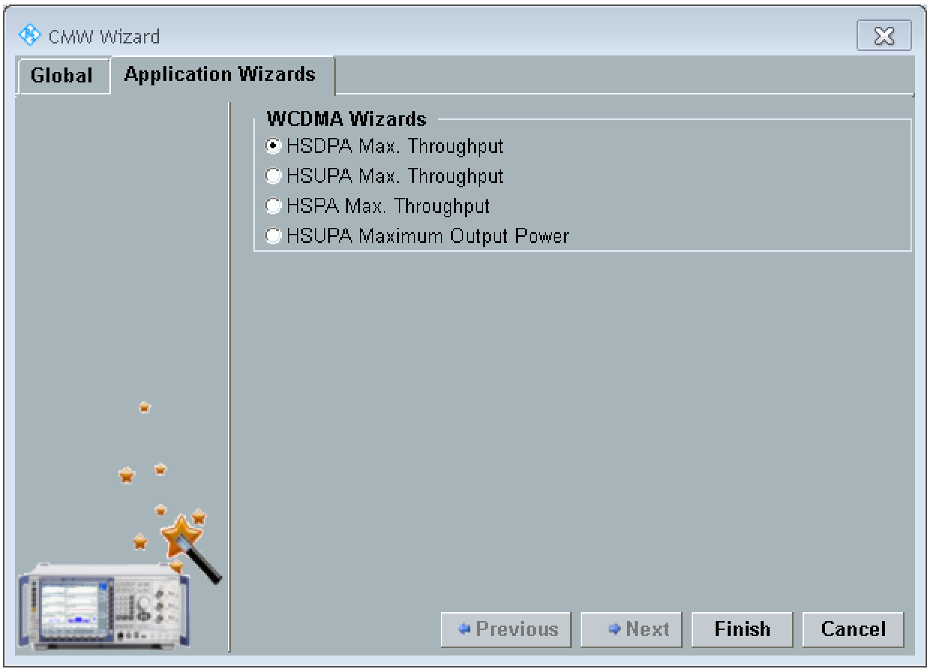


Fig. 6-44: CMW Wizard dialog box

WCDMA Wizards

Select the desired set of predefined settings, then press "Finish" to apply them.

For a list of configured parameters see chapter 6.2.16, "WCDMA Wizards", on page 451.

Option R&S CMW-KS411 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:PSETtings:HUMP`

`CONFigure:WCDMa:SIGN<i>:PSETtings`

6.4.5 General Settings

These settings are located at the very top of the configuration dialog.

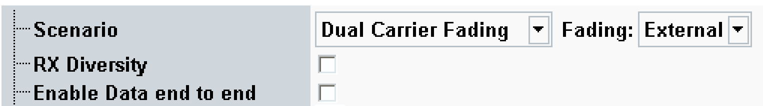


Fig. 6-45: Top of configuration dialog

Scenario

This parameter allows to switch between certain test situations that require different sets of parameters. Some parameters are only available for a specific scenario or have a different meaning depending on the scenario.

Scenarios with fading are only available for instruments equipped with an I/Q board.

- **Standard Cell**:
  Standard WCDMA cell with only one RF output path.
- **Dual Carrier**:
  WCDMA cell supporting dual carrier HSDPA in the downlink.
  Carrier 1 and carrier 2 use different output paths. Many parameters can be configured individually per carrier.
  Option R&S CMW-KS404 is required.
- **Standard Cell Fading / Dual Carrier Fading**:
  "Standard Cell" or "Dual Carrier" plus fading and/or AWGN insertion.
  Either external fading via a connected R&S AMU200A or internal fading via an internal fader I/Q board.
  Option R&S CMW-KS410 is required, for internal fading also R&S CMW-KE100 and R&S CMW-KE400, for "Dual Carrier Fading" also R&S CMW-KS404.
  See also chapter 6.2.5, "External Fading", on page 415 and chapter 6.2.6, "Internal Fading", on page 416.

Remote command:

`ROUTe:WCDMa:SIGN<i>:SCENario:SCELl`
`ROUTe:WCDMa:SIGN<i>:SCENario:DCARrier`
`ROUTe:WCDMa:SIGN<i>:SCENario:SCFading[:EXTernal]`
`ROUTe:WCDMa:SIGN<i>:SCENario:SCFading:INTernal`
`ROUTe:WCDMa:SIGN<i>:SCENario:DCFading[:EXTernal]`
`ROUTe:WCDMa:SIGN<i>:SCENario:DCFading:INTernal`
`ROUTe:WCDMa:SIGN<i>:SCENario?`
`ROUTe:WCDMa:SIGN<i>?`

RX Diversity

This parameter is only relevant and displayed for external "Dual Carrier Fading".

Enable it if you need a dual carrier signal with both carriers using the same carrier frequency. This makes sense if you use an external fader to shift the frequency of the second carrier for RX diversity tests.

If the parameter is enabled, the second carrier uses the center frequency of the first carrier.

Option R&S CMW-KS404 and R&S CMW-KS410 are required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:SCENario:DCFading:EXTernal:RXDiversity`

Enable Data end to end

Enable this parameter if you want to perform IP-based data tests involving the Data Application Unit (DAU). If this parameter is disabled, no connection is established between the signaling unit and the DAU.

Only one signaling application with this parameter enabled can be active at a time (cell on / downlink signal present). The parameter is only configurable while the downlink signal is switched off.

The parameter is only displayed if a DAU and option R&S CMW-KA100 are available.

Remote command:
CONFigure:WCDMa:SIGN<i>:ETOE

6.4.6 I/Q Settings

The parameters in this section configure the I/Q output and input paths for scenarios with external fading.

In such scenarios, a connected R&S AMU200A superimposes fading on the baseband downlink signal.

For a dual carrier scenario with external fading, all parameters described below are available per carrier.

See also chapter 6.2.5, "External Fading", on page 415

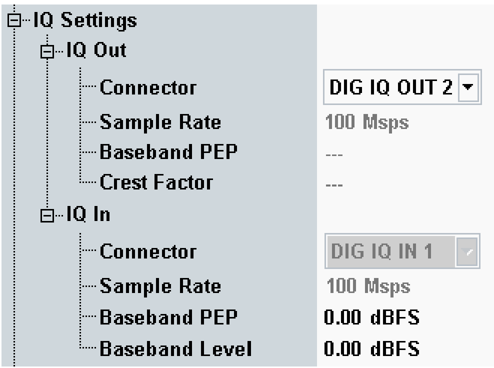


Fig. 6-46: I/Q settings (Standard Cell Fading: External)

Connector (Out / In)
Selects the output connector. The input connector depends on the output connector and is displayed for information.

The DIG IQ connectors are located at the rear panel (if an I/Q board is installed).

Remote command:
ROUTe:WCDMa:SIGN<i>:SCENario:SCFading[:EXTernal]
ROUTe:WCDMa:SIGN<i>:SCENario:DCFading[:EXTernal]

Sample Rate (Out / In)
The used sample rate is displayed for information. The value is fixed.

Configure the connected instrument accordingly (baseband input settings and digital I/Q output settings).

Remote command:
SENSe:WCDMa:SIGN<i>:IQOut:CARRier<carrier>?

Baseband PEP (Out / In)
Indicates the peak envelope power of the baseband signal as dB value relative to full scale. "Full scale" in this case corresponds to the maximum representable amplitude of the I/Q samples.

Use the displayed output PEP value to configure the baseband input of the R&S AMU200A.

Configure the input PEP so that it matches the baseband output of the connected instrument.

Remote command:
`SENSe:WCDMa:SIGN<i>:IQOut:CARRier<carrier>?`
`CONFigure:WCDMa:SIGN<i>:IQIN:CARRier<carrier>`

Crest Factor (Out)
Indicates the crest factor of the baseband signal, i.e. the ratio of peak to average baseband power. The average power is calculated for time intervals with active downlink traffic channel timeslots only.

Use the displayed crest factor value to configure the baseband input of the connected instrument.

Remote command:
`SENSe:WCDMa:SIGN<i>:IQOut:CARRier<carrier>?`

Baseband Level (In)
Indicates the nominal RMS level of the baseband signal during a call (connection established).

Configure the baseband level so that it matches the baseband output of the connected instrument.

Remote command:
`CONFigure:WCDMa:SIGN<i>:IQIN:CARRier<carrier>`

6.4.7 RF Settings

The parameters in this section provide general signal settings and configure the RF input and output paths.

Depending on the selected scenario the section configures one input and one output path or one input and two output paths.

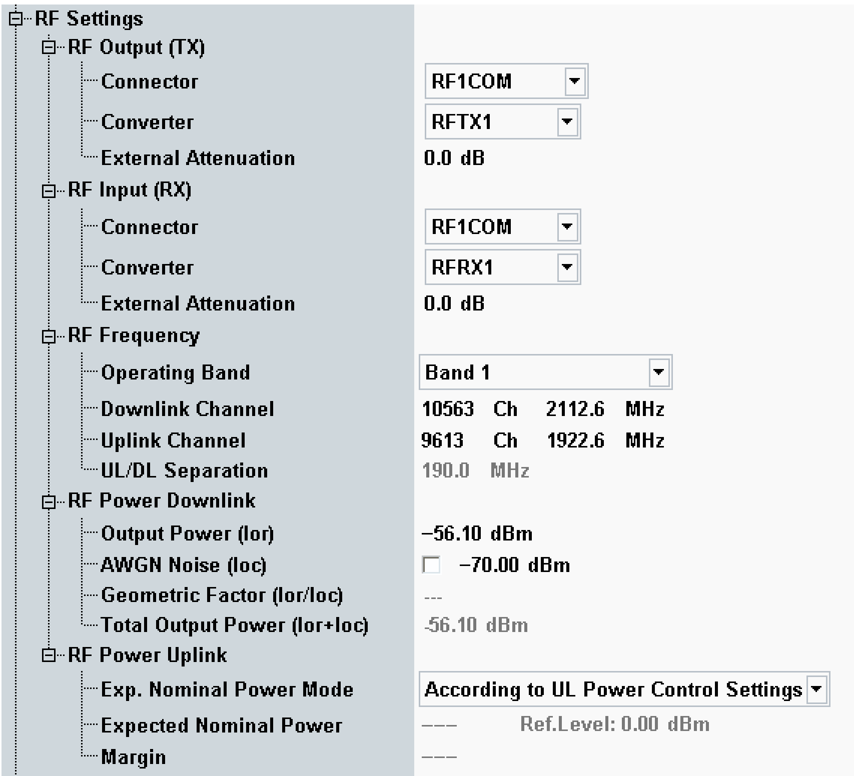


Fig. 6-47: RF settings (Standard Cell)

RF Output (TX) > Connector, Converter

Selects the output path for the generated RF signal, i.e. the output connector and the TX module to be used.

Depending on your hardware configuration there may be dependencies between both parameters. Select the RF connector first. The "Converter" parameter offers only values compatible with the selected RF connector.

Depending on the active scenario you can configure several output paths. Select a different TX module for each output path.

Remote command:

`ROUTe:WCDMa:SIGN<i>:SCENario:SCELl`
`ROUTe:WCDMa:SIGN<i>:SCENario:DCARrier`
`ROUTe:WCDMa:SIGN<i>:SCENario:SCFading[:EXTernal]`
`ROUTe:WCDMa:SIGN<i>:SCENario:SCFading:INTernal`
`ROUTe:WCDMa:SIGN<i>:SCENario:DCFading[:EXTernal]`
`ROUTe:WCDMa:SIGN<i>:SCENario:DCFading:INTernal`

RF Output (TX) > External Attenuation

Defines the value of an external attenuation (or gain, if the value is negative) in the output path. With an external attenuation of x dB, the power of the generated signal is increased by x dB. The actual generated levels are equal to the displayed values plus the external attenuation.

If a correction table for frequency-dependent attenuation is active for the chosen connector, then the table's name and a button are displayed. Press the button to display the table entries.

If the active scenario uses several output paths, you can configure the external attenuation individually for each path.

Remote command:
CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:
EATTenuation:OUTPut

RF Input (RX) > Connector, Converter
Selects the input path for the measured RF signal, i.e. the input connector and the RX module to be used.

Depending on your hardware configuration there may be dependencies between both parameters. Select the RF connector first. The "Converter" parameter offers only values compatible with the selected RF connector.

Remote command:
ROUTe:WCDMa:SIGN<i>:SCENario:SCELl
ROUTe:WCDMa:SIGN<i>:SCENario:DCARrier
ROUTe:WCDMa:SIGN<i>:SCENario:SCFading[:EXTernal]
ROUTe:WCDMa:SIGN<i>:SCENario:SCFading:INTernal
ROUTe:WCDMa:SIGN<i>:SCENario:DCFading[:EXTernal]
ROUTe:WCDMa:SIGN<i>:SCENario:DCFading:INTernal

RF Input (RX) > External Attenuation
Defines the value of an external attenuation (or gain, if the value is negative) in the input path. The power readings of the R&S CMW are corrected by the external attenuation value.

The external attenuation value is also used in the calculation of the maximum input power that the R&S CMW can measure.

If a correction table for frequency-dependent attenuation is active for the chosen connector, then the table's name and a button are displayed. Press the button to display the table entries.

Remote command:
CONFigure:WCDMa:SIGN<i>:RFSettings:EATTenuation:INPut

RF Frequency > ...
"Uplink Channel" specifies the center frequency of the RF analyzer and "Downlink Channel" the center frequency of the generated WCDMA signal.

The relation between operating band, frequency and channel number and the UL/DL separation are defined by 3GPP (see chapter 6.2.11, "Operating Bands", on page 436).

Option R&S CMW-KS425 is required for the S and L operating bands.

To specify the center frequencies, select an operating band first, then enter a valid channel number or frequency for uplink or downlink. The related frequency or channel number and the parameters for the other direction are calculated automatically.

If the dual carrier scenario is active, the two downlink carriers use adjacent channels. Generally the center frequency of carrier 2 equals the center frequency of carrier 1 plus 5 MHz. Exception: at the upper end of an operating band, carrier 2 uses the center frequency of carrier 1 minus 5 MHz. If you configure one downlink channel, the other downlink channel is configured automatically.

You can change the operating band and the channels in all main connection states. For an established connection you can either change one parameter directly (the R&S CMW performs a physical channel reconfiguration) or you can perform an intra-WCDMA handover to reconfigure several parameters, see chapter 6.2.8, "Handover", on page 422.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CARRier<carrier>:BAND`
`CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:CHANnel:DL`
`CONFigure:WCDMa:SIGN<i>:RFSettings:CHANnel:UL`
`CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:DL`
`CONFigure:WCDMa:SIGN<i>:RFSettings:UL`
`CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:FREQuency:DL`
`CONFigure:WCDMa:SIGN<i>:RFSettings:FREQuency:UL`

RF Power Downlink > Output Power (Ior)

Sets the base level of the generator, representing the total output power of the base station signal during a call (state connected), averaged over 1 frame but not taking into account a possible DTX mode for the TFCI bits. The individual physical channel levels are defined relative to the base level (see "Channel Table > Level" on page 525).

If the dual carrier scenario is active, you can configure the output power per carrier. The total power of both carriers is also displayed. If you modify it, both carrier powers are increased/decreased by the same amount so that the new total power is reached.

Remote command:

`CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:COPower`
`CONFigure:WCDMa:SIGN<i>:RFSettings:COPower:TOTal`

RF Power Downlink > AWGN Noise (Ioc)

Total level of the Additional White Gaussian Noise (AWGN) interferer in dBm (the spectral density integrated across the bandwidth of 3.84 MHz). The signaling unit adds the AWGN signal to the DL WCDMA signal unless AWGN is switched off. Like the output channel power, the AWGN level is varied as a function of the external output attenuation setting.

The range of values is sufficient for all tests specified in the conformance test specification 3GPP TS 34.121. The properties of the AWGN interferer comply with the requirements of 3GPP TS 34.121, section 7.1.2 (minimum bandwidth 5.76 MHz, flatness less than ±0.5 dB, peak to average ratio at a probability of 0.001 % above 10 dB). An AWGN signal source simulates realistic propagation conditions of the DL signal. It is needed for many of the performance tests and support of RRM tests described in 3GPP TS 34.121.

The signal at the output connector is limited to the maximum level stated in the data sheet. When the settings result in a signal exceeding this limit, the AWGN noise is decreased automatically.

If the dual carrier scenario is active, the same settings apply to both carriers.

For fading scenarios this parameter is disabled, so that AWGN can not be added by the signaling unit. Instead AWGN can be added by the fader (external or internal).

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:AWGN

RF Power Downlink > Geometric Factor (Ior/Ioc)
Displays the ratio of the Output Channel Power (Ior) to the AWGN Noise power (Ioc). Together with the absolute output channel power, the geometric factor is a measure for the signal quality. An external output attenuation has the same effect on Ior and Ioc, so that the geometry factor corresponds to the received channel power spectral density Ior divided by Ioc at the UE receiver (see 3GPP TS 34.121).

If the dual carrier scenario is active, the geometric factor is displayed per carrier.

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:GMTFactor?

RF Power Downlink > Total Output Power (Ior+Ioc)
Sum of the Output Channel Power (Ior) and the AWGN Noise power (Ioc). This value cannot be set but is displayed for information.

If the dual carrier scenario is active, the information is displayed per carrier. Additionally the sum of both powers is displayed.

Remote command:
CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:TOPower?
CONFigure:WCDMa:SIGN<i>:RFSettings:TOPower:TOTal?

RF Power Uplink > ...
These parameters configure the expected UL power. The displayed reference level is calculated as the sum of expected nominal power and margin.

Two modes are available:

- **Manual**
  In manual mode the expected nominal power and a margin can be defined manually. An appropriate expected nominal power value for WCDMA signals is the peak output power at the DUT during the measurement interval.
  The margin is used to account for the known variations (crest factor) of the RF input signal power. Appropriate values depend on the configuration of the UL WCDMA signal, e.g. on the active channels and gain factors. For a 12.2 kbps Reference Measurement Channel (RMC), a value of 5 dB is appropriate.
- **According to UL Power Control Settings**
  While a downlink signal is available, the expected nominal power and the margin are calculated automatically from the UL power control settings and displayed for information.
  As long as no call or connection has been set up, the expected power corresponds to the expected initial preamble power, see "Exp. Initial Preamble Power" on page 537 and a high margin is used.
  During a call/connection, the values depend e.g. on the TPC settings, the power class of the UE, the maximum power allowed in the cell and the beta factors.

The automatic mode is not recommended for the "Phase Disc..." and "Single Pattern Alt." TPC setups. Use the manual mode instead.
For all other TPC setups the automatic mode can be used. For the TPC test steps E to H the values are optimized several times per test step. These changes are performed too fast to display all of them at the GUI.
When performing spectrum measurements with a "Closed Loop" or "All 1" TPC setup, consider to use the manual mode in order to optimize the dynamic range.

Note: The actual input power at the connectors (i.e. the "Reference Level" minus the "External Attenuation (Input)" value, if all power settings are configured correctly) must be within the level range of the selected RF input connector; refer to the data sheet.

Remote command:
`CONFigure:WCDMa:SIGN<i>:RFSettings:ENPMode`
`CONFigure:WCDMa:SIGN<i>:RFSettings:ENPower`
`CONFigure:WCDMa:SIGN<i>:RFSettings:MARGin`

6.4.8 Internal Fading

This branch of the configuration tree is only visible if a fading scenario is selected ("Standard Cell Fading" or "Dual Carrier Fading") and the fading source is set to "Internal".

For general prerequisites/required options and background information see chapter 6.2.6, "Internal Fading", on page 416.

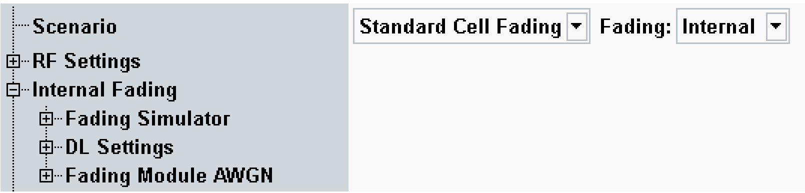


Fig. 6-48: Internal fading settings

6.4.8.1 Fading Simulator

The following parameters allow to enable and set up the fading simulator. For background information see chapter 6.2.6.1, "Fading Simulator", on page 416.

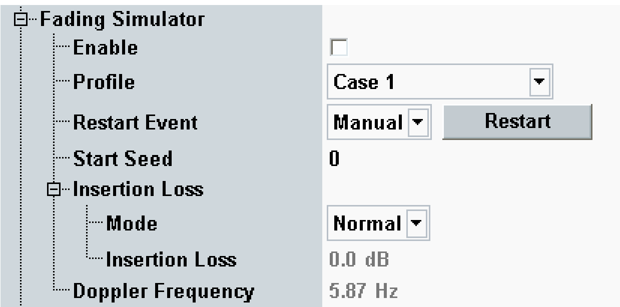


Fig. 6-49: Fading simulator settings

Enable

Enables/disables the fading simulator.

Remote command:
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:ENABle`

Profile

Selects one of the multipath propagation condition profiles defined in Annex B.2.2 of 3GPP TS 25.101:

- Case 1 to Case 6
- ITU Pedestrian A/B, 3 km/h (PA3, PB3)
- ITU Vehicular A, 3 km/h / 30 km/h / 120 km/h (VA3, VA30, VA120)

Remote command:
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:STANdard`

Restart Event

In "Auto" mode, fading automatically starts with the downlink signal. In "Manual" mode, it is started and restarted manually.

Remote command:
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:RESTart:MODE`
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:RESTart`

Start Seed

Sets the start seed for the pseudo-random fading algorithm. This enables reproducible fading conditions.

Remote command:
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:GLOBal:SEED`

Insertion Loss

In "Normal" mode, the insertion loss (i.e. the required attenuation at fader input) is calculated based on the currently selected Profile. In "Manual" mode it can be adjusted by the user.

A lower insertion loss allows for a higher downlink power but may result in clipping.

Remote command:
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:ILOSs:MODE`
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:ILOSs:LOSS`

Doppler Frequency

Displays the maximum Doppler frequency resulting from the selected fading profile.

Remote command:
`CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:DSHift?`

6.4.8.2 DL Settings

This branch displays noise power values, calculated from the downlink power and the fading module AWGN settings.

For a dual carrier scenario all values are available per carrier.

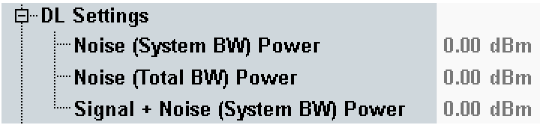


Fig. 6-50: Noise information

Noise (System BW) Power

Displays the noise power on the downlink carrier, i.e. within the channel bandwidth.

Remote command:

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:POWer:NOISe?

Noise (Total BW) Power

Displays the total noise power, within and outside of the downlink carrier.

Remote command:

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:POWer:NOISe:TOTal?

Signal + Noise (System BW) Power

Displays the total power (signal + noise) on the downlink carrier, i.e. within the channel bandwidth.

Remote command:

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:POWer:SUM?

6.4.8.3 Fading Module AWGN

The following parameters enable and configure the AWGN insertion on the fading module. For background information see chapter 6.2.6.2, "AWGN Generator", on page 417.

For a dual carrier scenario, the same AWGN settings apply to both carriers. The signal to noise ratio can nevertheless be different for the two carriers, due to a different downlink carrier power.

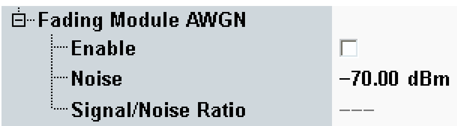


Fig. 6-51: AWGN settings

Enable

Enables/disables AWGN insertion via the fading module.

Remote command:

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:AWGN:ENABle

Noise

Total level of the AWGN interferer within the channel bandwidth (the spectral density integrated across the carrier bandwidth of 3.84 MHz).

The properties of the AWGN interferer comply with the requirements of 3GPP TS 34.121, section 7.1.2 (minimum bandwidth 5.76 MHz, flatness less than ±0.5 dB, peak to average ratio at a probability of 0.001 % above 10 dB).

Remote command:
CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:AWGN:NOISe

Signal/Noise Ratio
Displays the signal to noise ratio resulting from the configured AWGN level and the base level of the downlink signal generator.

Remote command:
CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:AWGN:SNRatio?

6.4.9 Physical Channel DL Settings

This section defines characteristics of the physical downlink channels.

The description of the settings is divided into several sections.

6.4.9.1 General Settings

The first parameters are general settings. If the dual carrier scenario is active, they are available per carrier.

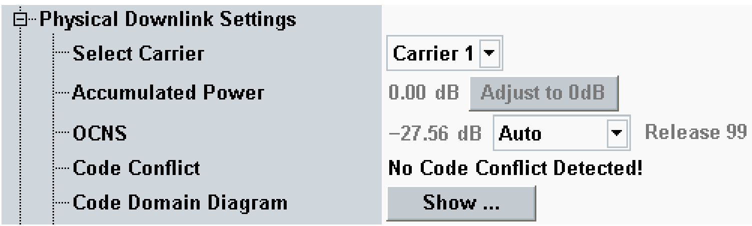


Fig. 6-52: Physical channel DL settings - general part

Select Carrier
Selects the carrier for which the physical downlink settings are displayed.

This parameter is only visible while the dual carrier scenario is active.

Remote command:
None - there are individual commands for the settings of both carriers.

Accumulated Power

Displays the total power of all physical downlink channels active during a call (state connected). Deactivated channels and channels that are not active during the call (AICH, S-CCPCH) are not considered for the calculation of the accumulated power. HSPA channels are only considered if they are relevant for the currently configured connection type.

The power is indicated relative to the base level of the generator (see "RF Power Downlink > Output Power (Ior)" on page 518). The information is carrier-specific.

The button "Adjust to 0 dB" corrects the power levels of all enabled channels of a carrier to minimize the difference between the total power level of the channels and the base level of the carrier. For this purpose the level of all enabled channels of the carrier is decreased by the same amount. As the levels are modified in steps of 0.1 dB this procedure may yield a small remaining accumulated power instead of 0 dB.

If the dual carrier scenario is active, the button triggers the correction of both carriers.

Remote command:

`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:APOWer?`

`CONFigure:WCDMa:SIGN<i>:DL:LEVel:ADJust`

OCNS

Displays the total OCNS channel power relative to the base level of the generator (see "RF Power Downlink > Output Power (Ior)" on page 518).

The OCNS channels are present if the total power of all active physical downlink channels is smaller than the base level of the generator. The remaining power is then assigned to the OCNS channels so that the base level is reached.

Four sets of OCNS channels are available: Release 99, 5, 6 and 7.

If you select "Auto", a suitable set is selected automatically depending on the current configuration. For carrier 2 the automatic mode always selects Release 6.

The OCNS channels can be configured per carrier.

See also chapter 6.2.9.5, "Orthogonal Channel Noise Simulator (OCNS)", on page 428

Remote command:

`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:OCNS:LEVel?`

`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:OCNS:TYPE`

Code Conflict

Displays whether a code conflict is detected or not. Additionally a red box is displayed next to the conflicting channels.

Conflicts are not corrected automatically. It is even possible to generate a signal using conflicting codes.

For background information see chapter 6.2.9.4, "Channelization Codes", on page 427

Remote command:

`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:CONFlict?`

Code Domain Diagram
Shows or hides the code domain diagram. For a description see chapter 6.4.9.6, "Code Domain Diagram", on page 534.

Remote command:
n/a

6.4.9.2 R99 Channels

This section configures the R99 channels and F-DPCH.

The settings described below apply to a single carrier scenario and to carrier 1 of a dual carrier scenario. For carrier 2 only the P-CPICH settings are displayed. The other R99 channels are not transmitted via carrier 2. For switching between the carriers see "Select Carrier" on page 523.

The column titles of the channel tables (e.g. "Level") don't apply to the "... Enhanced" settings.

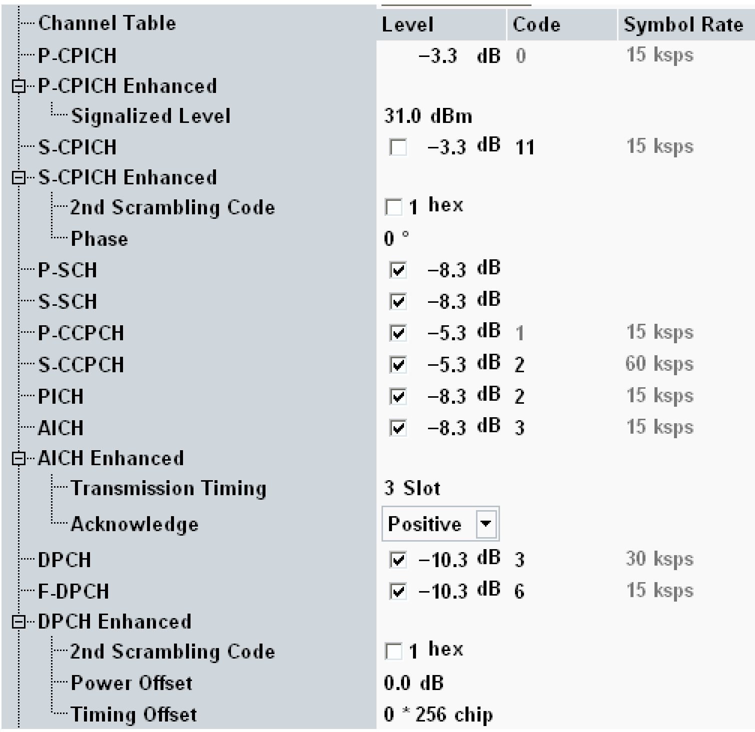


Fig. 6-53: Physical channel DL settings - R99 channel table

Channel Table > Level
Defines the level of a channel relative to the base level of the generator (see "RF Power Downlink > Output Power (Ior)" on page 518). The individual channels can be activated and deactivated (except P-CPICH).

Option R&S CMW-KS410 is required for S-CPICH.

The DPCH level value and the F-DPCH level value are equal. While the CPC feature is active the F-DPCH is activated automatically and is displayed in the code domain diagram instead of the DL DPCH, see chapter 6.4.9.6, "Code Domain Diagram", on page 534.

Option R&S CMW-KS413 is required for F-DPCH.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:PCPich`
`CONFigure:WCDMa:SIGN<i>:DL:LEVel:FDPCh` etc.

Channel Table > Code
Defines the channelization code number of a channel. Some channels are never channelized (e.g. S-SCH), so no channel code is displayed. Gray values indicate fixed standardized channelization codes. They cannot be modified but are relevant for display of code conflicts.

For background information see chapter 6.2.9.4, "Channelization Codes", on page 427

Option R&S CMW-KS410 is required for S-CPICH.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CODE:DPCH` etc.
`CONFigure:WCDMa:SIGN<i>:DL:CODE:FDPCh` etc.
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:PCPich?`
`CONFigure:WCDMa:SIGN<i>:DL:CODE:PCCPch?`

Channel Table > Symbol Rate
Displays the symbol rate of a channel. For most channels this value is fixed. For the DPCH it depends on the connection configuration (e.g. connection type, data rate, ...).

Option R&S CMW-KS410 is required for S-CPICH.

Remote command:
n/a

P-CPICH Enhanced > Signalized Level
Defines the P-CPICH power level to be reported to the UE. The UE determines the path loss by comparison of this power level and the power level measured on the pilot bits of the P-CPICH. A larger path loss results in a larger initial preamble power.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:PCPich:SLEVel`

S-CPICH Enhanced > 2nd Scrambling Code
Defines index k used for calculation of a secondary scrambling code number by adding k to the primary scrambling code number (see "Primary Scrambling Code" on page 553).

If the secondary scrambling code is deactivated, the primary scrambling code is used.

Option R&S CMW-KS410 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:ENHanced:SCPich:SSCode`

S-CPICH Enhanced > Phase
Defines the phase of the S-CPICH in degrees, relative to the P-CPICH phase. Within the allowed range, you can set multiples of -45 degrees.

Option R&S CMW-KS410 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:ENHanced:SCPich:PHASe`

AICH Enhanced > Transmission Timing
Defines the minimum allowed time delay between two consecutive RACH preambles. RACH preambles are sent by the UE during a random access procedure.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:ENHanced:AICH:TTIMing`

AICH Enhanced > Acknowledge
Defines how the R&S CMW acknowledges RACH preambles received from the UE.

"Positive" Normal operation mode. The R&S CMW acknowledges or negatively acknowledges the preambles appropriately. The UE can be registered and a connection can be set up.

"Negative" The R&S CMW always responds with negative acknowledgements so that the random access procedure fails after the maximum number of preamble cycles has been reached. The UE will reinitiate a new preamble cycle after a while but not succeed in performing a registration or establishing a connection.
This setting can be used for repeated tests of the random access procedures.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:ENHanced:AICH:ACKNowledge`

DPCH Enhanced > 2nd Scrambling Code
Defines index k used for calculation of a secondary scrambling code number by adding k to the value of parameter "Primary Scrambling Code" on page 553.

If the secondary scrambling code is deactivated, the primary scrambling code is used.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:ENHanced:DPCH:SSCode`

DPCH Enhanced > Power Offset
Defines the power of the DPCCH relative to the power of the DPDCH. The DPDCH power is defined as "DPCH" level in the channel table.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:ENHanced:DPCH:POFFset`

DPCH Enhanced > Timing Offset
Defines the offset between the DL P-CCPCH timing and the DL DPCH timing. The timing offset is a multiple of 256 chips (1/10 slot).

This parameter impacts also uplink channels, as the UL DPCH is separated by 1024 chips (4/10 slots) from the DL DPCH (see 3GPP TS 25.211, Chapter 7).

Remote command:

`CONFigure:WCDMa:SIGN<i>:DL:ENHanced:DPCH:TOFFset`

6.4.9.3 HS-SCCH Configuration

This section configures an HS-SCCH set with up to four HS-SCCH channels.

For a dual carrier scenario, all settings are available per carrier. For switching between the carriers see "Select Carrier" on page 523.

Please note that two HS-SCCH are required for an R7 or R8 connection, while one HS-SCCH is sufficient for an R5 connection.

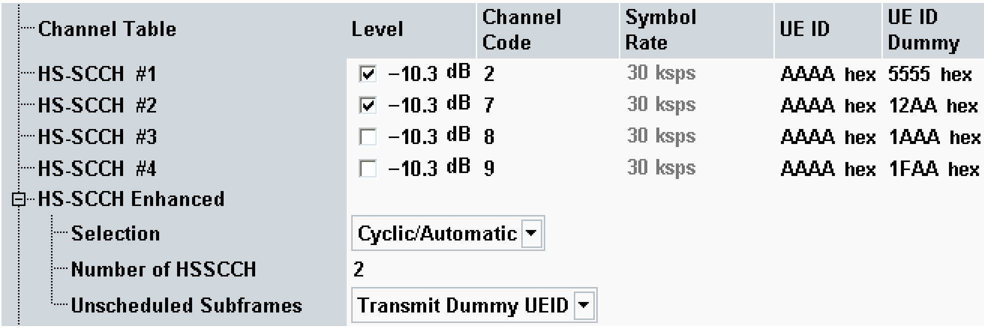


Fig. 6-54: Physical channel DL settings - HS-SCCH

Level

Defines the level of a channel relative to the base level of the generator (see "RF Power Downlink > Output Power (Ior)" on page 518).

The checkbox allows to switch off the power of an HS-SCCH. Switching off the power does not remove the channel from the HS-SCCH set, see also Number of HSSCCH.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:HSSCch<no>`

Channel Code

Defines the channelization code number of an HS-SCCH channel.

For background information see chapter 6.2.9.4, "Channelization Codes", on page 427

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:HSSCch<no>`

Symbol Rate

Displays the symbol rate of a channel. This value is fixed.

Option R&S CMW-KS401 is required.

Remote command:
n/a

UE ID

UE identity (=H-RNTI); 16-bit value, entered as a 4-digit hexadecimal number. The UE ID identifies the UE for which data is transmitted in the corresponding HS-DSCH TTI. As the entire HS-SCCH set is allocated to a single UE, all channels have the same UE ID. Modifying one UE ID changes all displayed UE IDs.

In unscheduled subframes the UE ID is not used. Which HS-SCCH actually carries the UE ID in scheduled subframes depends on parameter Selection.

Option R&S CMW-KS411 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:HSSCch<no>:UEID`

UE ID Dummy

4-digit hexadecimal number, to be sent in HS-SCCH subframes which are not allocated to the UE (unscheduled subframes).

Alternatively DTX can be sent in unscheduled subframes, for configuration see Unscheduled Subframes.

Option R&S CMW-KS411 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:HSSCch<no>:IDDummy`

Selection

Selection of the HS-SCCH that carries the UE ID in scheduled subframes. The UE ID can be assigned to a fixed HS-SCCH number or the assignment can change after each subframe.

In accordance with the 3GPP requirements, a change of the HS-SCCH is suspended when the UE is scheduled in two consecutive subframes. This scenario occurs for an inter-TTI distance of 1, provided that the number of HARQ processes is sufficiently large. For 6 or more HARQ processes, the UE is continuously scheduled so there is no change of the HS-SCCH.

For R5 connections (QPSK or 16-QAM) only one HS-SCCH is required.

For R7 and higher connections one HS-SCCH is required for QPSK, while two HS-SCCH are required for 16-QAM and 64-QAM modulation. One of the two HS-SCCH is selected for usage depending on the HS-PDSCH channelization codes.

Because of the complex selection rules, it is recommended to always use "Cyclic/Automatic" for R7 and higher connections. For R5 connections all values can be used.

The following values are available:

- **No. 1 to 4**
  The UE ID is transferred on the selected fixed HS-SCCH.
- **Random**
  The HS-SCCH for each transmission is selected at random among the channels 1 to n (n = "Number of HSSCCH"). This setting can be used as a stress test for the UE to

check whether it can actually detect subframes irrespective of the HS-SCCH carrying the UE ID.

- **Cyclic/Automatic**
  Cyclic applies to a R5 connection. The UE ID is transferred on the HS-SCCH sequence 1, 2,…, n, 1, 2,…, where n is the "Number of HSSCCH", see also "Example for cyclic HS-SCCH selection (R5 connection)" on page 531.
  Automatic applies to a R7 or higher connection. The UE ID is transferred on a fixed HS-SCCH, selected as follows:
  – QPSK modulation: HS-SCCH #1 is used
  – 16-QAM or 64-QAM modulation: Either HS-SCCH #1 or HS-SCCH #2 is used, depending on the total number of assigned HS-PDSCH channelization codes and depending on whether the first HS-PDSCH channelization code number is even or uneven. See following table.

Table 6-25: HS-SCCH selection for R7 or higher, 16-QAM or 64-QAM

	First HS-PDSCH Code Number	
HS-PDSCH Channelization Codes	**Even (2, 4, ...)**	**Uneven (1, 3, ...)**
1 to 7 HS-PDSCH codes	HS-SCCH #1	HS-SCCH #2
8 to 15 HS-PDSCH codes	HS-SCCH #2	HS-SCCH #1

Option R&S CMW-KS411 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSSCch:SELection`

Number of HSSCCH
Number of HS-SCCHs contained in the HS-SCCH set. A selected value n means that the set contains the HS-SCCHs number 1 to n. See also "Example for cyclic HS-SCCH selection (R5 connection)" on page 531.

Option R&S CMW-KS411 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSSCch:NUMBer`

Unscheduled Subframes
Defines the transmission in the gaps between consecutive HS-SCCH subframes allocated to the UE (inter-TTI distance > 1).

Option R&S CMW-KS411 is required.

"Transmit Dummy UEID"	The HS-SCCH power is maintained and the unscheduled HS-SCCH subframe contains the defined dummy UE ID, see UE ID Dummy.
"DTX"	Discontinuous transmission in unscheduled HS-SCCH subframes (output power switched off)

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSSCch:USFRames`

Example for cyclic HS-SCCH selection (R5 connection)
Settings:
- HS-SCCH #1: Level = –7 dB
- HS-SCCH #2: Level = OFF
- HS-SCCH #3: Level = –7 dB
- HS-SCCH #4: Level = OFF
- Selection = Cyclic/Automatic
- Number of HSSCCH = 3
- Inter TTI = 2 configured in HSDPA channel configuration, see chapter 6.4.13, "HSDPA Settings", on page 564

As a result of these settings, the HS-SCCH subframes 0 to 4 of the first two radio frames are generated as follows:
- Subframe 0: UE ID on HS-SCCH #1
- Subframe 1: UE unscheduled due to Inter TTI = 2
- Subframe 2: UE ID on HS-SCCH #2, but signal power off. UE returns DTX instead of ACK or NACK.
- Subframe 3: UE unscheduled
- Subframe 4: UE ID on HS-SCCH #3
- Subframe 0: UE unscheduled
- Subframe 1: UE ID on HS-SCCH #1
- Subframe 2: UE unscheduled
- Subframe 3: UE ID on HS-SCCH #2, but signal power off. UE returns DTX instead of ACK or NACK.
- Subframe 4: UE unscheduled

6.4.9.4 HS-PDSCH Configuration

This section configures the HS-PDSCH.

For a dual carrier scenario, all settings are available per carrier. For switching between the carriers see "Select Carrier" on page 523.

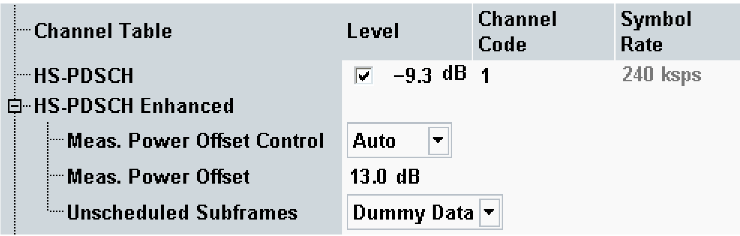


Fig. 6-55: Physical channel DL settings - HS-PDSCH

Level
Signal level of the HS-PDSCH summed over all active codes, relative to the base level of the generator (see "RF Power Downlink > Output Power (Ior)" on page 518). The checkbox enables/disables the HS-PDSCH.

The actual HS-PDSCH level is allowed to change from one TTI to another according to the reference power adjustment Δ defined in 3GPP TS 25.214, section 6A. The displayed HS-PDSCH shows the constant value corresponding to Δ = 0 dB. For a CQI channel configuration, the reference power adjustment is compensated for by a dynamic OCNS.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:HSPDsch

Channel Code
Defines the channelization code number of the HS-PDSCH.

For the HS-PDSCH several code channels can be assigned to one UE. The channel table indicates the first code number only. Example: number of codes = 4, code number = 5 means code numbers 5 to 8 are used. The number of assigned codes depends on the HSDPA channel configuration, see chapter 6.4.13, "HSDPA Settings", on page 564.

Option R&S CMW-KS401 is required.

For background information see chapter 6.2.9.4, "Channelization Codes", on page 427

Remote command:
CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:HSPDsch

Symbol Rate
Displays the symbol rate of the HS-PDSCH. This value is fixed.

Option R&S CMW-KS401 is required.

Remote command:
n/a

Meas. Power Offset Control, Meas. Power Offset
The measurement power offset Γ is signaled to the UE. The UE shall measure the P-CPICH power and assume the total received HS-PDSCH power to be

$P_{HS\text{-}PDSCH} = P_{P\text{-}CPICH} + \Gamma + \Delta(CQI, UE\ Category)$

The reference power adjustment Δ is only relevant for CQI channels and specified by 3GPP depending on the UE category.

In general, changing the measurement power offset will cause an offset of the CQI values reported by the UE. The larger the offset, the higher the reported CQIs.

For more details see 3GPP TS 25.214, section 6A.

Option R&S CMW-KS411 is required.

The first parameter can be set to the following values:

"Manual" Γ is set manually via the second parameter. A manual setting can be used to report a wrong offset value to the UE and test its reaction, e.g. by analyzing the returned CQI values.

"Auto" The correct value Γ is calculated automatically using the formula
$\Gamma = P_{HS\text{-}PDSCH} - P_{P\text{-}CPICH} - \Delta(CQI, UE\ Category)$

Remote command:
CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSPDsch:
POFFset

Unscheduled Subframes
Defines the transmission in the gaps between consecutive HS-DSCH subframes allocated to the mobile (inter-TTI distance > 1).

Option R&S CMW-KS411 is required.

"Dummy Data" The HS-DSCH power is maintained as specified in 3GPP TS 34.121 for CQI reporting tests.

"DTX" Discontinuous transmission in unscheduled HS-DSCH subframes (output power switched off)

Remote command:

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSPDsch:USFRames

6.4.9.5 HSUPA DL Channels

This section configures the downlink channels related to HSUPA: E-AGCH, E-HICH and E-RGCH.

The settings apply to a single carrier scenario and to carrier 1 of a dual carrier scenario. The channels are not transmitted via carrier 2. For switching between the carriers see "Select Carrier" on page 523.

Channel Table	Level	Channel Code	Symbol Rate
E-AGCH	☑ −9.3 dB	3	15 ksps
E-HICH	☑ −12.3 dB	6	30 ksps
E-RGCH	☐ −12.3 dB	6	30 ksps

Fig. 6-56: Physical channel DL settings - HSUPA

Level

Defines the level of a channel relative to the base level of the generator (see "RF Power Downlink > Output Power (Ior)" on page 518).

The checkboxes activate or deactivate the individual channels. The E-RGCH can not be active without the E-HICH.

The E-HICH and the E-RGCH have the same configured power level. Configuring the E-HICH level configures also the E-RGCH level.

Option R&S CMW-KS401 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:DL:LEVel:EAGCh

CONFigure:WCDMa:SIGN<i>:DL:LEVel:EHICh

CONFigure:WCDMa:SIGN<i>:DL:LEVel:ERGCh

Channel Code

Defines the channelization code number of a channel. The E-HICH and the E-RGCH use the same channelization code number. Configuring the E-HICH configures also the E-RGCH.

Option R&S CMW-KS401 is required.

For background information see chapter 6.2.9.4, "Channelization Codes", on page 427

Remote command:
`CONFigure:WCDMa:SIGN<i>:DL:CODE:EAGCh`
`CONFigure:WCDMa:SIGN<i>:DL:CODE:EHICh`
`CONFigure:WCDMa:SIGN<i>:DL:CODE:ERGCh`

Symbol Rate
Displays the symbol rate of a channel. The values are fixed.

Option R&S CMW-KS401 is required.

Remote command:
n/a

6.4.9.6 Code Domain Diagram

The code domain diagram provides a graphical overview of all active physical channels configured via the channel table (except P-SCH and S-SCH which are not channel coded and including active OCNS channels).

To show or hide the CDP diagram, see "Code Domain Diagram" on page 525.

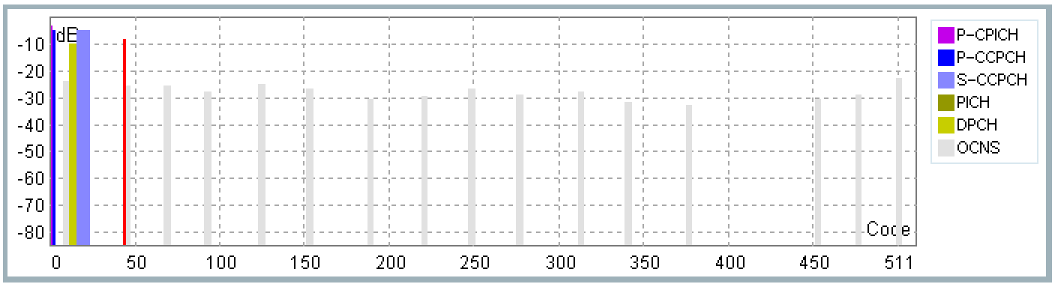


Fig. 6-57: Code domain diagram

The diagram displays one bar per channel. The X-axis displays the code numbers occupied for spreading factor 512. Channels with smaller spreading factor occupy several code numbers in this representation. Example: A channel with spreading factor 128 and code number 5 occupies channel numbers 20 to 23 of spreading factor 512. This is a direct result of the code tree structure, see chapter 6.2.9.4, "Channelization Codes", on page 427.

The example diagram above is based on the channel configuration listed in the following table. The column "Code Number Range" lists the code numbers occupied for spreading factor 512. They are calculated from the columns "Spreading Factor" and "Code Number" to facilitate the identification of the individual channels in the example diagram.

Channel	Spreading Factor	Code Number	Code Number Range (SF=512)	Level [dB]
P-CPICH	256	0	0 to 1	-3.3
P-CCPCH	256	1	2 to 3	-5.3
DPCH	128	3	12 to 15	-10.3

Channel	**Spreading Factor**	**Code Number**	**Code Number Range (SF=512)**	**Level [dB]**
PICH	256	22	44 to 45	-8.3
S-CCPCH	64	2	16 to 23	-5.3
OCNS (R99), 16 channels[1)]	128	2, 11, 17, ...	8 to 11, 44 to 47, 68 to 71, ...	-24.3, -26.3, -26.3, ...
Note 1) For details see chapter 6.2.9.5, "Orthogonal Channel Noise Simulator (OCNS)", on page 428				

When several channels occupy the same code numbers (code conflict), this is indicated in the diagram as follows: the overlapping parts of the conflicting bars are marked red. The displayed power level in this area represents the sum of the power levels of the conflicting channels. In the example above the PICH conflicts with the second OCNS channel.

6.4.10 Physical Channel UL Settings

This section defines characteristics related to the uplink. Most values are signaled to the UE.

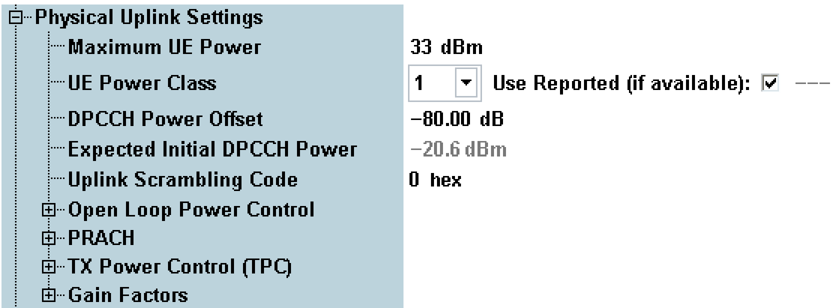


Fig. 6-58: Physical channel UL settings

For parameter descriptions refer to the subsections.

6.4.10.1 Miscellaneous Physical Uplink Settings

This section describes the highest level of the Physical Uplink Settings section.

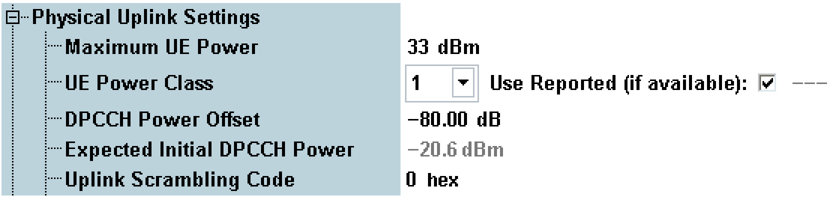


Fig. 6-59: Miscellaneous physical channel UL settings

Maximum UE Power

Maximum allowed output power of the UE transmitter (averaged over the transmit slot).

WCDMA user equipment is divided into four power classes. The maximum output power of the UE transmitter depending on the power class is defined in 3GPP TS 25.101, section 6.2. An even lower "Maximum UE Power" value restricts the output power range of the UE additionally.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:MUEPower

UE Power Class

In signaling mode the UE power class to be used by the R&S CMW can be set manually or the UE power class reported by the UE in the capability report can be used. In reduced signaling mode the UE power class must be set manually.

If no reported value is available, the manually configured value is used.

The power class influences the expected nominal power in automatic mode.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:UEPClass:MANual

CONFigure:WCDMa:SIGN<i>:UL:UEPClass:REPorted

DPCCH Power Offset

Reference value for the initial DPCCH power of the UE at random access: The larger the DPCCH Power Offset, the larger the initial DPCCH power.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:POFFset

Expected Initial DPCCH Power

Displays the expected power of the first DPCCH received from the UE. The value is calculated as follows (see also 3GPP TS 25.331):

Expected power = Minimum(<Maximum UE Power>, <DPCCH Power Offset> – <Output Power (Ior)> – <Level of P-CPICH>)

For configuration of the variables in the formula see:

- "Maximum UE Power" on page 536
- "DPCCH Power Offset" on page 536
- "RF Power Downlink > Output Power (Ior)" on page 518
- chapter 6.4.9.2, "R99 Channels", on page 525

Remote command:

SENSe:WCDMa:SIGN<i>:UL:EIPower?

Uplink Scrambling Code

Number of the long code that the UE shall use to scramble the uplink WCDMA signal. The scrambling code number must be in the range 0 to FFFFFF (hex) corresponding to 0 to 16777215 decimal.

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:SCODe`

6.4.10.2 Open Loop Power Control

This section defines basic parameters related to open loop power control. Additional parameters are available with option R&S CMW-KS410, see chapter 6.4.10.3, "PRACH Settings", on page 537.

For background information refer to chapter 6.2.14, "Random Access Procedure", on page 448.

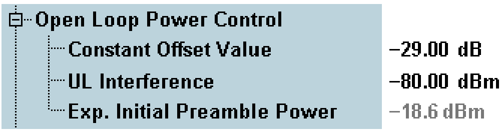


Fig. 6-60: Physical channel UL settings

Constant Offset Value

Constant offset for the initial preamble power. The larger the constant value, the larger the initial preamble power.

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:OLPControl:CVALue`

UL Interference

Estimated UL interference in dBm, contained in System Information Block type 7. In a network, the UL Interference can change fast. A large interference value increases the initial preamble power.

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:OLPControl:INTerference`

Exp. Initial Preamble Power

Displays the expected power of the first preamble sent by the UE for a preamble cycle. For calculation of the value see chapter 6.2.14, "Random Access Procedure", on page 448.

Remote command:

`SENSe:WCDMa:SIGN<i>:UL:OLPControl:EIPPower?`

6.4.10.3 PRACH Settings

The "PRACH" settings configure the physical random access procedure that can be initiated by the UE. For additional settings related to the initial preamble power refer to chapter 6.4.10.2, "Open Loop Power Control", on page 537.

For background information refer to chapter 6.2.14, "Random Access Procedure", on page 448.

All settings require option R&S CMW-KS410.

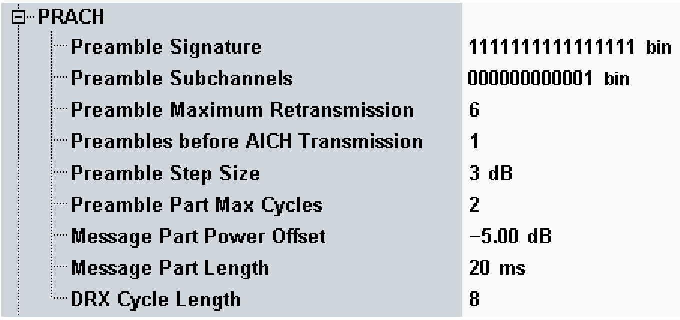


Fig. 6-61: PRACH settings

Preamble Signature

Specifies which of the 16 signatures defined by 3GPP TS 25.213 are available and associated with the PRACH. From left to right the bit sequence defines the availability of signature 15 to signature 0 (0=not available, 1=available).

Option R&S CMW-KS410 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:SIGNature`

Preamble Subchannels

Specifies which of the 12 PRACH subchannels are available. From left to right the bit sequence defines the availability of subchannel 11 to subchannel 0 (0=not available, 1=available). A PRACH subchannel defines a subset of the total set of uplink access slots; see 3GPP TS 25.214.

Option R&S CMW-KS410 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:SUBChannels`

Preamble Maximum Retransmission

Maximum number of preambles to be transmitted before a single preamble cycle is terminated.

Option R&S CMW-KS410 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:MRETrans`

Preambles before AICH Transmission

Number of preambles to be received before the instrument transmits the AICH. For a successful registration this value must not exceed the "Preamble Maximum Retransmission".

Option R&S CMW-KS410 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:AICH`

Preamble Step Size

Transmit power difference between two consecutive preambles.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:SSIZe

Preamble Part Max Cycles

Maximum number of times the preamble cycle is repeated.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:MCYCles

Message Part Power Offset

Transmit power difference between the last preamble transmitted and the RACH message part.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:PRACh:MESSage:POFFset

Message Part Length

Length of the RACH Transmission Time Interval (TTI) in ms. According to 3GPP a RACH may employ either 10 or 20 ms TTI.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:PRACh:MESSage:LENGth

DRX Cycle Length

The Discontinuous Reception (DRX) cycle length equals 2n frames where n is specified by this parameter. The DRX cycle can be used by the UE in idle mode in order to reduce power consumption. In that case the UE needs only to monitor one page indicator in one paging occasion per DRX cycle.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:PRACh:DRXCycle

6.4.10.4 TX Power Control Settings

The following TPC settings are available.

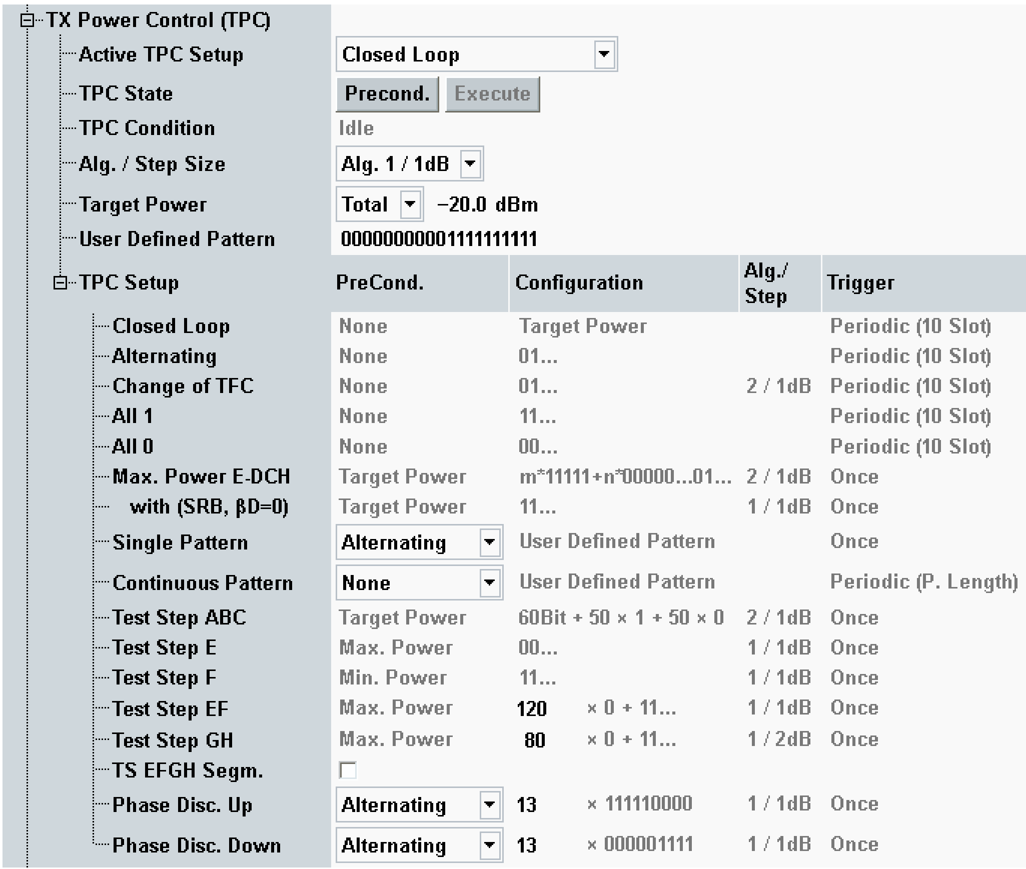


Fig. 6-62: TPC settings

Active TPC Setup

Select a TPC setup and configure it via the other parameters.

Option R&S CMW-KS410 is required for "Change of TFC", option R&S CMW-KS401 for "Max. Power E-DCH".

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:TPC:SET`

TPC State

When the button "Precond." is pressed, the instrument sends a TPC pattern to the UE to reach the precondition defined in the "TPC Setup" table for the active TPC setup. In most situations this action is performed automatically, see chapter 6.2.13.9, "Preconditions and Pattern Execution", on page 447.

After the precondition has been reached, the button "Execute" allows to start the execution of the active TPC setup.

These actions are only possible in connection state "Connection Established". The buttons have no effect in other connection states.

When one of the buttons is pressed for TPC setup "Max. Power E-DCH", an initial check is performed before the action is executed. The check verifies that both the target E-TFCI and the current E-TFCI can be determined and are equal. If this is not the case, the initiated action is aborted and the "TPC Condition" indicates the error (e.g. "Missing Resource" or "Setting Conflict").

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:TPC:PRECondition`
`CONFigure:WCDMa:SIGN<i>:UL:TPC:PEXecute`

TPC Condition
Displays the current TPC state. Transition states that would be displayed for a very short time only are indicated via remote command, but not displayed at the GUI (e.g. transmission of single pattern).

Possible values are:
- **Idle:** no connection established
- **Continuous Pattern:** transmitting continuous pattern
- **Alternating:** transmitting alternating pattern
- **Prec. <Precondition> (press Execute):** indicated <Precondition> has been reached
- **<State> (press Precond. or Execute):** The current <State> results from a previously executed TPC setup and does not match the precondition of the active TPC setup.
- **Target Power Locked:** closed loop target power reached
- **Target Power Unlocked:** reaching closed loop target power failed
- **Max Power:** maximum power reached
- **Min Power:** minimum power reached

Values only relevant for "Max. Power E-DCH" setup:
- **Missing Resource:** required resources are in use by another measurement
- **Searching:** setup started, max power not yet reached
- **Failed:** test procedure failed in state "Searching", see "Max. Power E-DCH Condition" for details
- **Setting Conflict:** settings inappropriate for the setup, see "Max. Power E-DCH Condition" for details
- **Settings Changed:** relevant settings changed after setup execution

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:TPC:STATe?`

Max. Power E-DCH Condition
This parameter is visible if the TPC setup "Max. Power E-DCH" is active (requires option R&S CMW-KS401).

It displays two E-TFCI values:
- Target E-TFCI: expected E-TFCI value, calculated from the HSUPA settings
- Current E-TFCI: value sent by the UE, monitored repeatedly during execution of the setup, each time for 150 ms
  If several E-TFCI values have been monitored within the 150 ms, the smallest value is displayed. Exception: If the smallest value equals the target E-TFCI, the next larger monitored value is displayed instead.

When executing the "Max. Power E-DCH" setup, the displayed E-TFCI values and the displayed TPC state can be used for troubleshooting as follows.

TPC State	Target/Current E-TFCI	Meaning
"Setting Conflict"	no target E-TFCI	The HSUPA settings do not allow to calculate an unambiguous E-TFCI value (for example alternating values). Correct the HSUPA settings.
"Setting Conflict"	two different values	Most probably the closed loop target power serving as precondition is too high. Check this setting. It shall be at least 7.5 dB lower than the maximum UE power.
"Target Power Locked"	no current E-TFCI	After the precondition has been reached, settings have been changed. Press "Precond." or "Execute" to update the displayed E-TFCI values and to reach the precondition again / execute the setup.
"Failed"	two equal values	This indicates a timeout in subtest 1 to 4. The UE has not sent a decreased E-TFCI.
"Failed"	two different values	Subtest 1 to 4: The UE has sent a decreased E-TFCI. But it has failed to increase the E-TFCI value back to the target value. Subtest 5: The current and target E-TFCI have been equal when the TPC setup was started, but they differ when the maximum power is assumed to be reached.

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:TPC:MPEDch:STATe?`

Alg. / Step Size

Define the power control algorithm (1 or 2) and the TPC step size (1dB or 2dB) to be signaled to the UE, see chapter 6.2.13, "Transmit Power Control (TPC)", on page 440.

Some setups use a fixed algorithm and step size, so that this setting is ignored, see table column "Alg./Step".

The duration of a TPC pattern required to command a UE to reach a precondition depends on the algorithm and TPC step size of the UE. For that reason correct settings are especially important when using a TPC setup with a precondition.

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:TPC:MODE`

Target Power

The target power can be defined either as total power or as DPCH power. It is relevant for the closed loop setup and for setups having "Target Power" as precondition.

For the TPC setup "Max. Power E-DCH" the lowest allowed value is 0 dBm. For other TPC setups it is -50 dBm.

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:TPC:TPOWer:REFerence`
`CONFigure:WCDMa:SIGN<i>:UL:TPC:TPOWer`

User Defined Pattern

Define a pattern for the TPC Setups "Single Pattern" and "Continuous Pattern".

Remote command:
`CONFigure:WCDMa:SIGN<i>:UL:TPC:PATTern`

TPC Setup

This table lists all defined TPC pattern configurations. One of these configurations is active (see "Active TPC Setup" on page 540). Most settings are predefined and cannot be modified (are grayed out).

For the setup "Max. Power E-DCH" two lines are displayed. The first one applies to test mode RMC+HSPA (subtest 1 to 4), the second line to test mode HSPA (subtest 5).

Table columns:

- **"PreCond."** defines or displays a precondition that the UE is commanded to before the pattern can be executed. For test steps E, F, G and H segmentation can be enabled.
- **"Configuration"** defines or displays the TPC pattern.
- **"Alg./Step"** displays the power control algorithm and the TPC step size if they are fixed for the TPC pattern.
- **"Trigger"** displays the trigger event for generation of a trigger pulse that can be evaluated by a measurement application of the R&S CMW.

For background information refer to:

- chapter 6.2.13.1, "TPC Pattern Setups", on page 441
- chapter 6.2.13.9, "Preconditions and Pattern Execution", on page 447
- chapter 6.2.13.8, "Generating TPC Trigger Signals", on page 447

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PRECondition:PHDown` etc.
`CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PRECondition:CONTinuous`
`CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:TSEF`
`CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:TSGH`
`CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:TSSegment`
`CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:PHUP`
`CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:PHDown`

6.4.10.5 Gain Factors

The parameters in this section specify gain factors and power offsets for uplink channels.

Gain Factors	βC	βD	ΔACK	ΔNACK	ΔCQI			
RMC 12.2	8	15						
RMC 64	5	15						
RMC 144	4	15						
RMC 384	4	15						
RMC 768	4	15						
Voice	11	15						
Video 64	9	15						
HSDPA	9	15	5	5	2			
HSUPA								
ΔE-DPCCH	5							
No of Reference E-TFCIs	1							
Reference E-TFCI	1	2	3	4	5	6	7	8
E-TFCI	11	67	71	75	81	90	100	127
Power Offset	4	18	23	26	27	28	29	29

Fig. 6-63: Gain factor settings

βC, βD

Specify the UE gain factors β_c (DPCCH) and β_d (DPDCH) for the connection types indicated to the left. The numbers behind the connection types indicate data rates in kbps (e.g. RMC with 12.2 kbps).

For calls with constant data rates, the specified gain factors are valid for the entire duration of the connection. For voice connections the UE can use DTX and switch off the DPDCHs if no data is being transferred.

Use the CDP vs. Slot view of the WCDMA Multi Evaluation Measurement (option R&S CMW-KM400) to verify to which degree of accuracy the actual gain factors of the UL channels comply with the gain factors signaled to the UE.

Option R&S CMW-KS401 is required for HSDPA.

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:GFACtor:RMC<no>`

`CONFigure:WCDMa:SIGN<i>:UL:GFACtor:VOICe`

`CONFigure:WCDMa:SIGN<i>:UL:GFACtor:VIDeo`

`CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSDPa`

ΔACK, ΔNACK, ΔCQI

Power offset parameters Δ_{ACK}, Δ_{NACK} and Δ_{CQI} for HS-DPCCH slots carrying ACK, NACK and CQI messages.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSDPa`

HSUPA

The following parameters control the gain factors for the uplink HSUPA channels E-DPCCH and E-DPDCH.

The UE derives the gain factors from the signaled values. For details see 3GPP TS 25.213 section 4.2.1.3 and 3GPP TS 25.214 section 5.1.2.5B.

Option R&S CMW-KS401 is required.

ΔE-DPCCH ← HSUPA

Specifies the signaled value ΔE-DPCCH. The value is used by the UE to derive the quantized amplitude ratio A_{ec}. From this ratio it calculates the E-DPCCH gain factor β_{ec}.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:EDPCch`

No of Reference E-TFCIs, Reference E-TFCI ← HSUPA

"No of Reference E-TFCIs" specifies how many pairs of reference E-TFCIs and assigned power offset values are signaled to the UE. The pairs are taken from the "Reference E-TFCI" table, using column 1 to n.

Each table column specifies a reference E-TFCI value and a signaled value ΔE-DPDCH (power offset). The signaled ΔE-DPDCH values are used by the UE to derive the quantized amplitude ratio A_{ed} for each reference E-TFCI. From these ratios it calculates the reference gain factors $\beta_{ed, ref}$.

Finally, the UE calculates the gain factors for all E-TFCIs and HARQ processes using the reference gain factors and the signaled HARQ Power Offset (see "HARQ Power Offset" on page 575).

Option R&S CMW-KS401 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:ETFCi:NUMBer
CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:ETFCi:REFerence
CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:ETFCi:POFFset

6.4.11 Connection Configuration

The "Connection Configuration" section selects a connection type for UE terminated connections and defines parameters for the supported connection types (applicable to mobile originated and mobile terminated connections).

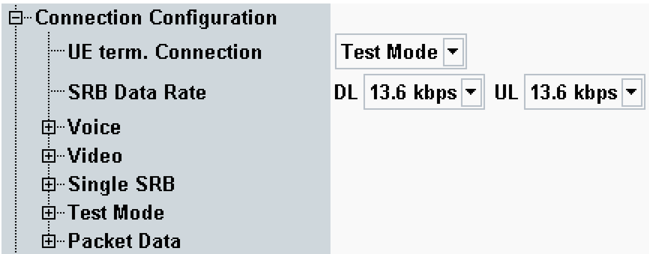


Fig. 6-64: Connection settings

For parameter descriptions refer to the subsections.

6.4.11.1 Miscellaneous Connection Configuration Settings

This section describes the highest level of the Connection Configuration section.

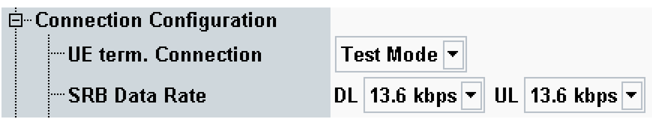


Fig. 6-65: Miscellaneous connection configuration settings

UE term. Connection

Selects the connection type to be used for UE terminated connections initiated by the instrument.

In reduced signaling mode only test mode connections are supported.

"Voice" The instrument uses a Signaling Radio Bearer (SRB) to set up a connection and allocate a voice channel. The received speech data is looped back to the UE.
For configuration see chapter 6.4.11.2, "Voice Connection Settings", on page 546.

"Video" The instrument uses an SRB to set up a circuit switched video call and loops back the received video data including audio to the UE.

"SRB only" The instrument uses an SRB to establish and maintain the connection.
For configuration see chapter 6.4.11.4, "SRB Connection Settings", on page 547.

"Test Mode" The instrument uses an SRB to set up a test mode connection. Three test mode types are available: RMC, HSPA, RMC + HSPA. For test mode types with RMC the SRB is established in the CS domain. For type "HSPA" the SRB is established in the PS domain.
For configuration see chapter 6.4.11.5, "Test Mode Connection Settings", on page 548.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CONNection:UETerminate`

SRB Data Rate

Selects the signaling radio bearer (SRB) data rate. This setting applies to the connection types Voice, Video and SRB only. For RMC connections a fixed value of 2.5 kbps is used for uplink and downlink. For test mode type "HSPA" a fixed value of 3.4 kbps is used.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CONNection:SRBData`

6.4.11.2 Voice Connection Settings

The "Voice" section configures the voice channel. The settings take effect when a UE originated or UE terminated voice channel connection is established.

This section is not relevant for reduced signaling.

Fig. 6-66: Voice connection settings

Voice Codec

Displays the Adaptive Multi Rate (AMR) voice codec type to be used. Option R&S CMW-KS410 allows to select a codec type.

Remote command:

CONFigure:WCDMa:SIGN<i>:CONNection:VOICe:CODec

NB AMR

Displays the mode of the narrowband AMR codec. Option R&S CMW-KS410 allows to select a mode.

The basic modes support one fixed bit-rate. Mode M supports several bit-rates.

If one of the fixed bit-rates is selected, this bit-rate is used in uplink and downlink. If mode M is selected, the instrument and the UE can select one of the supported bit-rates.

Remote command:

CONFigure:WCDMa:SIGN<i>:CONNection:VOICe:AMR:NARRow

WB AMR

Selects the mode of the wideband AMR codec. The basic modes support one fixed bit-rate. Mode M supports several bit-rates.

If one of the fixed bit-rates is selected, this bit-rate is used in uplink and downlink. If mode M is selected, the instrument and the UE can select one of the supported bit-rates.

Option R&S CMW-KS410 required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CONNection:VOICe:AMR:WIDE

6.4.11.3 Video Connection Settings

The "Video" section configures UE originated and UE terminated video connections. In the current release there are no administrable parameters.

This section is not relevant for reduced signaling.

Fig. 6-67: Video connection settings

Data Rate

A fixed data rate of 64 kbps is used for circuit switched video calls.

Remote command:

CONFigure:WCDMa:SIGN<i>:CONNection:VIDeo:DRATe?

6.4.11.4 SRB Connection Settings

The "Single SRB" section configures "SRB only" connections.

This section is not relevant for reduced signaling.

Fig. 6-68: SRB connection settings

Type

Displays the radio resource control state to which the UE is commanded when an "SRB only" connection is set up (for RRC states see 3GPP TS 25.331). Option R&S CMW-KS410 allows to select a state.

In Cell_DCH state the UE is allocated a dedicated traffic channel. This state is suitable for TX measurements. However some tests, e.g. Spurious Emissions tests as defined in 3GPP TS 34.121, require the CELL_FACH state where no dedicated traffic channel resource is allocated to the UE.

Remote command:

CONFigure:WCDMa:SIGN<i>:CONNection:SRBSingle:TYPE

6.4.11.5 Test Mode Connection Settings

The parameters in this section configure an RMC and/or HSPA test mode connection. The settings take effect when a test mode connection is established.

For HSPA option R&S CMW-KS401 is required.

For background information refer to chapter 6.2.10.1, "Reference Measurement Channel (RMC)", on page 430 and chapter 6.2.10.3, "High Speed Packet Access (HSPA)", on page 433.

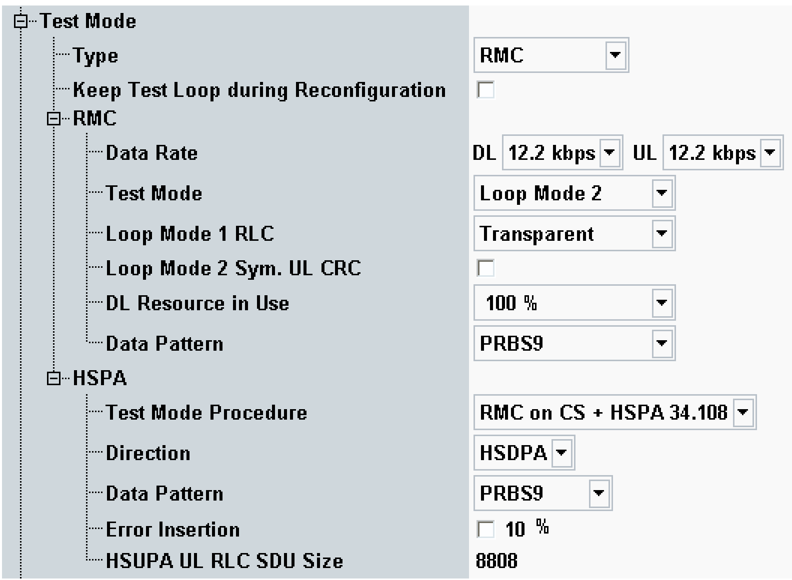


Fig. 6-69: Test mode connection settings

Type

Selects the test mode connection type.

Option R&S CMW-KS401 is required for HSPA / RMC + HSPA.

"RMC"	RMC in CS domain, no PS connection
"HSPA"	HSDPA or HSDPA+HSUPA in PS domain, no CS connection
"RMC + HSPA"	RMC in CS domain, HSDPA or HSDPA+HSUPA in PS domain

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:TYPE`

Keep Test Loop during Reconfiguration
Specifies whether the test loop is kept closed when the operating band or the carrier frequency is reconfigured for an established test mode connection with test loop.

By default, the loop is opened before reconfiguration and closed again after reconfiguration. If the UE supports keeping the loop closed during reconfiguration, you can speed up the procedure by enabling this parameter.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:KTLReconfig`

RMC
The following parameters configure an RMC test mode connection.

Data Rate ← RMC
Information bit rate of the downlink and uplink reference channel in kbps.

Option R&S CMW-KS410 required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:DRATe`

Test Mode ← RMC
Selects the test mode (loop mode) that the UE enters after connecting to the UTRAN. The test modes are defined in 3GPP TS 34.109.

When the R&S CMW sets up an RMC connection it forces the UE to the UE radio bearer test mode. The connection is fast (without Alerting) and must be initiated by the instrument. Three different test modes are available: "No Loop", "Loop Mode 1 RLC" and "Loop Mode 2".

In reduced signaling mode only loop mode 2 is supported. The loop must be activated at the UE and this parameter is hidden.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:TMODe`

Loop Mode 1 RLC ← RMC
Selects RLC "Transparent" mode or "Acknowledged" mode for RMC transmission with loop mode 1.

With acknowledged mode, it is possible to perform RLC Throughput measurements.

In reduced signaling mode only loop mode 2 is supported and this parameter is hidden.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:RLCMode`

Loop Mode 2 Sym. UL CRC / UL CRC ← RMC
Enables or disables the uplink Cyclic Redundancy Check (CRC) for Loop Mode 2. This setting is only relevant when an RMC with symmetric DL/UL data rate is used.

If the uplink CRC is enabled, the UE sends a 16-bit CRC sequence, the DL/UL transport block size is symmetric.

If the uplink CRC is disabled, the UE sends no CRC sequence, but adds the DL CRC to the transport block. The DL/UL transport block size is asymmetric.

For RMCs with asymmetric DL/UL data rate the setting is ignored. In that case the UL CRC is enabled and the DL/UL transport block size is asymmetric.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:UCRC`

DL Ressource in Use ← RMC
Percentage of DL RMC transport blocks that are filled with information bits. The percentages are rounded and correspond to values 1, 1/2, 1/4, 1/6, …, 1/30, 1/32. A value 1/n means that out of n transport blocks, only one is fully filled with data, (n – 1) blocks are empty. The effective data rate decreases by the factor n.

Restricting the DL resources can be necessary to prevent a buffer overflow in the UE, especially in cases where BLER tests are performed with asymmetric RMCs (e.g. 384 kbps DL and 12.2 kbps UL).

Note: The uplink DPDCH is only active (and filled with data) as long as the UE transmits data. In closed test loop mode, this implies that the UL power decreases if the percentage of DL resources in use is reduced.

Option R&S CMW-KS410 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:DLRessources`

Data Pattern ← RMC
Bit pattern transmitted as user information on the DTCH: Bit sequence consisting of zeros (All 0), ones (All 1), 010101... (Alternating), or pseudo-random bit sequences of variable length (PRBS9, PRBS11, PRBS13, PRBS15).

Remote command:
`CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:DATA`

HSPA
The following parameters configure an HSPA test mode connection.

Option R&S CMW-KS401 is required.

Test Mode Procedure ← HSPA
Selects the connection setup method to be used for "RMC + HSPA" test mode connections.

Option R&S CMW-KS401 is required.

"RMC on CS + HSPA 34.108"	When you set up the test mode connection, both the RMC connection and the HSPA connection are set up.

"RMC on CS + HSPA (opt)" When you set up the test mode connection, only the RMC connection is set up. You can trigger an HSPA connection setup manually later on if desired (opt = optional).
Thus you can for example test an RMC connection separately and then add an HSPA connection for additional tests, without releasing the RMC connection in between.
This value is not available in reduced signaling mode.

Remote command:
CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:PROCedure

Direction ← HSPA
You can enable HSPA in downlink direction only (value HSDPA) or in downlink and uplink direction (value HSPA).

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:DIRection

Data Pattern ← HSPA
Selects the bit pattern to be transmitted as user information on the HS-DSCH. The pattern consists of zeros (All 0), ones (All 1), 010101... (Alternating), or pseudo-random bit sequences of variable length (PRBS9, PRBS11, PRBS13, PRBS15).

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:DATA

Error Insertion ← HSPA
Configures the rate of HS-DSCH data to be sent with an incorrect CRC value, so that the failed CRC check in the UE should cause an NACK in the UL.

Together with the HSDPA ACK measurement, this can be used for a first plausibility check whether the UE operates correctly.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:EINSertion

HSUPA UL RLC SDU Size ← HSPA
The HSUPA UL RLC SDU size is an integer multiple of the HSDPA DL RLC SDU size of 2936 bit. The reason is to ensure a sufficient data rate in the uplink. With an UL SDU size of n times 2936 bit, the UE can transmit n copies of each received SDU in the uplink. The default value of 8808 bit (n = 3) is sufficient for an uplink user data rate of 2 Mbps, which is the maximum allowed throughput for a 10 ms TTI.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:USDU

6.4.11.6 Packet Data

The parameters in this section are only relevant for end to end data connections, involving the Data Application Unit (DAU).

To set up such a connection, see chapter 6.2.4, "End to End Packet Data Connections", on page 414.

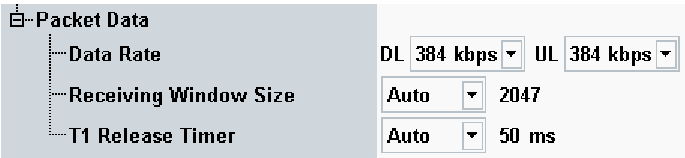


Fig. 6-70: Packet Data settings

Data Rate

Data rates for the packet data connection in downlink and uplink direction.

The values HSDPA and HSUPA allow to set up HSDPA, HSUPA, or combined HSDPA/HSUPA connections. Option R&S CMW-KS401 is required for these values.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CONNection:PACKet:DRATe`

Receiving Window Size

Size of the HSDPA receiver window in the UE, see 3GPP TS 25.321, section 11.6.2.3.

Select "Auto" for automatic configuration or select "Manual" and enter the value manually to the right.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CONNection:PACKet:HSDPa:RWINdow`

T1 Release Timer

Timeout value in ms of the re-ordering release timer T1. T1 controls the stall avoidance in the UE reordering buffer for HSDPA as described in 3GPP TS 25.321, section 11.6.2.3.

Select "Auto" for automatic configuration or select "Manual" and enter the value manually to the right.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CONNection:PACKet:HSDPa:TIMer`

6.4.12 Network Settings

The "Network" settings configure parameters of the simulated radio network.

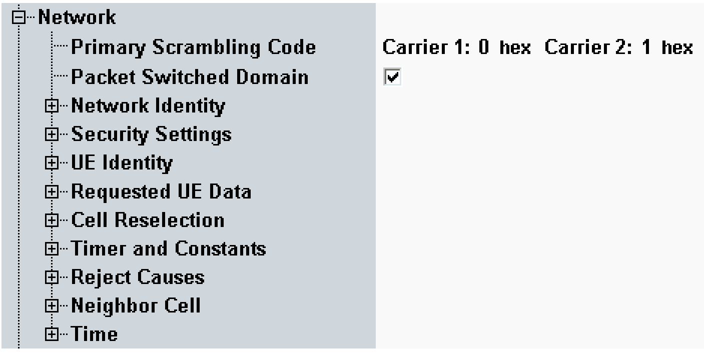


Fig. 6-71: Network settings

For parameter descriptions refer to the subsections.

6.4.12.1 Miscellaneous Network Settings

This section describes the highest level of the Network Settings section.

Fig. 6-72: Miscellaneous network settings

Primary Scrambling Code

Set index i for calculation of the primary scrambling code number by multiplication with 16.

Some channels can be scrambled using the primary or a secondary scrambling code. The secondary scrambling code is defined individually for each of these channels, see chapter 6.4.9, "Physical Channel DL Settings", on page 523.

If the dual carrier scenario is active, individual values can be set per carrier.

For background information see chapter 6.2.9.3, "Scrambling Codes", on page 426.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:SCODe`

Packet Switched Domain

Selects whether the emulated UTRAN cell supports packet switched connections. Circuit switched connections are always supported.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:PSDomain`

6.4.12.2 Network Identity Settings

The "Network Identity" settings configure parameters of the simulated radio network. The values are broadcasted to the UE under test.

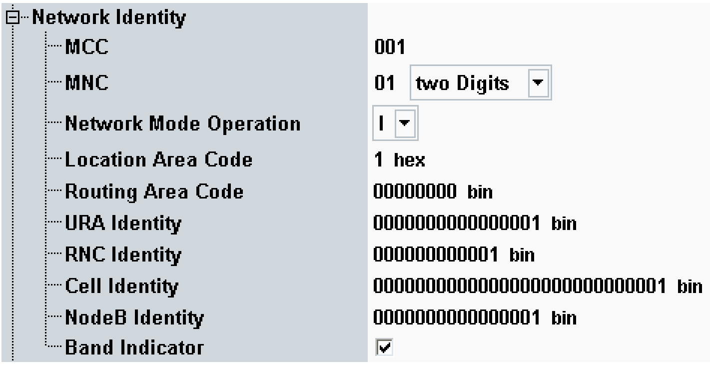


Fig. 6-73: Network identity settings

MCC

Specifies the 3-digit Mobile Country Code (MCC).

According to 3GPP TS 25.307, section 6.1.2, the Mobile Country Code (MCC) should be set to a value between 440 and 443 when using operating band VI. Otherwise a Release 5 UE (or lower) may fail to register.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:MCC`

MNC

Specifies the Mobile Network Code (MNC). A two or three-digit MNC can be set.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:MNC`

Network Mode Operation

Selects the network operation mode as specified in 3GPP TS 123.060. This parameter indicates whether a Gs interface is present in the network (mode I) or not (mode II).

Option R&S CMW-KS410 required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:NTOPeration`

Location Area Code
Specifies the location area code for CS services.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:LAC`

Routing Area Code
Specifies the routing area code for PS services.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:RAC`

URA Identity
Specifies the UTRAN Registration Area (URA) identity.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:URA`

RNC Identity
Specifies the Radio Network Controller (RNC) identity.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:RNC`

Cell Identity
Specifies the cell identity.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:IDENtity`

Node B Identity
Specifies the Node B identity.

Option R&S CMW-KS410 required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:IDNode`

Band Indicator
Specifies whether the band indicator shall be broadcasted as part of the system information or not.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:BINDicator`

6.4.12.3 Security Settings

The "Security" settings configure parameters related to the authentication procedure and other security procedures.

This section is not relevant for reduced signaling.

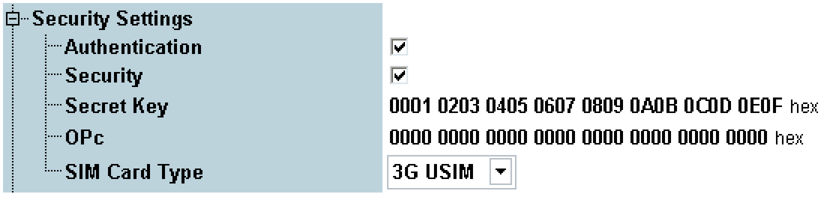


Fig. 6-74: Security settings

Authentication

Enables or disables authentication, to be performed during registration. Authentication requires a test SIM. An appropriate 3GPP USIM can be obtained from Rohde & Schwarz (R&S CMW-Z04, stock no. 1207.9901.02).

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:SECurity:AUTHenticat`

Security

Enables or disables the security mode during authentication. With enabled security mode, the UE performs an integrity check. This setting is only relevant if authentication is enabled.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:SECurity:ENABle`

Secret Key

The secret key K is used for the authentication procedure (including a possible integrity check). The value is entered as 32-digit hexadecimal number and is relevant for all SIM card types.

The authentication fails unless the secret key set by this parameter is equal to the value stored on the test USIM of the UE under test. The default value is compatible with the R&S CMW-Z04.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:SECurity:SKEY`

OPc

The key OP_c is used for authentication and integrity check procedures with the MILENAGE algorithm set (SIM card type "Milenage"). The value is entered as 32-digit hexadecimal number.

Option R&S CMW-KS410 required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:SECurity:OPC`

SIM Card Type

Displays the type of the SIM card used for registration. Option R&S CMW-KS410 allows to select a SIM card type.

The full test functionality is available for all types. "Milenage" refers to a USIM with MILENAGE algorithm set.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:SECurity:SIMCard`

6.4.12.4 UE Identity

The "UE Identity" settings are related to UE identities like IMSI, IMEI and TMSI.

This section is not relevant for reduced signaling.

Fig. 6-75: UE identity settings

In Use
Specifies whether the default IMSI defined in this dialog shall be used. Setting up a call without registration is only possible if the correct default IMSI is set and enabled.

Prior to registration the default IMSI is always enabled and can not be disabled manually. During registration of a different IMSI, the default IMSI is disabled automatically. Afterwards you can re-enable the default IMSI manually if required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:UEIDentity:USE`

Default IMSI
15-digit International Mobile Subscriber Identity (IMSI) that the instrument can use before the UE is registered. With an appropriate UE configuration this IMSI can be used as well to speed up the paging procedure (see also "Attach/Detach" on page 558).

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:UEIDentity:IMSI`

Identity (Registration), Identity Type (Registration)
Display the ID and ID type received from the UE during registration. The format of the ID depends on the ID type: IMSI, IMEI, IMSISV, TMSI, P-TMSI or None.

Remote command:
`SENSe:WCDMa:SIGN<i>:UESinfo:RITYpe?`
`SENSe:WCDMa:SIGN<i>:UESinfo:RIDentity?`

6.4.12.5 Requested UE Data

The parameters in this section specify which information shall be requested from the UE and whether registration shall be performed or not.

This section is not relevant for reduced signaling.

Fig. 6-76: Settings for requested UE data

Attach/Detach

Enable or disable the CS registration and PS attach procedure. If disabled, the UE will listen to paging messages as soon as it has detected the UTRAN cell simulated by the instrument.

Disabling the registration requires the default IMSI to be set properly, see "Default IMSI" on page 557. UEs that are configured to always attach to the packet switched domain will ignore the setting "Attach/Detach" = disabled.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:REQuest:ADETach

IMEI Request

Enable or disable the request of the International Mobile station Equipment Identity (IMEI) from the UE. A received IMEI is displayed in the main view.

An IMEI request is also possible for connections without previous UE registration. If the IMEI request is enabled when a connection to a non-registered UE is established, the instrument sends an Identity Request. The result is displayed after a delay caused by the exchange of signaling messages. A signaled IMEI is deleted after the connection is released and the instrument has reached the "Signal On" state, because no assignment to the DUT is possible any more.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:REQuest:IMEI

6.4.12.6 Cell Reselection

The parameters in this section define the cell reselection information to be transmitted in the system information blocks SIB3 and SIB11. For detailed information refer to 3GPP TS 25.304.

This section is not relevant for reduced signaling.

Fig. 6-77: Settings for cell reselection

S intrasearch

Threshold $S_{intrasearch}$ for intra frequency measurements and for the Hierarchical Cell Structure (HCS) measurement rules.

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:RESelection:SEARch

S intersearch

Threshold $S_{intersearch}$ for inter-frequency measurements and for the HCS measurement rules.

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:RESelection:SEARch

S searchrat GSM

Threshold S $search_{RAT\ m}$ used in inter-RAT measurement rules for RAT m = GSM.

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:RESelection:SEARch

Q qualmin

Minimum required quality level in the cell in dB ($Q_{qualmin}$).

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:RESelection:QUALity

Q rxlevmin

Minimum required RX level in the cell in dBm ($Q_{rxlevmin}$).

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:RESelection:QUALity

6.4.12.7 Timer and Constants

The parameters in this section configure timers and counters.

This section is not relevant for reduced signaling.

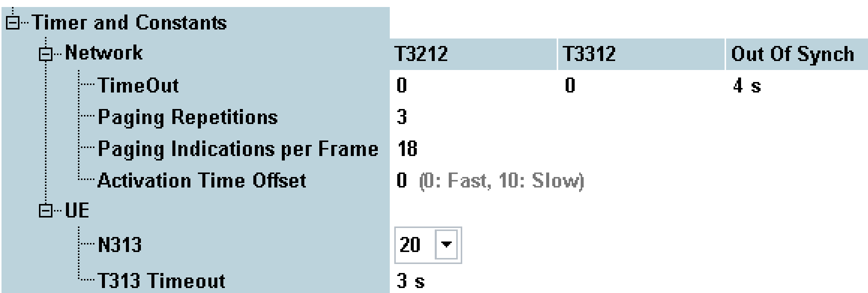


Fig. 6-78: Timer and constants settings

Network > TimeOut > T3212/T3312
Timer "T3212" controls the initiation of a periodic location area update by the UE. It is set in multiples of 6 minutes. If 0 is set, no periodic location area update is required.

Timer "T3312" controls the initiation of a periodic routing area update by the UE. It is set in multiples of 2 seconds. If 0 is set, no periodic routing area update is required.

Option R&S CMW-KS410 required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:TOUT:T3212`
`CONFigure:WCDMa:SIGN<i>:CELL:TOUT:T3312`

Network > TimeOut > OutOfSynch
The "OutOfSynch" timer specifies the time after which the instrument, having waited for a signal from the connected UE, releases the connection and returns to state Registered.

Option R&S CMW-KS410 required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:TOUT:OSYNch`

Network > Paging Repetitions
This counter limits the number of paging procedures to be performed if no answer is received from the UE. Paging is repeated until the specified number of paging repetitions is reached. Then the call setup is aborted.

Option R&S CMW-KS410 required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:TOUT:PREPetitions`

Network > Paging Indications per Frame
Number N_p of paging indicators that the R&S CMW transmits in each PICH frame. According to 3GPP TS 25.211, this number equals 18, 36, 72, or 144. The parameter N_p occurs in 3GPP TS 34.121, e.g. in section "Demodulation of Paging Channel (PCH)".

Option R&S CMW-KS410 required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:TOUT:PPIF`

Network > Activation Time Offset
Delay used by the RRC for calculation of the activation time in peer messages, e.g. for channel changes within the band.

A low value results in fast signaling, a high value in slow signaling. If your UE does not support fast signaling, increase the value.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:TOUT:ATOFfset`

UE > N313
Maximum number of successive "out of sync" indications received from layer 1 before the UE considers a "radio link failure" condition and a connection release; see 3GPP TS 25.331. A specific value for N313 is required for some conformance tests; e.g. 3GPP TS 34.121, section 5.4.4.

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:TOUT:N313

UE > T313 Timeout
Maximum time after which the connected UE, having waited for a signal from the instrument, initiates the clearing of the connection by sending a disconnect request.

Option R&S CMW-KS410 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:TOUT:T313

6.4.12.8 Reject Causes

The parameters in this section configure the rejection of location update requests and attach requests received from the UE.

The rejection causes are defined in 3GPP TS 24.008, section 10.5.3.6 and annex G. The purpose of rejecting UE requests is to test the reaction of the UE: does it repeat the request at all and if so, in which time intervals.

The section is not relevant for reduced signaling. It is only visible if R&S CMW-KS410 is available.

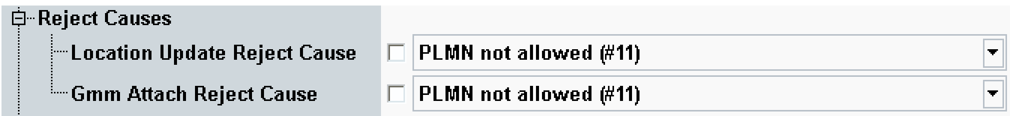


Fig. 6-79: Reject cause settings

Location Update Reject Cause
If the checkbox is enabled, the application rejects location update requests from the UE and includes the selected reject cause in the reject message.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:RCAuse:LOCation

Gmm Attach Reject Cause
If the checkbox is enabled, the application rejects attach requests from the UE and includes the selected reject cause in the reject message.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:RCAuse:ATTach

6.4.12.9 Neighbor Cell Settings

This section defines neigbour cell information to be broadcasted to the UE. For each radio access technology you can define several neighbor cell entries. The signaling messages for broadcast of neighbour cell information are defined in 3GPP TS 25.331.

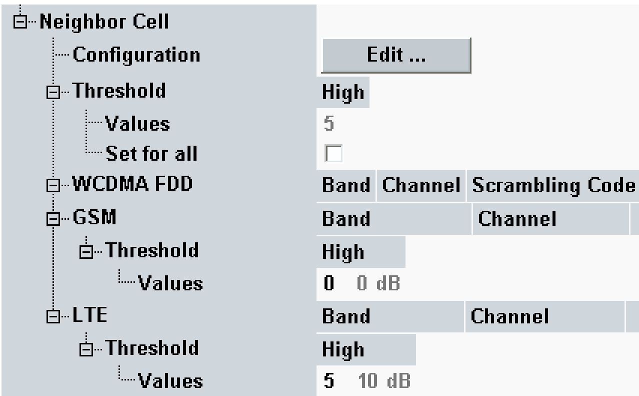


Fig. 6-80: Neighbor cell settings

To configure the neighbour cell entries, press the "Edit" button. The configuration dialog contains one tab per technology. Only the enabled entries are broadcasted.

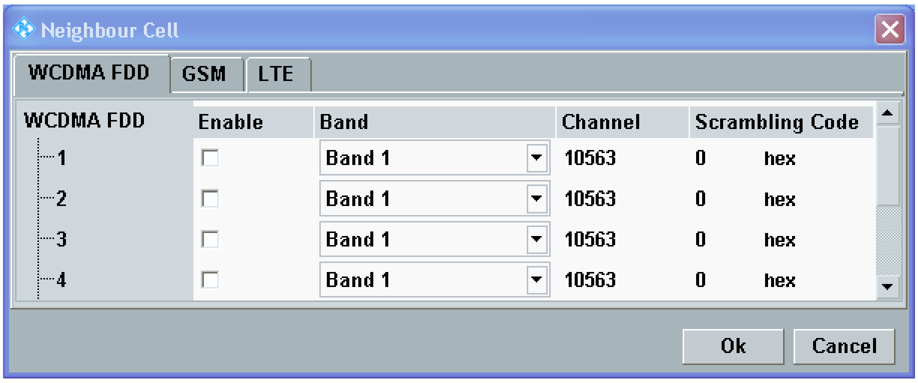


Fig. 6-81: Neighbor cell list configuration dialog

Threshold

The configured "High" reselection threshold value is written into the system information block element "threshXhigh" defined in 3GPP TS 25.331. The resulting threshold value in dB is displayed for information.

You can define an individual threshold per technology or a common threshold applicable to all technologies. To apply common thresholds, enable "Threshold > Set for all". Disable the parameter to apply the individual thresholds. For WCDMA neighbor cells the threshold is not configurable.

Remote command:

`CONFigure:WCDMa:SIGN<i>:NCELl:ALL:THResholds:HIGH`
`CONFigure:WCDMa:SIGN<i>:NCELl:GSM:THResholds:HIGH`
`CONFigure:WCDMa:SIGN<i>:NCELl:LTE:THResholds:HIGH`

WCDMA FDD

For a WCDMA neighbor cell entry you can specify the operating band, the downlink channel number and the primary scrambling code of the cell.

Remote command:

`CONFigure:WCDMa:SIGN<i>:NCELl:WCDMa:CELL<n>`

GSM

For a GSM neighbor cell entry you can specify the operating band and the channel number used for the Broadcast Control Channel (BCCH).

Remote command:

CONFigure:WCDMa:SIGN<i>:NCELl:GSM:CELL<n>

LTE

For an LTE neighbor cell entry you can specify the operating band and the downlink channel number.

Remote command:

CONFigure:WCDMa:SIGN<i>:NCELl:LTE:CELL<n>

6.4.12.10 Time

The "Time" section allows you to send configurable date and time information to the UE. Thus you can update the date and time displayed by the mobile. In a real network this service is typically used to send the current local time to the UE.

The section is not relevant for reduced signaling. It is only visible if R&S CMW-KS410 is available.

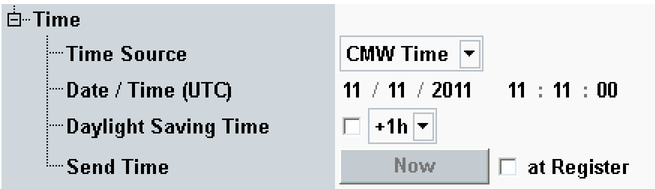


Fig. 6-82: Time settings

Time Source

This parameter selects the date and time source.

- **CMW Time**
  Selects the current CMW (Windows) date and time as source. The Windows settings determine the UTC date, the UTC time, the current daylight saving time offset and the time zone offset.
- **Date / Time**
  Selects the parameters "Date / Time (UTC)" and "Daylight Saving Time" as source. The time zone offset is set to 0.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:TIME:TSOurce

Date / Time (UTC)

Defines the UTC date and time to be used if "Time Source" is set to "Date / Time".

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:TIME:DATE
CONFigure:WCDMa:SIGN<i>:CELL:TIME:TIME

Daylight Saving Time

Specifies a Daylight Saving Time (DST) offset to be used if "Time Source" is set to "Date / Time".

You can disable DST or enable it with an offset of +1 hour or +2 hours.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:TIME:DSTime

Send Time

Press "Now" to send the date and time information to the UE.

"at Register" selects whether the date and time information is sent to the UE during the registration and attach procedures or not.

Option R&S CMW-KS410 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:TIME:SNOW
CONFigure:WCDMa:SIGN<i>:CELL:TIME:SREGister

6.4.13 HSDPA Settings

This section contains parameters for HSDPA configuration, e.g. the configuration of the transport channel HS-DSCH.

All settings require option R&S CMW-KS401, user defined channel configuration requires also R&S CMW-KS411.

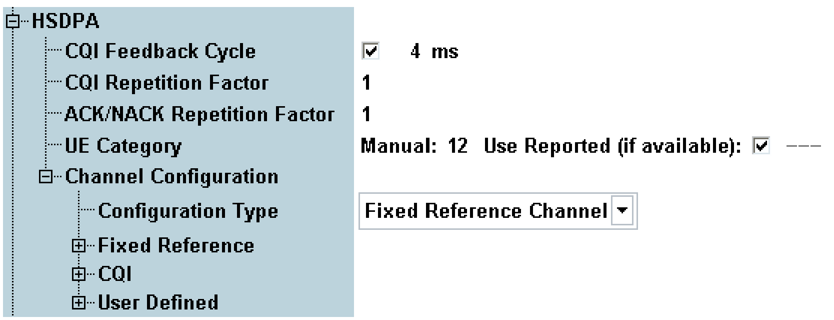


Fig. 6-83: HSDPA settings

For parameter descriptions refer to the subsections.

6.4.13.1 Miscellaneous HSDPA Settings

This section describes the first part of the HSDPA section.

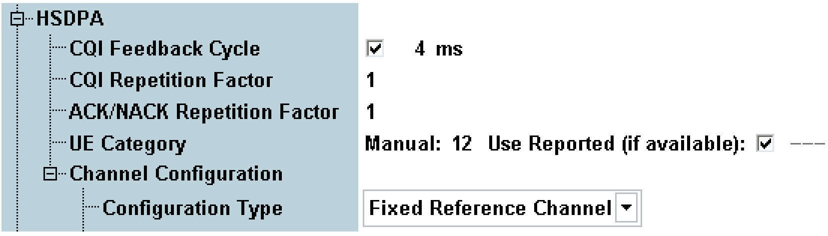


Fig. 6-84: Miscellaneous HSDPA settings

CQI Feedback Cycle, CQI Repetition Factor

The feedback cycle specifies the time after which the UE sends a new CQI value on the HS-DPCCH. The repetition factor defines how often it transmits the same CQI value per feedback cycle. If the feedback cycle parameter is disabled, the UE transmits no CQI values at all.

For a feedback cycle of n*2 ms and a repetition factor of m, a new CQI symbol is transmitted in every n^{th} subframe and repeated in the following m-1 subframes.

Either a new or a repeated CQI value can be sent per HS-DPCCH subframe, so 3GPP requests that *feedback cycle ≥ repetition factor * 2 ms*. If *feedback cycle = repetition factor * 2 ms* then all uplink subframes carry CQI symbols so that no DTX periods occur.

See also 3GPP TS 25.214, section 6A.

Option R&S CMW-KS401 required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:FBCYcle
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RFACtor

ACK/NACK Repetition Factor

Specifies the number of transmissions of the same ACK/NACK. The UE repeats the transmission in consecutive HS-DPCCH subframes.

The UE shall ignore the HS-SCCH and HS-DSCH subframes corresponding to HS-DPCCH subframes used for retransmission. This must be considered when performing BER measurements. Ensure that the inter TTI distance is greater than or equal to the repetition mode * 2 ms.

See also 3GPP TS 25.214, section 6A.

Option R&S CMW-KS401 required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:ANRFactor

UE Category

In signaling mode the UE category to be used by the R&S CMW can be set manually or it can be set automatically according to the UE categories reported by the UE in the capability report. In reduced signaling mode the category must be set manually.

- Manually set value:

If you set the category manually and use a fixed reference channel, the configured category and the selected H-Set must be compatible. For mapping tables refer to 3GPP TS 34.121, section 9 or see table 6-13.
Consider that the UE categories 21 to 24 require dual carrier operation.
See also "HSDPA UE Categories" on page 433

- "Use Reported (if available)":
If no reported value is available, the manually configured value is used.
If reported values are available, the application displays the used value.

Note that the terms "UE Category" and "HS-DSCH Category" are synonymous in the context of HSDPA.

Option R&S CMW-KS401 required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UECategory:MANual`
`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UECategory:REPorted`

Configuration Type
Selects the configuration type of the High Speed Downlink Shared Channel (HS-DSCH). The HS-DSCH is the downlink transport channel for user data.

Option R&S CMW-KS401 required.

"Fixed Reference Channel"	FRC according to 3GPP TS 25.101, Annex A7. Many performance tests for HSDPA use a specific FRC. For configuration see chapter 6.4.13.2, "Fixed Reference Channel Configuration", on page 566.
"CQI"	Channel for CQI reporting tests. For configuration see chapter 6.4.13.3, "CQI Test Channel Configuration", on page 567.
"User Defined"	Flexible configuration of transport channel parameters by the user. For configuration see chapter 6.4.13.4, "User Defined Channel Configuration", on page 569.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:TYPE`

6.4.13.2 Fixed Reference Channel Configuration

This section configures a Fixed Reference Channel (FRC). The settings take effect when a connection with an HS-DSCH of this configuration type is set up, see "Configuration Type" on page 566.

Fig. 6-85: Fixed reference channel configuration

H-Set
Fixed Reference Channels (FRC) for HSDPA conformance tests are defined in 3GPP TS 25.101, Annex A7. Each FRC is identified by an H-Set. Most H-Sets are available with different modulation schemes.

The following H-Sets are not defined in Annex A7:

- H-Set 1 Max Input: see 3GPP TS 25.101, section 7.4.2.1
- H-Set 1A Max Input: see 3GPP TS 34.121, section 6.3C
- H-Set 8 Max Input: see 3GPP TS 25.101, section 7.4.2.2
- H-Set 8A Max Input: see 3GPP TS 25.101, section 7.4.3.2
- H-Set 8/12 Max Throughput: H-Set 8/12 with parameter values optimized for maximum throughput. These H-Sets are not standardized.

For additional information about the H-Sets see table 6-13.

Option R&S CMW-KS401 required for R5 H-Sets, R&S CMW-KS403 for R7 H-Sets, R&S CMW-KS404 for R8 H-Sets.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:FIXed:HSET`

6.4.13.3 CQI Test Channel Configuration

This section configures a CQI reporting test channel. The settings take effect when a connection with an HS-DSCH of this configuration type is set up, see "Configuration Type" on page 566.

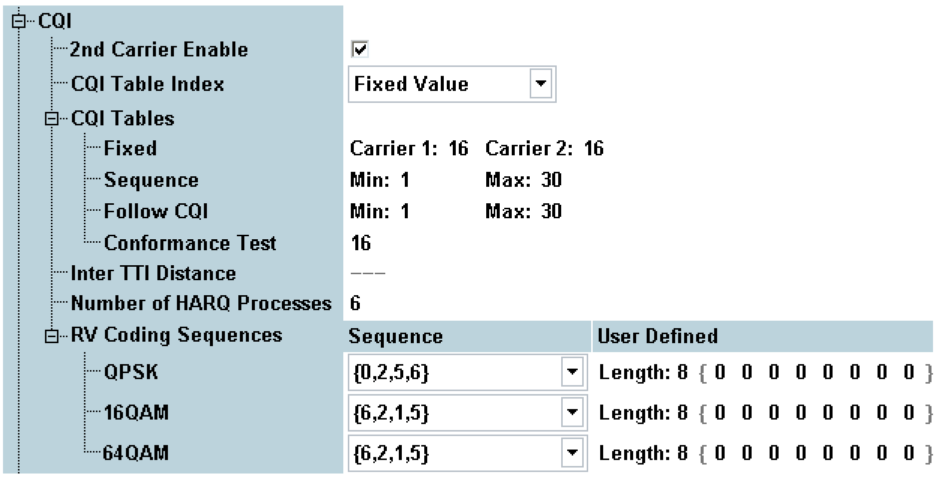


Fig. 6-86: CQI test channel configuration

2nd Carrier Enable

Enables or disables the usage of the second carrier for data transport via the HS-DSCH.

This parameter is only visible while the dual carrier scenario is active.

Option R&S CMW-KS404 required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CARRier2:HSDPa:CQI:ENABle`

CQI Table Index, CQI Tables

Determine the downlink transport format of the CQI test channels. The settings refer to the CQI mapping tables defined in 3GPP TS 25.214, section 6A.2.3. Which of the tables is applied depends on the UE category, see "UE Category" on page 565.

Each row of a mapping table can be identified via the CQI value listed in the first table column. Selection of a table row is done via this CQI value.

If a reference power adjustment is defined in the used table row, this results in a reduction of the HS-DSCH power. This reduction is compensated automatically by an increased OCNS power, so that the output channel power remains constant irrespective of the used CQI value.

Select one of the following values for "CQI Table Index" and configure the corresponding "CQI Tables" parameter.

Option R&S CMW-KS401 required.

"Fixed Value" A fixed mapping table row is used. Parameter "Fixed" selects the CQI value of the row.
If the dual carrier scenario is active, the value can be configured per carrier.

"Sequence" A range of mapping table rows is used. The used row changes cyclically from the minimum to the maximum CQI value configured via parameter "Sequence".
The sequence starts with the minimum CQI value. For each scheduled subframe the CQI value is increased by one, until the maximum value has been used. Then the sequence restarts with the minimum value.

"Follow CQI UL" The CQI value to be used is proposed by the UE. The parameter "Follow CQI" allows to restrict the range of allowed CQI values.
If the minimum CQI is set to a larger value than the maximum CQI, then only the maximum value is allowed.

"Conformance Test" This value is for future use to perform a CQI reporting test according to 3GPP TS 34.121, section 9.3.
The parameter "Conformance Test" defines the CQI value to be used in the first stage of the test where the downlink transport format is fixed and the frequency distribution of the reported CQI values is calculated.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TINDex`

`CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:CQI:FIXed`

`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:SEQuence`

`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:FOLLow`

`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:CONFormance`

Inter TTI Distance

Displays the minimum distance between two consecutive transmission time intervals in which the HS-DSCH is allocated to the UE (1 to 3 TTIs).

In accordance with the CQI test requirements, the inter TTI distance is automatically set to 3 if "Conformance Test" is selected. Otherwise the inter TTI distance depends on the UE category.

Option R&S CMW-KS401 required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TTI?`

Number of HARQ Processes
Number of hybrid automatic repeat request processes for retransmission of HSDPA packets.

Option R&S CMW-KS401 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:HARQ

RV Coding Sequences
Redundancy and constellation version coding sequences, defining the retransmission of HSDPA packets.

The format of a coding sequence is {$X_{rv,0}$, …, $X_{rv,N}$} for N retransmissions. The first value defines the initial transmission and each subsequent value defines one retransmission.

Each X_{rv} value is a 3-bit number, encoding two redundancy version parameters and for 16-QAM and 64-QAM modulation also a constellation version parameter. For details refer to 3GPP TS 25.222, sections 4.5.4 and 4.6.1.4.

In the first column you can select a predefined sequence for each modulation scheme. Alternatively you can select "User Defined" and define the length of the sequence and the sequence itself in the second column. For length = n only the first n entries within the brackets are considered.

Option R&S CMW-KS401 required for QPSK and 16-QAM, R&S CMW-KS403 required for 64-QAM.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QPSK
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QPSK:UDEFined
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QAM<no>
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QAM<no>:UDEFined

6.4.13.4 User Defined Channel Configuration

This section configures a user defined HS-DSCH. The settings take effect when a connection with this configuration type is set up, see "Configuration Type" on page 566.

User defined channel configuration requires option R&S CMW-KS411.

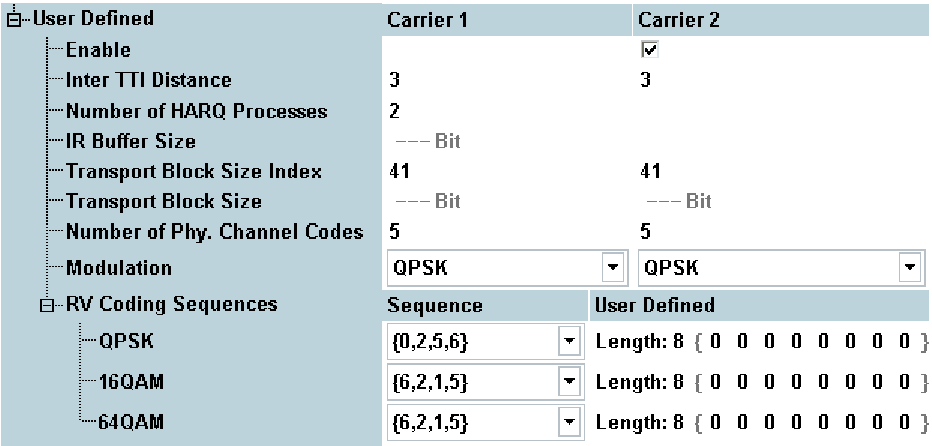


Fig. 6-87: User defined channel configuration

Enable (Carrier 2)

Enables or disables the usage of the second carrier for data transport via the HS-DSCH.

This parameter is only visible while the dual carrier scenario is active.

Options R&S CMW-KS404 and R&S CMW-KS411 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CARRier2:HSDPa:UDEFined:ENABle

Inter TTI Distance

Minimum distance between two consecutive transmission time intervals in which the HS-DSCH is allocated to the UE.

If the dual carrier scenario is active, you can configure the parameter per carrier.

Option R&S CMW-KS411 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:TTI

Number of HARQ Processes

Number of hybrid automatic repeat request processes for retransmission of HSDPA packets.

Option R&S CMW-KS411 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:HARQ

IR Buffer Size

Displays the size (no. of bits) of the virtual IR buffer used in the H-ARQ process. The IR buffer size is given by the total buffer size divided by the number of HARQ processes. The total buffer size for all H-ARQ processes is fixed for each UE category; see 3GPP TS 25.306, table 5.1a, "Total number of soft channel bits".

Option R&S CMW-KS411 required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:IRBuffer?

Transport Block Size Index

Value of the Transport Format and Resource Indicator (TFRI) signaled to the UE. The TFRI is also called k_i in the specification. It is used for calculation of the transport block size.

If the dual carrier scenario is active, you can configure the parameter per carrier.

Option R&S CMW-KS411 required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:TBLock`

Transport Block Size

Displays the used transport block size for information. The value depends on the transport block size index, the modulation type and the number of assigned channelization codes.

If the dual carrier scenario is active, the information is displayed per carrier.

Option R&S CMW-KS411 required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:TBLock`

Number of Physical Channel Codes

Number of HS-PDSCH channelization codes to be assigned to the UE.

If the dual carrier scenario is active, you can configure the parameter per carrier.

Option R&S CMW-KS411 required.

See also "Channel Code" on page 532.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:NCODes`

Modulation

Modulation scheme QPSK, 16-QAM or 64-QAM.

If the dual carrier scenario is active, you can configure the modulation scheme per carrier.

Option R&S CMW-KS411 required for QPSK and 16-QAM.

Option R&S CMW-KS411 and R&S CMW-KS403 required for 64-QAM.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:MODulation`

RV Coding Sequences

Redundancy and constellation version coding sequences, defining the retransmission of HSDPA packets.

The parameters are configured in the same way as for CQI channels, see "RV Coding Sequences" on page 569.

Option R&S CMW-KS411 required for QPSK and 16-QAM.

Option R&S CMW-KS411 and R&S CMW-KS403 required for 64-QAM.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QPSK
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QPSK:UDEFined
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QAM<no>
CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QAM<no>:UDEFined

6.4.14 HSUPA Settings

The parameters in this section configure for example the HSUPA system information and the contents transmitted via E-AGCH, E-RGCH and E-HICH.

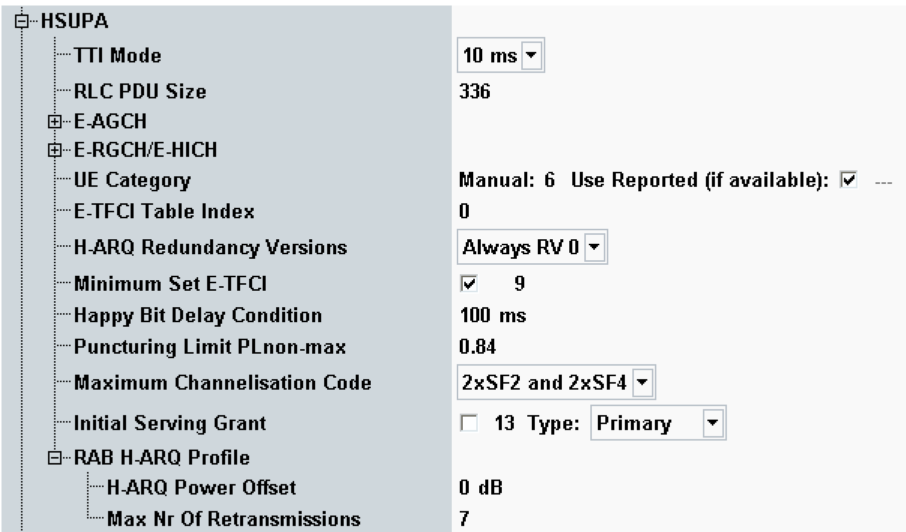
Option R&S CMW-KS401 is required.

For parameter descriptions refer to the subsections.

6.4.14.1 Miscellaneous HSUPA Settings

This section describes the highest level of the HSUPA section and the "RAB H-ARQ Profile" settings.

Many of the parameter values are signaled to the UE in the "Radiobearer Setup" message. The message contents are specified in 3GPP TS 25.331. For easier identification of the parameters in the standard, the corresponding sections of the "Radiobearer Setup" message are mentioned below for most parameters.



TTI Mode
Selects the Transmission Time Interval (TTI) for the E-DCH. 3GPP TS 25.321 allows TTIs of 2 ms (1 HSUPA subframe comprising 3 slots) or 10 ms duration (1 WCDMA frame comprising 15 slots). Depending on the UE category the UE supports both or only one TTI mode, see table 6-8.

The TTI duration has an impact on the number of HARQ processes (4 for 10 ms TTI, 8 for 2 ms TTI) and on the structure of the downlink HSUPA channels.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:TTI`

RLC PDU Size
Selects the RLC PDU size to be signaled to the UE in order to configure its UL RLC PDU size. Uplink signals with specific RLC PDU size are used in various conformance tests.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:PDU`

E-AGCH
See chapter 6.4.14.2, "E-AGCH Settings", on page 576

E-RGCH/E-HICH
See chapter 6.4.14.3, "E-RGCH and E-HICH Settings", on page 578

UE Category
In signaling mode the UE category to be used by the R&S CMW can be set manually or it can be set automatically according to the UE category reported by the UE in the capability report. In reduced signaling mode the category must be set manually.

- "Use Reported (if available)" disabled:
  The manually configured value is used.
- "Use Reported (if available)" enabled:
  If no reported value is available, the manually configured value is used.
  If a reported value is available, the application uses and displays it.

Note that the terms "UE Category" and "E-DCH Physical Layer Category" are synonymous in the context of HSUPA. See also "HSUPA UE Categories" on page 433.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:UECategory:MANual`
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:UECategory:REPorted`

E-TFCI Table Index
Specifies the "E-TFCI table index" value signaled to the UE in section "E-DPDCH Info".

The value indicates which table shall be used by the UE for mapping between the E-TFCI and the E-DCH transport block size. The tables 0 and 1 are defined in Annex B of 3GPP TS 25.321.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ETFCi:TINDex

H-ARQ Redundancy Versions
Specifies the "HARQ RV Configuration" value signaled to the UE in section "HARQ Info for E-DCH".

The UE can be ordered to use always redundancy version 0. Or it can be ordered to determine the redundancy version using a table as specified in 3GPP TS 25.212.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HRVersion

Minimum Set E-TFCI
Specifies the "E-DCH minimum set E-TFCI" value signaled to the UE in section "E-DPDCH Info". The checkbox allows to enable/disable transmission of the information element.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ETFCi:MSET

Happy Bit Delay Condition
Specifies the "Happy bit delay condition" value signaled to the UE in section "E-DPCCH Info".

The UE compares this value to the time needed to transmit the E-DCH buffer contents with current transmission parameters. If the transmission time is longer than the delay condition (and some other conditions are fulfilled), the UE sets the happy bit to "unhappy". For details see 3GPP TS 25.321, section 11.8.1.5.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HBDConition

Puncturing Limit $PL_{non-max}$
Specifies the "$PL_{non-max}$" value signaled to the UE in section "E-DPDCH Info".

This parameter limits the amount of puncturing that the UE is allowed to perform. The allowed puncturing in % equals (1-PL)*100.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:PLPLnonmax

Maximum Channelisation Code
Specifies the "Maximum channelisation codes" value signaled to the UE in section "E-DPDCH Info".

The value indicates the maximum channelization code configuration the UE may use and thus the maximum data rate. The data rate is increased by using a smaller Spreading Factor (SF) and by using several channelization codes in parallel for the E-DCH transmission.

Values sorted from low to high data rate:
- SF64 to SF4: one code, SF 64 to SF 4
- 2xSF4: two codes, SF 4
- 2xSF2: two codes, SF 2
- 2xSF2 and 2xSF4: four codes, two with SF 2 and two with SF 4

Of these values, only a subset of values compatible with the other configured HSUPA parameters is offered. This subset depends on the UE category, the RLC PDU size, the TTI mode, the test mode type and some other parameters. See also table 6-8.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:MCCode`

Initial Serving Grant

Specifies the "Serving Grant value" and the "Primary/Secondary Grant Selector" signaled to the UE in section "E-DCH Info".

Value 38 means ZERO_GRANT. The checkbox allows to enable/disable transmission of the information element.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ISGRant`

HARQ Power Offset

Specifies the "E-DCH MAC-d flow power offset" value signaled to the UE in section "Common E-DCH MAC-d flows".

The parameter is called Δ_{harq} in 3GPP TS 25.213 and used to define HARQ-dependent gain factors for the E-DPDCH.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HARQ:POFFset`

Max Nr Of Retransmissions

Specifies the "E-DCH MAC-d flow maximum number of retransmissions" value signaled to the UE in section "Common E-DCH MAC-d flows".

This value indicates how often the HARQ entity in the UE may re-transmit failed blocks.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HARQ:RETX`

6.4.14.2 E-AGCH Settings

The following settings configure the absolute grant messages transmitted via the Enhanced DCH Absolute Grant Channel (E-AGCH).

An absolute grant defines the maximum amount of uplink (E-DCH) resources the UE may use (see 3GPP TS 25.321). It is signaled to the UE by the serving cell. Up to two UE identities, one primary and one secondary, can be allocated to a UE at a time.

To enable the E-AGCH, see chapter 6.4.9.5, "HSUPA DL Channels", on page 533. To enable HSUPA see chapter 6.4.11, "Connection Configuration", on page 545.

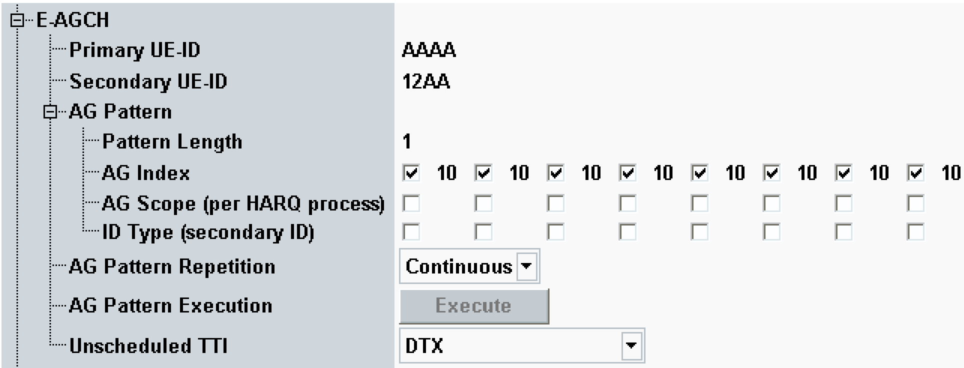


Fig. 6-88: E-AGCH settings

Primary / Secondary UE-ID

Specify the primary and secondary E-RNTI (E-DCH Radio Network Temporary Identifier) of the UE.

Option R&S CMW-KS401 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:UEID

AG Pattern

Configures the absolute grant pattern, i.e. the sequence of absolute grant messages to be sent to the UE. The signaling application steps through the table from left to right, using one column per TTI.

Each table column contains three parameter values: It defines an absolute grant index, the absolute grant scope and selects whether the message is addressed to the primary or to the secondary UE-ID.

Option R&S CMW-KS401 is required.

Pattern Length ← AG Pattern

Specifies the number of table columns to be considered (from left to right).

The maximum number of columns corresponds to the number of HARQ processes. For a 10 ms TTI the maximum pattern length is 4. For a 2 ms TTI the maximum length is 8.

Option R&S CMW-KS401 is required.

Remote command:

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:LENGth

AG Index ← AG Pattern

Specifies the absolute grant index. The UE maps the index to an absolute grant value, indicating the maximum E-DCH traffic to pilot ratio (E-DPDCH/DPCCH) that the UE is allowed to use in the next transmission.

Index 0 means INACTIVE, index 1 means ZERO_GRANT.

If a checkbox is disabled, this results in an unscheduled TTI. Either DTX or a dummy absolute grant for another UE can be transmitted, see "Unscheduled TTI" on page 578.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:INDex`

AG Scope (per HARQ process) ← AG Pattern

The absolute grant scope defines whether the absolute grant applies to all HARQ processes (checkbox disabled) or to one HARQ process only (checkbox enabled).

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:SCOPe`

ID Type (secondary ID) ← AG Pattern

Specifies whether the absolute grant message is addressed to the primary UE-ID (checkbox disabled) or to the secondary UE-ID (checkbox enabled).

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:TYPE`

AG Pattern Repetition

By default, the configured absolute grant pattern is executed continuously. So when the end of the pattern is reached, it starts again with the first column.

With repetition "Once", the selected pattern is transmitted once whenever the "Execute" button is pressed. Before and after transmission of the pattern there are unscheduled TTIs.

With a pattern of length 1, repetition "Once" allows to reset the E-TFCI of the UE to a definite value whenever needed.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:REPetition`

AG Pattern Execution

Triggers the execution of a single absolute grant pattern ("AG Pattern Repetition" = "Once"). The button is irrelevant for continuous patterns.

Option R&S CMW-KS401 is required.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:EXECute`

Unscheduled TTI

Defines the transmission in unscheduled TTIs. Unscheduled TTIs occur before and after pattern transmission with repetition "Once". A disabled AG index also results in an unscheduled TTI.

Option R&S CMW-KS401 is required.

"Transmit Dummy UEID"
The E-AGCH power is maintained and the unscheduled TTIs contain a UE-ID which is different from the specified primary and secondary UE-IDs.

"DTX" Discontinuous transmission is used during an unscheduled TTI, i.e. the output power is switched off.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:UTTI`

6.4.14.3 E-RGCH and E-HICH Settings

The following settings configure the contents of the Enhanced DCH Relative Grant Channel (E-RGCH) and the Enhanced DCH Hybrid ARQ Indicator Channel (E-HICH).

The E-RGCH carries relative grants, used in the scheduling process to incrementally adjust the allowed UE transmit power and thus the maximum amount of uplink (E-DCH) resources the UE may use.

The E-HICH carries the HARQ acknowledgement indicator, representing the positive or negative acknowledgement of a previous uplink transport block.

To enable the E-HICH and the E-RGCH, see chapter 6.4.9.5, "HSUPA DL Channels", on page 533. To enable HSUPA see chapter 6.4.11, "Connection Configuration", on page 545.

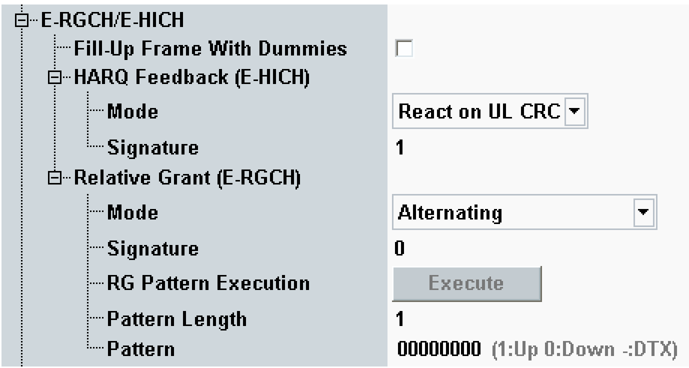


Fig. 6-89: E-RGCH and E-HICH settings

Fill-Up Frame With Dummies

With a 10 ms TTI the E-RGCH and E-HICH are transmitted for 12 slots per frame. During the remaining slots it is possible to switch the channels off (DTX) or to continue sending in order to maintain the channel power (fill-up with dummies). This setting has no effect for 2 ms TTIs.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EHRCh:FUFDummies`

HARQ Feedback (E-HICH)
The following parameters configure the HARQ feedback transmitted via the E-HICH.

Mode ← HARQ Feedback (E-HICH)
Type of the HARQ acknowledgement indicator sequence transmitted via the E-HICH.

You can e.g. send an alternating sequence or an all ACK or all NACK sequence. ACK corresponds to 1, NACK to 0.

The selection "React on UL CRC" sends: ACK for correct UL CRC, NACK for UL CRC error, DTX if no E-DPCCH is detected.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EHICh:MODE`

Signature ← HARQ Feedback (E-HICH)
E-HICH signature used to separate the E-HICH from the E-RGCH and from the E-HICH/E-RGCH allocated to other UEs.

The value is equal to the "Sequence index l" defined in 3GPP TS 25.211. Configure different values for the E-HICH signature and the E-RGCH signature.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EHICh:SIGNature`

Relative Grant (E-RGCH)
The following parameters configure the relative grant sequence transmitted via the E-RGCH.

Option R&S CMW-KS401 is required.

Mode ← Relative Grant (E-RGCH)
Type of the relative grant sequence transmitted via the E-RGCH.

You can send an alternating sequence or an all UP or all DOWN or all DTX sequence. UP corresponds to 1, DOWN to 0 and DTX to -.

The selections "Continuous" and "Single Pattern + All DTX" transmit a configurable pattern continuously or once. For configuration of the pattern see "Pattern Length, Pattern" on page 580.

Option R&S CMW-KS401 is required.

Remote command:
`CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:MODE`

Signature ← Relative Grant (E-RGCH)
E-RGCH signature used to separate the E-RGCH from the E-HICH and from the E-HICH/E-RGCH allocated to other UEs.

The value is equal to the "Sequence index l" defined in 3GPP TS 25.211. Configure different values for the E-HICH signature and the E-RGCH signature.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:SIGNature

RG Pattern Execution ← Relative Grant (E-RGCH)
Triggers the execution of a single relative grant pattern ("Mode" = "Single Pattern + All DTX"). The button is irrelevant for the other modes.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern:EXECute

Pattern Length, Pattern ← Relative Grant (E-RGCH)
Specify a single pattern for the modes "Continuous" and "Single Pattern + All DTX".

The maximum allowed pattern length depends on the TTI mode.

Option R&S CMW-KS401 is required.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern:LENGth
CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern

6.4.15 CPC Settings

The parameters in this section configure the CPC feature used by HSPA+ R7 defined in 3GPP TS 25.331.

For the parameter descriptions refer to the subsections and chapter 6.2.15, "Continuous Packet Connectivity (CPC)", on page 450.

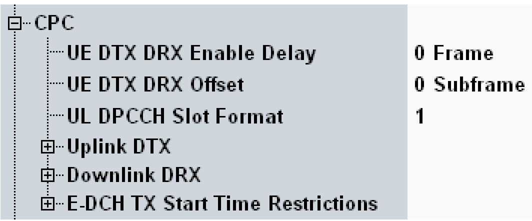


Fig. 6-90: CPC configuration

Dependencies:

- Option R&S CMW-KS413 is required.
- CPC is possible only in the test mode type HSPA, direction HSPA, see Connection Configuration.
- While the CPC is active, the data generator cannot be started and the test loop cannot be used.
  Thus the data pattern setting is not relevant during the CPC, see Data Pattern.
- R&S CMW does not check the UE CPC capability.
- R&S CMW warns if the conditions defined in 3GPP TS 25.331:8.6.6.39 (e.g. DTX-DRX information FDD only) are not fullfilled however the set values are not modified automatically.
- It is possible to activate DL DRX only if UL DTX is active.
- While the CPC is active, F-DPCH is activated automatically. F-DPCH is displayed in the code domain diagram instead of the DL DPCH.

6.4.15.1 General CPC Settings

This section describes the settings of the DTX-DRX timing information and the UL DPCCH slot format, see also chapter 6.2.15, "Continuous Packet Connectivity (CPC)", on page 450.

All parameters for the DTX-DRX timing information are defined in 3GPP TS 25.331.

The UL DPCCH slot format is defined in 3GPP TR 25.903.

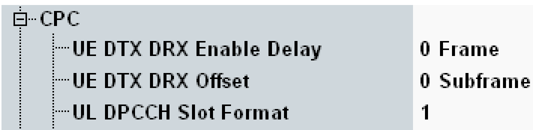


Fig. 6-91: DTX-DRX timing information and DPCCH format

UE DTX DRX Enable Delay

Time the UE waits until enabling a new timing pattern for the DRX/DTX operation.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CPC:DTRX:DELay`

UE DTX DRX Offset

Offset of the DTX/DRX cycles at the given TTI.

This parameter is used to spread the transmission of the different UEs.

Remote command:

`CONFigure:WCDMa:SIGN<i>:CELL:CPC:DTRX:OFFSet`

UL DPCCH Slot Format
Defines the UL DPCCH slot format used by the CPC.

In the R7 a new UL DPCCH slot format no. 4 was introduced, see chapter 6.2.15, "Continuous Packet Connectivity (CPC)", on page 450.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:HLOPeration:SFORmat

6.4.15.2 Uplink DTX

This section describes the parameters for the discontinuous transmission in the uplink, see also chapter 6.2.15, "Continuous Packet Connectivity (CPC)", on page 450.

The parameters from this section are defined in 3GPP TS 25.331 as the DTX-DRX information.

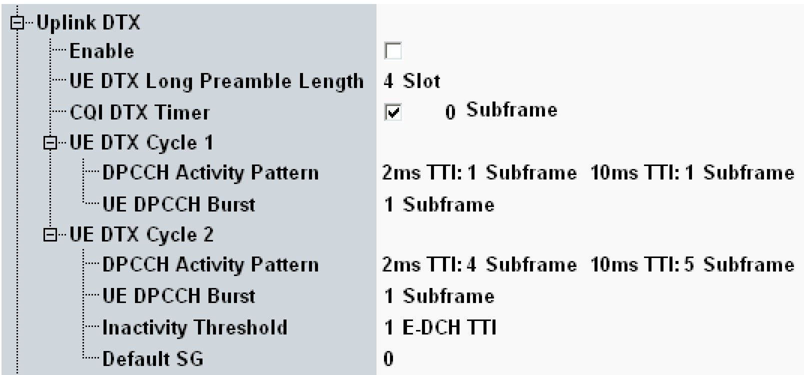


Fig. 6-92: Uplink DTX configuration

Enable
Enables discontinuous transmission in the uplink.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:ENABle

UE DTX Long Preamble Length
Preamble is used for the synchronisation, transmitted by the UE in the DPCCH prior to the uplink DTX transmission .

UE transmits the DTX long preamble immediately prior to the E-DCH transmission in the UE DTX cycle 2.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:LPLength

CQI DTX Timer
Number of subframes after an HS-DSCH reception during which the CQI reports have higher priority than the DTX pattern and are transmitted according to the regular CQI pattern.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CQITimer

UE DTX Cycle 1/2 > DPCCH Activity Pattern
Specifies how often UE has to transmit uplink DPCCH when UE DTX cycle 1/2 is active.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:APATtern:TTI<ms>

UE DTX Cycle 1/2 > UE DPCCH Burst
Specifies the length of DPCCH transmission when UE DTX cycle 1/2 is active.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:BURSt

UE DTX Cycle 2 > Inactivity Threshold
Specifies when to activate the UE DTX cycle 2 after the last uplink data transmission.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:ITHReshold

UE DTX Cycle 2 > Default SG
Indicates E-DCH serving grant index for default serving grant value in the UE DTX cycle 2.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:DSG

6.4.15.3 Downlink DRX

This section describes the parameters for discontinuous reception in the downlink, see also chapter 6.2.15, "Continuous Packet Connectivity (CPC)", on page 450.

The parameters from this section are defined in 3GPP TS 25.331 as the DTX-DRX information.

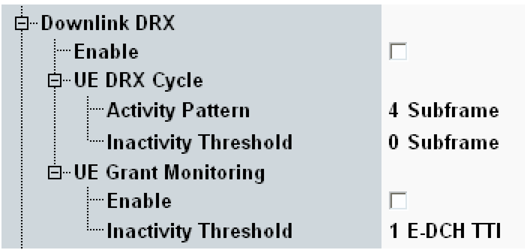


Fig. 6-93: Downlink DRX configuration

Enable
Enables discontinuous reception in the downlink.

Enabling the DL DRX is possible only if the UL DTX is enabled.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:ENABle

UE DRX Cycle > Activity Pattern
Specifies how often UE has to monitor HS-SCCH when UE DRX cycle is active.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:CYCLe:APATtern

UE DRX Cycle > Inactivity Threshold
Number of subframes after downlink activity where UE has to continuously monitor HS-SCCH.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:CYCLe:ITHReshold

UE DRX Cycle > UE Grant Monitoring: Enable, Inactivity Threshold
Configures whether the UE is required to monitor E-AGCH/E-RGCH when they overlap with the start of an HS-SCCH reception as defined in the UE DRX cycle. Inactivity threshold is the number of subframes after uplink activity when UE has to continue to monitor E-AGCH/E-RGCH.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:GMONitoring:ENABle
CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:GMONitoring:ITHReshold

6.4.15.4 E-DCH TX Start Time Restrictions

This section describes the parameters for the transmission restrictions in the uplink on the E-DCH, see also chapter 6.2.15, "Continuous Packet Connectivity (CPC)", on page 450.

The parameters from this section are defined in 3GPP TS 25.331 as the DTX-DRX information.

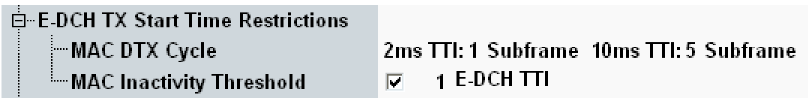


Fig. 6-94: E-DCH TX restriction configuration

E-DCH TX Start Time Restriction > MAC DTX Cycle
Specifies pattern of time instances where the start of uplink E-DCH transmission after inactivity is allowed.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:MAC:CYCLe:TTI<ms>

E-DCH TX Start Time Restriction > MAC Inactivity Threshold
E-DCH inactivity time after which the UE can start E-DCH transmission only at given times according to MAC DTX cycle.

Remote command:
CONFigure:WCDMa:SIGN<i>:CELL:CPC:MAC:CYCLe:ITHReshold

6.4.16 UE Measurement Report Settings

The parameters in this section activate, deactivate and configure the UE measurement report. The report is shown in the main signaling view, see chapter 6.4.1, "Signaling View", on page 492.

This section is not relevant for reduced signaling.

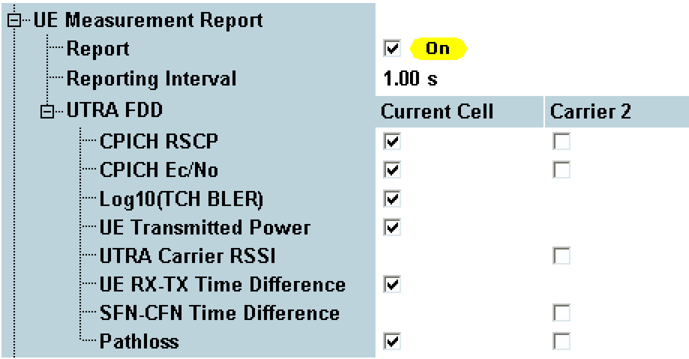


Fig. 6-95: UE measurement report settings

Report

Enable or disable the UE measurement report completely. If reporting is enabled, the instrument requests reports from the UE. As the delivery of the requested reports may take some time, a command allows to check whether the process has been completed or the instrument is still waiting for reports from the UE.

With enabled measurement reporting, the properties of the uplink signal change whenever a report is received, resulting e.g. in power steps. For that reason it is recommended to disable measurement reports for TX measurements.

Remote command:

CONFigure:WCDMa:SIGN<i>:UEReport:ENABle

FETCh:WCDMa:SIGN<i>:UEReport:STATe?

Reporting Interval

Sets the interval between two consecutive measurement report messages. Reduce the interval to check whether the UE can cope with a high repetition rate.

Remote command:

CONFigure:WCDMa:SIGN<i>:UEReport:RINTerval

UTRA FDD

Enable or disable the evaluation and display of the individual information elements included in the UE measurement report message. The purpose of this section is to adjust the measurement report to the UE capabilities.

If the dual carrier scenario is active, the reports for the two carriers consist of different information elements which can be enabled or disabled per carrier. "Current Cell" corresponds to carrier 1.

Remote command:

`CONFigure:WCDMa:SIGN<i>:UEReport:CCELl:ENABle`
`CONFigure:WCDMa:SIGN<i>:UEReport:NCELl:ENABle`

6.4.17 Messaging (SMS) Parameters

The "Messaging (SMS)" section configures parameters of the Short Message Service (SMS). Sending an SMS message to the UE is triggered via hotkey, see chapter 6.4.2, "Signaling and Connection Control", on page 508.

This section is not relevant for reduced signaling.

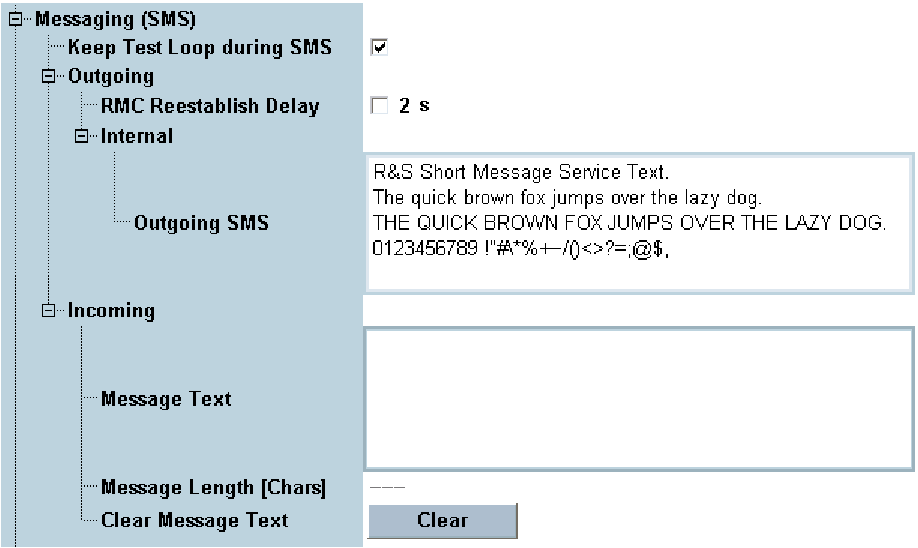


Fig. 6-96: Messaging (SMS) Parameters

Keep Test Loop during SMS

Specifies whether the test loop is kept closed for an established connection with test loop, when an SMS message is sent to the UE.

If disabled, the loop is opened before the message is sent and closed again afterwards. If the UE supports keeping the loop closed, you can speed up the procedure by enabling this parameter.

Remote command:

`CONFigure:WCDMa:SIGN<i>:SMS:KTLoop`

Outgoing > RMC Reestablish Delay

Defines the time between sending of an SMS message and re-establishment of the RMC connection.

This parameter is relevant if you send an SMS message in parallel to an established RMC connection and parameter Keep Test Loop during SMS is disabled. In that case the RMC connection is released (RRC connection is kept), the SMS message is sent and then the RMC connection is re-established after the defined delay time.

The delay can also be deactivated completely, so that the RMC connection is re-established immediately after the SMS message has been sent.

Remote command:
CONFigure:WCDMa:SIGN<i>:SMS:OUTGoing:RMCDelay

Outgoing > Internal > Outgoing SMS
Defines the SMS message text to be sent. It is encoded as 7-bit ASCII text and consists of up to 160 characters.

Remote command:
CONFigure:WCDMa:SIGN<i>:SMS:OUTGoing:INTernal

Incoming > Message Text / Message Length
Show the text and length of the last received SMS message. Only 7-bit ASCII text is supported.

Remote command:
SENSe:WCDMa:SIGN<i>:SMS:INComing:INFO:MTEXt?
SENSe:WCDMa:SIGN<i>:SMS:INComing:INFO:MLENgth?

Incoming > Clear Message Text
The button resets all parameters related to a received SMS message.

The message text and the information about the message length are deleted. The "message read" flag is set to true.

Remote command:
SENSe:WCDMa:SIGN<i>:SMS:INFO:LRMessage:RFLag?
CLEan:WCDMa:SIGN<i>:SMS:INComing:INFO:MTEXt

6.4.18 Shortcut Configuration

This section configures the three shortcut softkeys that provide a fast way to switch to selectable measurements.

See also chapter 6.4.3, "Using the Shortcut Softkeys", on page 510

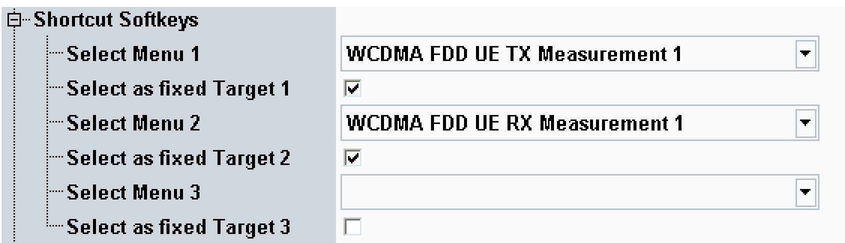


Fig. 6-97: Shortcut configuration

Select Menu

Selects a measurement. The corresponding shortcut softkey opens a dialog presenting this measurement as default target or uses the measurement as fixed target.

Select as fixed Target

Configures and renames the corresponding shortcut softkey.

- **Enabled**: The softkey directly opens the measurement selected via Select Menu.
- **Disabled**: The softkey opens a dialog box for selection of the target measurement.

6.4.19 Message Monitoring Settings

Messages exchanged between the WCDMA signaling application and the UE can be monitored. For this purpose the messages are sent to an external PC.

See also: "Logging" in the R&S CMW user manual, chapter "Basic Instrument Functions"

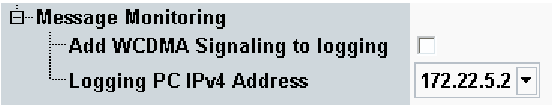


Fig. 6-98: Message Monitoring Settings

Add WCDMA Signaling to logging

Enables or disables message monitoring for the WCDMA signaling application.

Remote command:

`CONFigure:WCDMa:SIGN<i>:MMONitor:ENABle`

Logging PC IPv4 Address

Selects the IP address to which the messages shall be sent for monitoring.

The address pool is configured globally, see "Setup" dialog, section "Logging".

Remote command:

`CONFigure:WCDMa:SIGN<i>:MMONitor:IPADdress`

6.4.20 BER Measurement Configuration

The signaling BER measurement is included in the "WCDMA signaling" application. It must be activated in the "Measurement Controller" dialog via the entry "RX Measurement...". The "BER" tab of the RX measurement view and the related configuration dialog are described in this section.

6.4.20.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"

BER (Softkey)

The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:

`INITiate:WCDMa:SIGN<i>:BER`

`STOP:WCDMa:SIGN<i>:BER`

`ABORt:WCDMa:SIGN<i>:BER`

`FETCh:WCDMa:SIGN<i>:BER:STATe?`

`FETCh:WCDMa:SIGN<i>:BER:STATe:ALL?`

6.4.20.2 BER Tab

The tab shows the connection status and measurement results to the left and settings to the right.

Additional settings of the "WCDMA signaling" application can be accessed via the "Signaling Parameter" softkey and the related hotkeys.

To switch to the signaling application, press the "WCDMA UE Signaling" softkey two times.

The "Config" hotkey opens either the configuration dialog of the measurement or the configuration dialog of the signaling application, depending on which softkey is currently active.

Fig. 6-99: BER tab

Connection Status

The connection status information is the same as in the main view. For a description see chapter 6.4.1.1, "Connection Status", on page 493.

Additionally, the "DL/UL Alignment" is displayed. It indicates the offset between DL DPCH and UL DPCH at the RF connectors of the instrument. The ideal offset as specified by 3GPP equals 1024 chips. The DL/UL alignment is a general measurement result, available independent of an initiated BER measurement.

Remote command:

`SENSe:WCDMa:SIGN<i>:UESinfo:DULalignment?`

Cell Setup / Connection Setup

These settings are common settings of the "WCDMA signaling" application. Changing the values in one view changes the values in all views of the "WCDMA signaling" application.

For parameter descriptions see chapter 6.4.1, "Signaling View", on page 492.

Results

For a detailed description of the results see chapter 6.2.17.2, "Measurement Results", on page 458.

Remote command:

`FETCh:WCDMa:SIGN<i>:BER?`
`READ:WCDMa:SIGN<i>:BER?`
`CALCulate:WCDMa:SIGN<i>:BER?`

6.4.20.3 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the measurement.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

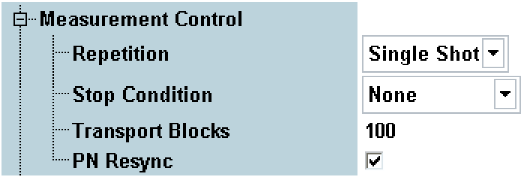


Fig. 6-100: Measurement control settings

Repetition

Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:

CONFigure:WCDMa:SIGN<i>:BER:REPetition

Stop Condition

Specifies the conditions for an early termination of the measurement:

- **None:** The measurement is performed according to its "Transport Blocks", irrespective of the limit check results.
- **On Limit Failure**: The measurement is stopped as soon as one of the limits is exceeded. If no limit failure occurs, it is performed according to its "Transport Blocks" settings. Use this value for measurements that are essentially intended for checking limits, e.g. production tests.

Remote command:

CONFigure:WCDMa:SIGN<i>:BER:SCONdition

Transport Blocks

Defines the number of transport blocks to be measured per measurement cycle (statistics cycle). The number of transport blocks sent can be larger than the specified value because transport blocks may be lost on the way to the UE and back.

See also: "Statistical Results" in the R&S CMW user manual, chapter "System Overview"

Remote command:

CONFigure:WCDMa:SIGN<i>:BER:TBLocks

PN Resync
Activates a correction mechanism for the order of looped back transports blocks. The setting is relevant in the case that the UE eliminates or reorders some of the received blocks carrying an irregular bit pattern, in particular a PN sequence (PRBS). The main purpose of the setting is to check whether a high BER actually results from a reordering of blocks by the UE.

"ON" The R&S CMW checks the BER within each individual received block and corrects its PN phase and its position in the block sequence, if necessary. The BER measurement result is based on the bit stream of the corrected block sequence. It can be zero although the UE has eliminated or reordered some blocks. The number of corrected blocks is displayed as measurement result "PN Discontinuity".

"Off" The received block sequence is not corrected. No "PN Discontinuity" result is provided.

Remote command:
CONFigure:WCDMa:SIGN<i>:BER:PNResync

6.4.20.4 Limit Settings

The "Limit" section defines upper limits for the results of the "BER" measurement.

3GPP TS 34.121 specifies a variety of test cases related to these results, especially to BER, BLER and FDR. A maximum BER of 0.1% is required for most test cases.

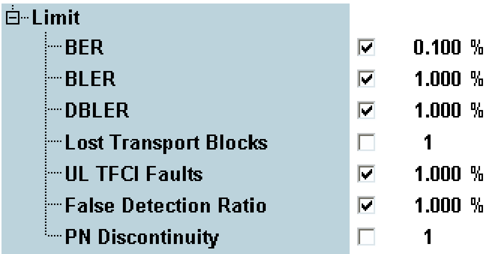


Fig. 6-101: Limit settings

Limit
Defines and activates/deactivates individual upper limits for the results of the "BER" measurement.

Remote command:
CONFigure:WCDMa:SIGN<i>:BER:LIMit

6.4.21 HSDPA ACK Measurement Configuration

The signaling HSDPA ACK measurement is included in the "WCDMA signaling" application. It must be activated in the "Measurement Controller" dialog via the entry "RX Measurement...". The "HSDPA ACK" tab of the RX measurement view and the related configuration dialog are described in this section.

Option R&S CMW-KS401 is required.

6.4.21.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"

HSDPA ACK (Softkey)
The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:
INITiate:WCDMa:SIGN<i>:HACK
STOP:WCDMa:SIGN<i>:HACK
ABORt:WCDMa:SIGN<i>:HACK
FETCh:WCDMa:SIGN<i>:HACK:STATe?
FETCh:WCDMa:SIGN<i>:HACK:STATe:ALL?

6.4.21.2 HSDPA ACK Tab

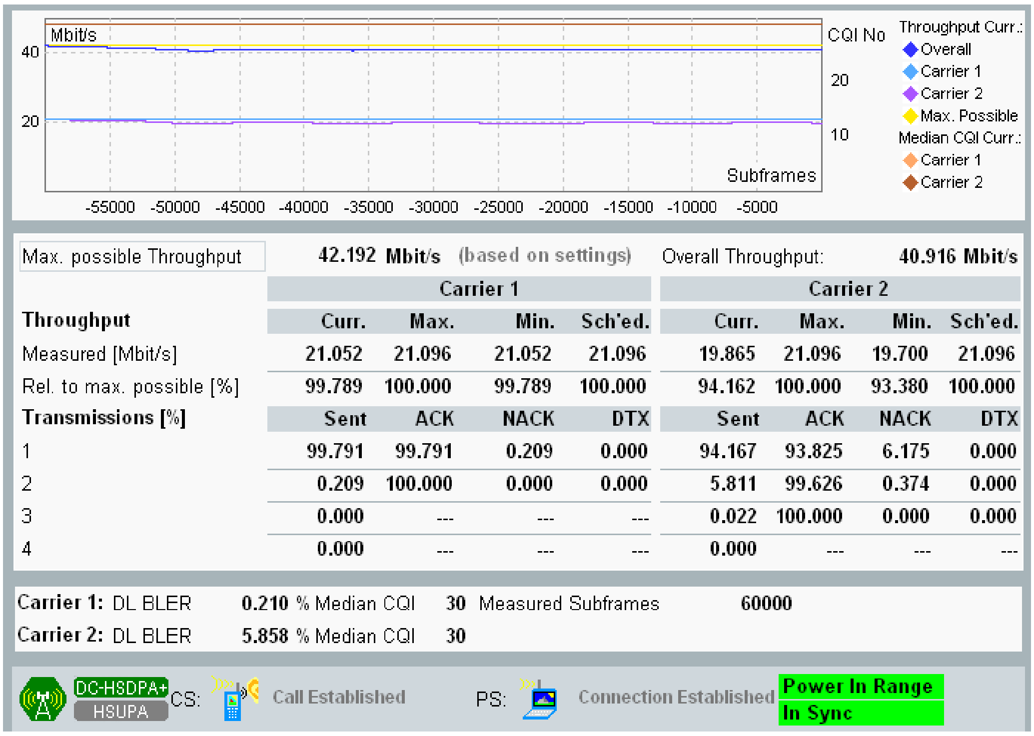
The tab shows the measurement results and the connection status.

The connection status information displayed at the bottom is the same as in the "WCDMA signaling" main view, see chapter 6.4.1.1, "Connection Status", on page 493.

The most important settings of the "WCDMA signaling" application can be accessed via the "Signaling Parameter" softkey and the related hotkeys.

To switch to the signaling application, press the "WCDMA UE Signaling" softkey two times.

The "Config" hotkey opens either the configuration dialog of the measurement or the configuration dialog of the signaling application, depending on which softkey is currently active.



	Carrier 1				Carrier 2			
Throughput	Curr.	Max.	Min.	Sch'ed.	Curr.	Max.	Min.	Sch'ed.
Measured [Mbit/s]	21.052	21.096	21.052	21.096	19.865	21.096	19.700	21.096
Rel. to max. possible [%]	99.789	100.000	99.789	100.000	94.162	100.000	93.380	100.000
Transmissions [%]	Sent	ACK	NACK	DTX	Sent	ACK	NACK	DTX
1	99.791	99.791	0.209	0.000	94.167	93.825	6.175	0.000
2	0.209	100.000	0.000	0.000	5.811	99.626	0.374	0.000
3	0.000	---	---	---	0.022	100.000	0.000	0.000
4	0.000	---	---	---	0.000	---	---	---

Fig. 6-102: HSDPA ACK tab

Results

For a detailed description of the results see chapter 6.2.18.2, "Measurement Results", on page 460.

Remote command:

FETCh:WCDMa:SIGN<i>:HACK:TRACe:THRoughput:CARRier<carrier>:CURRent?
FETCh:WCDMa:SIGN<i>:HACK:TRACe:THRoughput:TOTal:CURRent?
FETCh:WCDMa:SIGN<i>:HACK:TRACe:MCQI:CARRier<carrier>:CURRent?
FETCh:WCDMa:SIGN<i>:HACK:THRoughput:CARRier<carrier>:ABSolute?
FETCh:WCDMa:SIGN<i>:HACK:THRoughput:CARRier<carrier>:RELative?
FETCh:WCDMa:SIGN<i>:HACK:TRANsmission:CARRier<carrier>?
FETCh:WCDMa:SIGN<i>:HACK:BLER:CARRier<carrier>?
FETCh:WCDMa:SIGN<i>:HACK:MSFRames?
FETCh:WCDMa:SIGN<i>:HACK:MCQI:CARRier<carrier>?

6.4.21.3 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the measurement.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

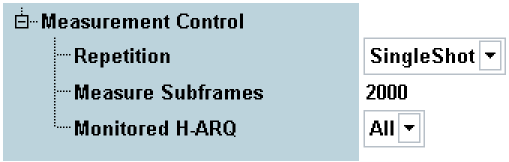


Fig. 6-103: Measurement control settings

Repetition
Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:
`CONFigure:WCDMa:SIGN<i>:HACK:REPetition`

Measure Subframes
Defines the number of HSDPA subframes (transmission packets) to be measured per measurement cycle (statistics cycle). Only subframes scheduled for the UE are counted.

Specify a multiple of 100 subframes.

See also: "Statistical Results" in the R&S CMW user manual, chapter "System Overview"

Remote command:
`CONFigure:WCDMa:SIGN<i>:HACK:MSFRames`

Monitored H-ARQ
Selects either a single H-ARQ process (numbered 0 to 7) to be monitored or specifies that all processes are to be monitored.

Selecting a single process extends the measurement duration because only a part of the transmitted subframes is measured. For fast production tests, it is recommended to monitor all processes.

Remote command:
`CONFigure:WCDMa:SIGN<i>:HACK:HARQ`

6.4.22 RLC Throughput Measurement Configuration

The signaling RLC Throughput measurement is included in the "WCDMA signaling" application. It must be activated in the "Measurement Controller" dialog via the entry "RX Measurement...". The "RLC Throughput" tab of the RX measurement view and the related configuration dialog are described in this section.

See also chapter 6.2.19.1, "Performing RLC Throughput Measurements", on page 463

6.4.22.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"

RLC Throughput (Softkey)
The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:
`INITiate:WCDMa:SIGN<i>:THRoughput`
`STOP:WCDMa:SIGN<i>:THRoughput`
`ABORt:WCDMa:SIGN<i>:THRoughput`
`FETCh:WCDMa:SIGN<i>:THRoughput:STATe?`
`FETCh:WCDMa:SIGN<i>:THRoughput:STATe:ALL?`

6.4.22.2 RLC Throughput Tab

The tab shows the measurement results and the connection status.

The connection status information displayed at the bottom is the same as in the "WCDMA signaling" main view, see chapter 6.4.1.1, "Connection Status", on page 493.

The most important settings of the "WCDMA signaling" application can be accessed via the "Signaling Parameter" softkey and the related hotkeys.

To switch to the signaling application, press the "WCDMA UE Signaling" softkey two times.

The "Config" hotkey opens either the configuration dialog of the measurement or the configuration dialog of the signaling application, depending on which softkey is currently active.

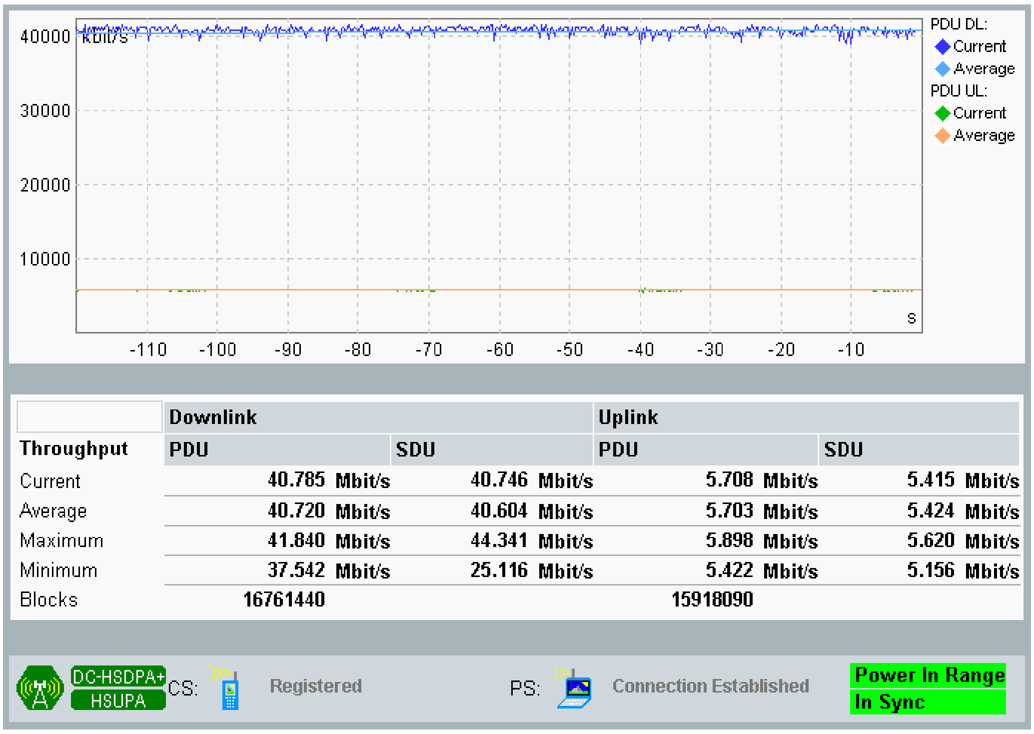


Fig. 6-104: RLC Throughput tab

Results

For a description of the results see chapter 6.2.19.2, "Measurement Results", on page 464.

Remote command:

`FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?` etc.
`FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:DL:SDU:CURRent?` etc.
`FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?` etc.
`FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:UL:SDU:CURRent?` etc.
`FETCh:WCDMa:SIGN<i>:THRoughput?` etc.

6.4.22.3 Measurement Control Settings

The "Measurement Control" parameters configure the scope of the measurement.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

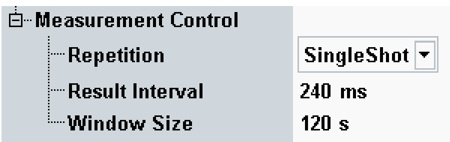


Fig. 6-105: Measurement control settings

Repetition
Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:
`CONFigure:WCDMa:SIGN<i>:THRoughput:REPetition`

Result Interval
Time interval used to derive a single throughput result (multiple of 80 ms).

Remote command:
`CONFigure:WCDMa:SIGN<i>:THRoughput:UPDate`

Window Size
Width of the result window displaying the throughput traces (X-axis range). The window size equals the duration of a single shot measurement (one statistics cycle). It is internally rounded down to the next integer multiple of the "Result Interval". As a consequence the number of results in the diagram equals the integer number <Window Size> / <Result Interval>.

Remote command:
`CONFigure:WCDMa:SIGN<i>:THRoughput:WINDow`

6.4.23 E-HICH Measurement Configuration

The signaling E-HICH measurement is included in the "WCDMA signaling" application. It must be activated in the "Measurement Controller" dialog via the entry "RX Measurement...". The "E-HICH" tab of the RX measurement view and the related configuration dialog are described in this section.

6.4.23.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"

HSUPA E-HICH (Softkey)
The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:
INITiate:WCDMa:SIGN<i>:EHICh
STOP:WCDMa:SIGN<i>:EHICh
ABORt:WCDMa:SIGN<i>:EHICh
FETCh:WCDMa:SIGN<i>:EHICh:STATe?
FETCh:WCDMa:SIGN<i>:EHICh:STATe:ALL?

6.4.23.2 E-HICH Tab

The tab shows the measurement results and the connection status.

The connection status information displayed at the bottom is the same as in the "WCDMA signaling" main view, see chapter 6.4.1.1, "Connection Status", on page 493.

The most important settings of the "WCDMA signaling" application can be accessed via the "Signaling Parameter" softkey and the related hotkeys.

To switch to the signaling application, press the "WCDMA UE Signaling" softkey two times.

The "Config" hotkey opens either the configuration dialog of the measurement or the configuration dialog of the signaling application, depending on which softkey is currently active.

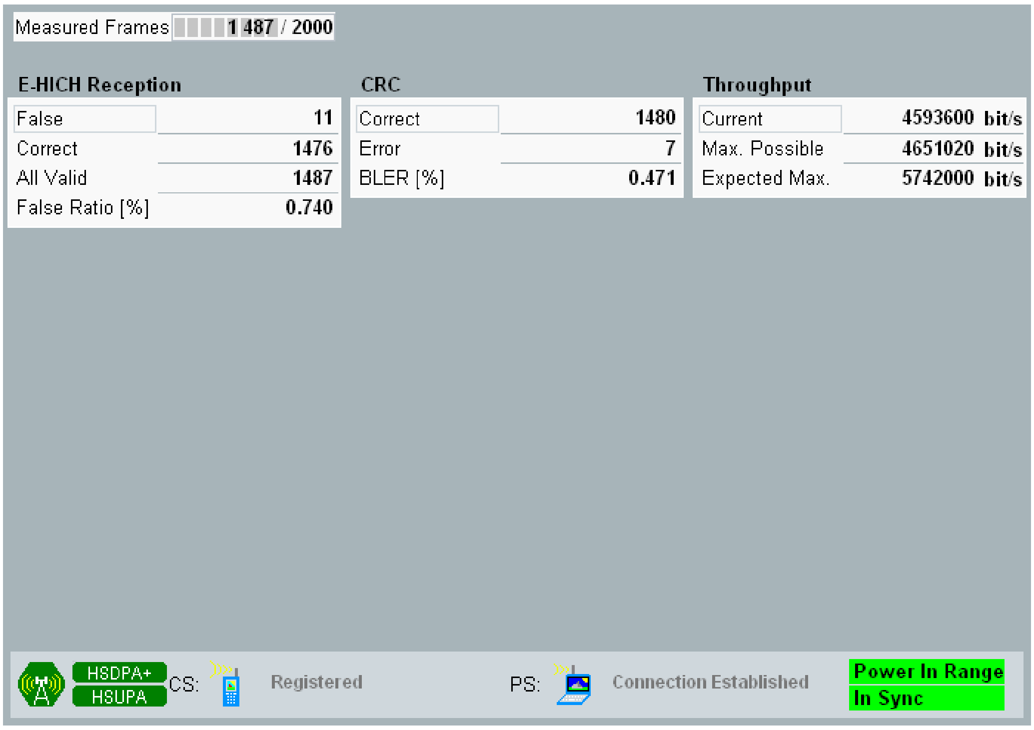


Fig. 6-106: E-HICH tab

Results

For a description of the results see chapter 6.2.20.2, "Measurement Results", on page 466.

Remote command:

FETCh:WCDMa:SIGN<i>:EHICh?

READ:WCDMa:SIGN<i>:EHICh?

6.4.23.3 Measurement Settings

The "Measurement Control" parameters configure the scope of the measurement. A limit can also be defined.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

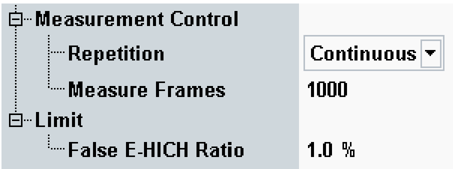


Fig. 6-107: Measurement settings

Repetition

Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:

CONFigure:WCDMa:SIGN<i>:EHICh:REPetition

Measure Frames

Specifies the number of subframes to be measured per measurement cycle (statistics cycle).

Remote command:

CONFigure:WCDMa:SIGN<i>:EHICh:MFRames

Limit

Defines an upper limit for the E-HICH reception "False Ratio" result.

Remote command:

CONFigure:WCDMa:SIGN<i>:EHICh:LIMit

6.4.24 UL Logging Measurement Configuration

The signaling UL logging measurement is included in the "WCDMA signaling" application. It must be activated in the "Measurement Controller" dialog via the entry "RX Measurement...". The "UL Logging" tab of the RX measurement view and the related configuration dialog are described in this section.

6.4.24.1 Measurement Control

The measurement is turned on or off using the ON | OFF or RESTART | STOP keys.

See also: "Measurement Control" in the R&S CMW user manual, chapter "System Overview"

HSUPA UL logging (Softkey)
The softkey shows the current measurement state. Additional measurement substates may be retrieved via remote control.

Remote command:
```
INITiate:WCDMa:SIGN<i>:ULLogging
STOP:WCDMa:SIGN<i>:ULLogging
ABORt:WCDMa:SIGN<i>:ULLogging
FETCh:WCDMa:SIGN<i>:ULLogging:STATe?
FETCh:WCDMa:SIGN<i>:ULLogging:STATe:ALL?
```

6.4.24.2 UL Logging Tab

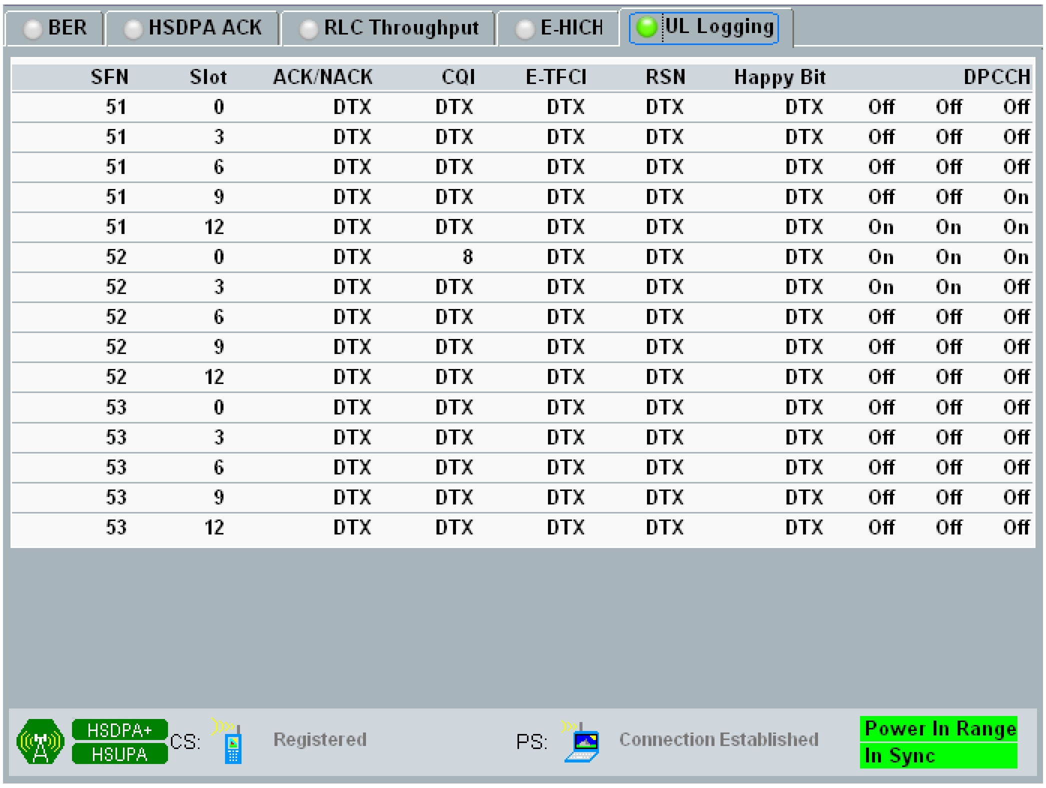
The tab shows the measurement results and the connection status.

The connection status information displayed at the bottom is the same as in the "WCDMA signaling" main view, see Connection Status.

The most important settings of the "WCDMA signaling" application can be accessed via the "Signaling Parameter" softkey and the related hotkeys.

To switch to the signaling application, press the "WCDMA UE Signaling" softkey two times.

The "Config" hotkey opens either the configuration dialog of the measurement or the configuration dialog of the signaling application, depending on which softkey is currently active.



SFN	Slot	ACK/NACK	CQI	E-TFCI	RSN	Happy Bit	DPCCH		
51	0	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
51	3	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
51	6	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
51	9	DTX	DTX	DTX	DTX	DTX	Off	Off	On
51	12	DTX	DTX	DTX	DTX	DTX	On	On	On
52	0	DTX	8	DTX	DTX	DTX	On	On	On
52	3	DTX	DTX	DTX	DTX	DTX	On	On	Off
52	6	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
52	9	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
52	12	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	0	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	3	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	6	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	9	DTX	DTX	DTX	DTX	DTX	Off	Off	Off
53	12	DTX	DTX	DTX	DTX	DTX	Off	Off	Off

Fig. 6-108: UL logging tab

Results

For more information to the results see UL Logging Measurement.

Remote command:

`FETCh:WCDMa:SIGN<i>:ULLogging:SFN?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:SLOT?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:CARRier<carrier>:ANACk?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:CARRier<carrier>:CQI?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:ETFCi?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:RSN?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:HBIT?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:DPCCh?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging[:SCELl]?` etc.
`FETCh:WCDMa:SIGN<i>:ULLogging:DCARrier?` etc.

6.4.24.3 Measurement Settings

The "Measurement Control" parameters configure the scope of the measurement.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "System Overview"

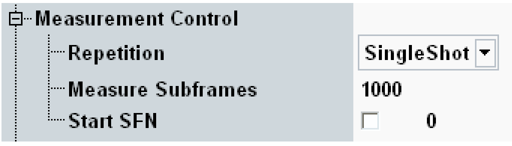


Fig. 6-109: Measurement settings

Repetition

Defines how often the measurement is repeated if it is not stopped explicitly or by a failed limit check.

- **Continuous:** The measurement is continued until it is explicitly terminated; the results are periodically updated.
- **Single-Shot:** The measurement is stopped after one statistics cycle.

Single-shot is preferable if only a single measurement result is required under fixed conditions, which is typical for remote-controlled measurements. Continuous mode is suitable for monitoring the evolution of the measurement results in time and observe how they depend on the measurement configuration, which is typically done in manual control. The reset/preset values therefore differ from each other.

Remote command:

CONFigure:WCDMa:SIGN<i>:ULLogging:REPetition

Measure Subframes

Specifies the number of subframes to be measured per measurement cycle (statistics cycle).

Remote command:

CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames

Start SFN

Specifies the first system frame number for which the UL logging information is displayed.

Remote command:

CONFigure:WCDMa:SIGN<i>:ULLogging:SSFN

6.5 Programming

The following sections provide programming examples for the WCDMA signaling application.

The examples contain SCPI commands supported by the R&S CMW and the following symbolic scripting commands:

- // <comment>:
  A <comment> ignored by the used programming tool
- WHILE <query> <> <value>:
  Waits until the <query> returns a certain <value>, e.g. a specific state is reached.
- WAITKEY <message>:
  Displays a dialog box with a <message> and waits until the box is closed by the user.

See also: "Remote Control" in the R&S CMW user manual

6.5.1 Signaling Application

The WCDMA signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:WCDMa:SIGN:...`
- After a `*RST`, the DL signal is switched off.
  To activate the DL signal use `SOURce:WCDMa:SIGN:CELL:STATe ON`.
  Query the cell state using `SOURce:WCDMa:SIGN:CELL:STATe:ALL?`. The result `ON,ADJ` indicates that the DL signal is available.
- To initiate a connection setup in the CS domain use
  `CALL:WCDMa:SIGN:CSWitched:ACTion CONNect`.
  Depending on the settings, this may also initiate a connection setup in the PS domain.
  To initiate a connection setup in the PS domain after the CS connection has been established, use `CALL:WCDMa:SIGN:PSWitched:ACTion CONNect`.
  To query the connection states use `FETCh:WCDMa:SIGN:CSWitched:STATe?` and `FETCh:WCDMa:SIGN:PSWitched:STATe?`.
- To switch on dedicated downlink channels for reduced signaling use
  `CALL:WCDMa:SIGN:RSIGnaling:ACTion ON`
  To query the reduced signaling state use
  `FETCh:WCDMa:SIGN:RSIGnaling:STATe?`.

The following sections describe how to configure the signaling application. Some of the listed configuration commands are not relevant for reduced signaling, but can nevertheless be executed before the reduced signaling mode is enabled.

The subsequent sections describe how to switch on the cell signal and the UE, how to set up a CS or PS connection or how to switch on dedicated DL channels for reduced signaling. These sections distinguish between signaling and reduced signaling mode. Some examples for actions possible after connection setup are also given.

6.5.1.1 Specifying General Settings

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Enable a connection to the DAU.
// *****************************************************************************
CONFigure:WCDMa:SIGN:ETOE ON

// *****************************************************************************
// Define paths for a standard cell with or without external fading,
// including signal routing and external attenuation.
// ROUTe commands also activate the scenario. Send only one of the two commands.
// *****************************************************************************
ROUTe:WCDMa:SIGN:SCENario:SCELl RF2C,RX1,RF2C,TX1
ROUTe:WCDMa:SIGN:SCENario:SCFading RF2C,RX1,RF2C,TX1,IQ2O
CONFigure:WCDMa:SIGN:RFSettings:CARRier:EATTenuation:OUTPut 2
CONFigure:WCDMa:SIGN:RFSettings:EATTenuation:INPut 2

// *****************************************************************************
// Define paths for dual carrier with or without external fading.
// ROUTe commands also activate the scenario. Send only one of the two commands.
// No preparation for RX diversity handling by external fader.
// *****************************************************************************
ROUTe:WCDMa:SIGN:SCENario:DCARrier RF1C,RX1,RF1C,TX1,RF3C,TX2
ROUTe:WCDMa:SIGN:SCENario:DCFading RF1C,RX1,RF1C,TX1,RF3C,TX2,IQ2O,IQ4O
CONFigure:WCDMa:SIGN:RFSettings:CARRier1:EATTenuation:OUTPut 2
CONFigure:WCDMa:SIGN:RFSettings:CARRier2:EATTenuation:OUTPut 2
CONFigure:WCDMa:SIGN:RFSettings:EATTenuation:INPut 2
CONFigure:WCDMa:SIGN:SCENario:DCFading:EXTernal:RXDiversity OFF

// *****************************************************************************
```

```
// Specify operating band plus DL channel number for carrier 1 and query the
// automatically calculated UL channel number and the number for carrier 2.
// Alternatively configure the same channels via their center frequency.
// Alternatively use a single command to set band and channel.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CARRier:BAND OB7
CONFigure:WCDMa:SIGN:RFSettings:CARRier1:CHANnel:DL 2500
CONFigure:WCDMa:SIGN:RFSettings:CARRier2:CHANnel:DL?
CONFigure:WCDMa:SIGN:RFSettings:CHANnel:UL?

CONFigure:WCDMa:SIGN:RFSettings:CARRier1:FREQuency:DL 2675E+6
CONFigure:WCDMa:SIGN:RFSettings:CARRier2:FREQuency:DL?
CONFigure:WCDMa:SIGN:RFSettings:FREQuency:UL?

CONFigure:WCDMa:SIGN:RFSettings:CARRier1:DL OB7, 2500
CONFigure:WCDMa:SIGN:RFSettings:CARRier2:DL?
CONFigure:WCDMa:SIGN:RFSettings:UL?

// *****************************************************************************
// Carrier1: Define the power of the base station signal, enable AWGN, define
// the AWGN power and query the resulting total power.
// *****************************************************************************
CONFigure:WCDMa:SIGN:RFSettings:CARRier1:COPower -50
CONFigure:WCDMa:SIGN:RFSettings:CARRier1:AWGN ON, -80
CONFigure:WCDMa:SIGN:RFSettings:CARRier1:TOPower?

// *****************************************************************************
// Repeat settings for carrier2
// *****************************************************************************
CONFigure:WCDMa:SIGN:RFSettings:CARRier2:COPower -50
CONFigure:WCDMa:SIGN:RFSettings:CARRier2:AWGN ON, -80
CONFigure:WCDMa:SIGN:RFSettings:CARRier2:TOPower?

// *****************************************************************************
// Modify total base station signal power of both carriers and query the
// resulting total power for the sum of both carriers.
// *****************************************************************************
CONFigure:WCDMa:SIGN:RFSettings:COPower:TOTal -50
CONFigure:WCDMa:SIGN:RFSettings:TOPower:TOTal?

// *****************************************************************************
// Select manual expected nominal power mode and specify the expected power
// and the user margin.
// *****************************************************************************
CONFigure:WCDMa:SIGN:RFSettings:ENPMode MANual
CONFigure:WCDMa:SIGN:RFSettings:ENPower 7
CONFigure:WCDMa:SIGN:RFSettings:MARGin 1
```

6.5.1.2 Configuring Internal Fading

```
// *****************************************************************************
// Select a standard cell scenario with internal fading.
// *****************************************************************************
ROUTe:WCDMa:SIGN:SCENario:SCFading:INTernal RF2C,RX1,RF2C,TX1

// *****************************************************************************
// Configure the fading simulator:
// Enable it, select a fading profile, start fading automatically,
// set start seed and calculate insertion loss automatically.
// Query maximum Doppler shift.
// *****************************************************************************
CONFigure:WCDMa:SIGN:FADing:FSIMulator:ENABle ON
CONFigure:WCDMa:SIGN:FADing:FSIMulator:STANdard C5
CONFigure:WCDMa:SIGN:FADing:FSIMulator:RESTart:MODE AUTO
CONFigure:WCDMa:SIGN:FADing:FSIMulator:GLOBal:SEED 0
CONFigure:WCDMa:SIGN:FADing:FSIMulator:ILOSs:MODE NORMal
CONFigure:WCDMa:SIGN:FADing:FSIMulator:DSHift?

// *****************************************************************************
// Configure AWGN insertion for carrier 1:
// Enable AWGN and set noise level.
// Query signal to noise ratio and total power (signal + noise).
// *****************************************************************************
CONFigure:WCDMa:SIGN:FADing:CARRier:AWGN:ENABle ON
CONFigure:WCDMa:SIGN:FADing:CARRier:AWGN:NOISe -80
CONFigure:WCDMa:SIGN:FADing:CARRier:AWGN:SNRatio?
CONFigure:WCDMa:SIGN:FADing:CARRier:POWer:SUM?
```

6.5.1.3 Configuring Physical Channel DL Settings

```
// *****************************************************************************
// Set level and channelization code of S-CCPCH
// *****************************************************************************
CONFigure:WCDMa:SIGN:DL:LEVel:SCCPch -5
CONFigure:WCDMa:SIGN:DL:CODE:SCCPch 6

// *****************************************************************************
// Configure 2 HS-SCCH: level, channelization code, UE ID and dummy UE ID
// *****************************************************************************
CONFigure:WCDMa:SIGN:DL:CARRier1:LEVel:HSSCch1 -10
CONFigure:WCDMa:SIGN:DL:CARRier1:LEVel:HSSCch2 -9
CONFigure:WCDMa:SIGN:DL:CARRier1:CODE:HSSCch1 100
CONFigure:WCDMa:SIGN:DL:CARRier1:CODE:HSSCch2 101
CONFigure:WCDMa:SIGN:DL:CARRier1:HSSCch:UEID #HEEEE
CONFigure:WCDMa:SIGN:DL:CARRier1:HSSCch1:IDDummy #HEEE1
CONFigure:WCDMa:SIGN:DL:CARRier1:HSSCch2:IDDummy #HEEE2
```

```
// *****************************************************************************
// Configure HS-PDSCH: level and first channelization code number
// *****************************************************************************
CONFigure:WCDMa:SIGN:DL:CARRier1:LEVel:HSPDsch -8
CONFigure:WCDMa:SIGN:DL:CARRier1:CODE:HSPDsch 2

// *****************************************************************************
// Set level and channelization code of E-AGCH, E-HICH and E-RGCH.
// *****************************************************************************
CONFigure:WCDMa:SIGN:DL:LEVel:EAGCh -10
CONFigure:WCDMa:SIGN:DL:LEVel:ERGCh -13
CONFigure:WCDMa:SIGN:DL:CODE:EAGCh 252
CONFigure:WCDMa:SIGN:DL:CODE:EHICh 123

// *****************************************************************************
// Query and adjust accumulated power.
// Select OCNS type R6 and query OCNS power.
// Check for channelization code conflicts.
// *****************************************************************************
CONFigure:WCDMa:SIGN:DL:CARRier1:LEVel:APOWer?
CONFigure:WCDMa:SIGN:DL:LEVel:ADJust
CONFigure:WCDMa:SIGN:DL:CARRier1:OCNS:TYPE R6
CONFigure:WCDMa:SIGN:DL:CARRier1:OCNS:LEVel?
CONFigure:WCDMa:SIGN:DL:CARRier1:CODE:CONFlict?

// *****************************************************************************
// Adjust enhanced settings.
// *****************************************************************************
CONFigure:WCDMa:SIGN:DL:CARRier1:ENHanced:PCPich:SLEVel 30
CONFigure:WCDMa:SIGN:DL:ENHanced:SCPich:SSCode #HA
CONFigure:WCDMa:SIGN:DL:ENHanced:SCPich:PHASe -90
CONFigure:WCDMa:SIGN:DL:ENHanced:AICH:TTIMing 4
CONFigure:WCDMa:SIGN:DL:ENHanced:AICH:ACKNowledge NEG
CONFigure:WCDMa:SIGN:DL:ENHanced:DPCH:SSCode #HB
CONFigure:WCDMa:SIGN:DL:ENHanced:DPCH:POFFset 2
CONFigure:WCDMa:SIGN:DL:ENHanced:DPCH:TOFFset 10
CONFigure:WCDMa:SIGN:DL:CARRier1:ENHanced:HSSCch:SELection AUTomatic
CONFigure:WCDMa:SIGN:DL:CARRier1:ENHanced:HSSCch:NUMBer 2
CONFigure:WCDMa:SIGN:DL:CARRier1:ENHanced:HSSCch:USFRames DTX
CONFigure:WCDMa:SIGN:DL:CARRier1:ENHanced:HSPDsch:POFFset AUTO
CONFigure:WCDMa:SIGN:DL:CARRier1:ENHanced:HSPDsch:USFRames DTX

// *****************************************************************************
// Configure carrier 2.
// *****************************************************************************
CONFigure:WCDMa:SIGN:DL:CARRier2:LEVel:PCPich -5
CONFigure:WCDMa:SIGN:DL:CARRier2:LEVel:HSSCch1 -10
CONFigure:WCDMa:SIGN:DL:CARRier2:LEVel:HSSCch2 -9
CONFigure:WCDMa:SIGN:DL:CARRier2:LEVel:HSPDsch -8
CONFigure:WCDMa:SIGN:DL:CARRier2:CODE:HSSCch1 100
```

```
CONFigure:WCDMa:SIGN:DL:CARRier2:CODE:HSSCch2 101
CONFigure:WCDMa:SIGN:DL:CARRier2:CODE:HSPDsch 2
CONFigure:WCDMa:SIGN:DL:CARRier2:HSSCch:UEID #HEEEE
CONFigure:WCDMa:SIGN:DL:CARRier2:HSSCch1:IDDummy #HEEE1
CONFigure:WCDMa:SIGN:DL:CARRier2:HSSCch2:IDDummy #HEEE2

CONFigure:WCDMa:SIGN:DL:CARRier2:OCNS:TYPE R6
CONFigure:WCDMa:SIGN:DL:CARRier2:LEVel:APOWer?
CONFigure:WCDMa:SIGN:DL:LEVel:ADJust
CONFigure:WCDMa:SIGN:DL:CARRier2:OCNS:LEVel?
CONFigure:WCDMa:SIGN:DL:CARRier2:CODE:CONFlict?

CONFigure:WCDMa:SIGN:DL:CARRier2:ENHanced:PCPich:SLEVel 30
CONFigure:WCDMa:SIGN:DL:CARRier2:ENHanced:HSSCch:SELection AUTomatic
CONFigure:WCDMa:SIGN:DL:CARRier2:ENHanced:HSSCch:NUMBer 2
CONFigure:WCDMa:SIGN:DL:CARRier2:ENHanced:HSSCch:USFRames DTX
CONFigure:WCDMa:SIGN:DL:CARRier2:ENHanced:HSPDsch:POFFset AUTO
CONFigure:WCDMa:SIGN:DL:CARRier2:ENHanced:HSPDsch:USFRames DTX
```

6.5.1.4 Configuring Physical Channel UL Settings

```
// *****************************************************************************
// Configure maximum allowed UE power, DPCCH power offset
// and UL scrambling code. Query expected initial DPCCH power.
// *****************************************************************************
CONFigure:WCDMa:SIGN:UL:MUEPower 27
CONFigure:WCDMa:SIGN:UL:POFFset -77
CONFigure:WCDMa:SIGN:UL:UEPClass:REPorted OFF
CONFigure:WCDMa:SIGN:UL:UEPClass:MANual PC4
CONFigure:WCDMa:SIGN:UL:SCODe #H31F
SENSe:WCDMa:SIGN:UL:EIPower?

// *****************************************************************************
// Configure open loop power control: initial preamble power offset
// and estimated UL interference. Query expected initial preamble power.
// *****************************************************************************
CONFigure:WCDMa:SIGN:UL:OLPControl:CVALue -28
CONFigure:WCDMa:SIGN:UL:OLPControl:INTerference -90
SENSe:WCDMa:SIGN:UL:OLPControl:EIPPower?

// *****************************************************************************
// Configure PRACH settings: available preamble signatures and subchannels,
// maximum preamble retransmission per cycle, preambles to be received before
// AICH transmission, preamble step size, maximum number of cycles,
// message power offset, TTI length, DRX cycle length.
// *****************************************************************************
CONFigure:WCDMa:SIGN:UL:PRACh:PREamble:SIGNature #B1111000011110000
CONFigure:WCDMa:SIGN:UL:PRACh:PREamble:SUBChannels #B000000000011
CONFigure:WCDMa:SIGN:UL:PRACh:PREamble:MRETrans 7
```

```
CONFigure:WCDMa:SIGN:UL:PRACh:PREamble:AICH 6
CONFigure:WCDMa:SIGN:UL:PRACh:PREamble:SSIZe 2
CONFigure:WCDMa:SIGN:UL:PRACh:PREamble:MCYCles 3
CONFigure:WCDMa:SIGN:UL:PRACh:MESSage:POFFset -4
CONFigure:WCDMa:SIGN:UL:PRACh:MESSage:LENGth 0.01
CONFigure:WCDMa:SIGN:UL:PRACh:DRXCycle 9

// *****************************************************************************
// Configure gain factors βc and βd for RMC 1 and 2 (12.2 kbps and 64 kbps),
// for voice connections and for video connections.
// Configure gain factors and power offsets for HSDPA connections.
// Configure gain factor related parameters for HSUPA connections.
// *****************************************************************************
CONFigure:WCDMa:SIGN:UL:GFACtor:RMC1 7,15; RMC2 4,15
CONFigure:WCDMa:SIGN:UL:GFACtor:VOICe 10,15
CONFigure:WCDMa:SIGN:UL:GFACtor:VIDeo 8,15
CONFigure:WCDMa:SIGN:UL:GFACtor:HSDPa 8,15,5,5,2
CONFigure:WCDMa:SIGN:UL:GFACtor:HSUPa:EDPCch 6
CONFigure:WCDMa:SIGN:UL:GFACtor:HSUPa:ETFCi:NUMBer 2
CONFigure:WCDMa:SIGN:UL:GFACtor:HSUPa:ETFCi:REFerence 11,68,71,77,81,90,100,127
CONFigure:WCDMa:SIGN:UL:GFACtor:HSUPa:ETFCi:POFFset 4,15,21,26,27,28,29,29
```

6.5.1.5 Configuring Connection Types

```
// *****************************************************************************
// Select test mode as UE terminated call type and specify SRB data rate.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CONNection:UETerminate TEST
CONFigure:WCDMa:SIGN:CONNection:SRBData R1K7, R1K7

// *****************************************************************************
// Configure voice calls: select narrowband AMR voice codec, mode D.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CONNection:VOICe:CODec NB
CONFigure:WCDMa:SIGN:CONNection:VOICe:AMR:NARRow D

// *****************************************************************************
// Configure "SRB only" connections: select RRC target state CELL_FACH.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CONNection:SRBSingle:TYPE CFACh

// *****************************************************************************
// Configure general test mode settings: Select test mode type and keep test
// loop during reconfiguration.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CONNection:TMODe:TYPE RHSPa
CONFigure:WCDMa:SIGN:CONNection:TMODe:KTLReconfig ON

// *****************************************************************************
```

```
// Configure RMC connections: DL and UL data rate, loop test mode,
// acknowledged mode for loop mode 1, uplink CRC for loop mode 2,
// percentage of used DL resources, data pattern.
// ******************************************************************************
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:DRATe R64K, R12K2
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:TMODe MODE1
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:RLCMode ACKN
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:UCRC ON
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:DLRessources P0056
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:DATA PRBS11

// ******************************************************************************
// Configure the HSPA test mode:
// test mode procedure, PRBS9 as data pattern, 10% CRC errors.
// ******************************************************************************
CONFigure:WCDMa:SIGN:CONNection:TMODe:HSPA:PROCedure CSPS
CONFigure:WCDMa:SIGN:CONNection:TMODe:HSPA:DIRection HSPA
CONFigure:WCDMa:SIGN:CONNection:TMODe:HSPA:DATA PRBS9
CONFigure:WCDMa:SIGN:CONNection:TMODe:HSPA:EINSertion 10
CONFigure:WCDMa:SIGN:CONNection:TMODe:HSPA:USDU 11744

// ******************************************************************************
// Configure packet data settings:
// data rate, receiving window size, T1 release timer.
// ******************************************************************************
CONFigure:WCDMa:SIGN:CONNection:PACKet:DRATe HSDPa, HSUPa
CONFigure:WCDMa:SIGN:CONNection:PACKet:HSDPa:RWINdow MANual, 2560
CONFigure:WCDMa:SIGN:CONNection:PACKet:HSDPa:TIMer MANual, 0.1
```

6.5.1.6 Configuring Network Settings

```
// ******************************************************************************
// Specify index i for primary scrambling code and activate PS domain.
// ******************************************************************************
CONFigure:WCDMa:SIGN:CELL:CARRier1:SCODe #H1A
CONFigure:WCDMa:SIGN:CELL:CARRier2:SCODe #H1B
CONFigure:WCDMa:SIGN:CELL:PSDomain ON

// ******************************************************************************
// Specify network identities: MCC, MNC, network operation mode,
// LAC, RAC, URA, RNC ID, cell ID, Node B ID, no band indicator.
// ******************************************************************************
CONFigure:WCDMa:SIGN:CELL:MCC 262
CONFigure:WCDMa:SIGN:CELL:MNC 30, D2
CONFigure:WCDMa:SIGN:CELL:NTOPeration M1
CONFigure:WCDMa:SIGN:CELL:LAC 1435
CONFigure:WCDMa:SIGN:CELL:RAC #B1011
CONFigure:WCDMa:SIGN:CELL:URA #B11
CONFigure:WCDMa:SIGN:CELL:RNC #B101
```

```
CONFigure:WCDMa:SIGN:CELL:IDENtity #B1001010
CONFigure:WCDMa:SIGN:CELL:IDNode #B11110
CONFigure:WCDMa:SIGN:CELL:BINDicator OFF

// ****************************************************************************
// Configure security settings: enable authentication and security mode,
// define secret key, OPc and SIM card type.
// ****************************************************************************
CONFigure:WCDMa:SIGN:CELL:SECurity:AUTHenticat ON
CONFigure:WCDMa:SIGN:CELL:SECurity:ENABle ON
CONFigure:WCDMa:SIGN:CELL:SECurity:SKEY #H000102030405060708090A0B0C0D0E0F
CONFigure:WCDMa:SIGN:CELL:SECurity:OPC #H1F1A0
CONFigure:WCDMa:SIGN:CELL:SECurity:SIMCard MILenage

// ****************************************************************************
// Configure UE identity settings: use and set the default IMSI.
// ****************************************************************************
CONFigure:WCDMa:SIGN:CELL:UEIDentity:USE ON
CONFigure:WCDMa:SIGN:CELL:UEIDentity:IMSI '001010123456063'

// ****************************************************************************
// Enable CS registration and PS attach. Enable IMEI request.
// ****************************************************************************
CONFigure:WCDMa:SIGN:CELL:REQuest:ADETach ON
CONFigure:WCDMa:SIGN:CELL:REQuest:IMEI ON

// ****************************************************************************
// Configure cell reselection information.
// ****************************************************************************
CONFigure:WCDMa:SIGN:CELL:RESelection:SEARch -30, -30, -30
CONFigure:WCDMa:SIGN:CELL:RESelection:QUALity -15, -113

// ****************************************************************************
// Configure timers and counters.
// ****************************************************************************
CONFigure:WCDMa:SIGN:CELL:TOUT:T3212 10
CONFigure:WCDMa:SIGN:CELL:TOUT:T3312 30
CONFigure:WCDMa:SIGN:CELL:TOUT:OSYNch 8
CONFigure:WCDMa:SIGN:CELL:TOUT:PREPetitions 5
CONFigure:WCDMa:SIGN:CELL:TOUT:PPIF 36
CONFigure:WCDMa:SIGN:CELL:TOUT:ATOFfset 5
CONFigure:WCDMa:SIGN:CELL:TOUT:N313 N20
CONFigure:WCDMa:SIGN:CELL:TOUT:T313 10

// ****************************************************************************
// Configure reject causes.
// ****************************************************************************
CONFigure:WCDMa:SIGN:CELL:RCAuse:LOCation C12
CONFigure:WCDMa:SIGN:CELL:RCAuse:ATTach C32
```

```
// *****************************************************************************
// Specify 2 neighbor cell entries for LTE, GSM and WCDMA.
// *****************************************************************************
CONFigure:WCDMa:SIGN:NCELl:LTE:CELL1 ON, OB1, 10
CONFigure:WCDMa:SIGN:NCELl:LTE:CELL2 ON, OB2, 700
CONFigure:WCDMa:SIGN:NCELl:GSM:CELL1 ON, G09, 0
CONFigure:WCDMa:SIGN:NCELl:GSM:CELL2 ON, G09, 124
CONFigure:WCDMa:SIGN:NCELl:WCDMa:CELL1 ON, OB1, 10562, #H10A
CONFigure:WCDMa:SIGN:NCELl:WCDMa:CELL2 ON, OB2, 412, #H10B

// *****************************************************************************
// Specify neighbor cell reselection thresholds per technology.
// *****************************************************************************
CONFigure:WCDMa:SIGN:NCELl:LTE:THResholds:HIGH 5
CONFigure:WCDMa:SIGN:NCELl:GSM:THResholds:HIGH 5
```

6.5.1.7 Configuring HSDPA Settings

```
// *****************************************************************************
// Configure CQI feedback cycle, CQI repetition factor and
// ACK/NACK repetition factor.
// Configure UE category manually and use fixed reference channel.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:FBCYcle 0.004
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:RFACtor 2
CONFigure:WCDMa:SIGN:CELL:HSDPa:ANRFactor 1
CONFigure:WCDMa:SIGN:CELL:HSDPa:UECategory:MANual 13
CONFigure:WCDMa:SIGN:CELL:HSDPa:UECategory:REPorted OFF
CONFigure:WCDMa:SIGN:CELL:HSDPa:TYPE FIXed

// *****************************************************************************
// Select H-Set for fixed reference channel.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:HSDPa:FIXed:HSET H1M2

// *****************************************************************************
// Configure a CQI reporting test channel:
// Enable usage of second carrier, select a table index selection method
// and configure all methods. Query the minimum inter TTI distance.
// Define the number of HARQ processes. Define the RV coding sequences.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:CARRier2:HSDPa:CQI:ENABle ON
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:TINDex SEQuence
CONFigure:WCDMa:SIGN:CELL:CARRier1:HSDPa:CQI:FIXed 17
CONFigure:WCDMa:SIGN:CELL:CARRier2:HSDPa:CQI:FIXed 17
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:SEQuence 1, 15
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:FOLLow 1, 15
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:CONFormance 17
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:TTI?
```

```
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:HARQ 5
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:RVCSequences:QPSK UDEFined
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:RVCSequences:QAM16 UDEFined
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:RVCSequences:QAM64 UDEFined
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:RVCSequences:QPSK:UDEFined 3,1,2,3
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:RVCSequences:QAM16:UDEFined 4,3,6,5,4
CONFigure:WCDMa:SIGN:CELL:HSDPa:CQI:RVCSequences:QAM64:UDEFined 2,2,4

// *****************************************************************************
// Configure a user defined HSDPA channel:
// Enable usage of second carrier, configure the minimum inter TTI distance,
// number of HARQ processes, transport block size index,
// number of channelization codes, modulation scheme and RV coding sequences.
// Query the size of the IR buffer.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:CARRier2:HSDPa:UDEFined:ENABle ON
CONFigure:WCDMa:SIGN:CELL:CARRier1:HSDPa:UDEFined:TTI 3
CONFigure:WCDMa:SIGN:CELL:CARRier2:HSDPa:UDEFined:TTI 3
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:HARQ 5
CONFigure:WCDMa:SIGN:CELL:CARRier1:HSDPa:UDEFined:TBLock 42
CONFigure:WCDMa:SIGN:CELL:CARRier2:HSDPa:UDEFined:TBLock 42
CONFigure:WCDMa:SIGN:CELL:CARRier1:HSDPa:UDEFined:NCODes 3
CONFigure:WCDMa:SIGN:CELL:CARRier2:HSDPa:UDEFined:NCODes 3
CONFigure:WCDMa:SIGN:CELL:CARRier1:HSDPa:UDEFined:MODulation QPSK
CONFigure:WCDMa:SIGN:CELL:CARRier2:HSDPa:UDEFined:MODulation QPSK
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:RVCSequences:QPSK UDEFined
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:RVCSequences:QAM16 UDEFined
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:RVCSequences:QAM64 UDEFined
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:RVCSequences:QPSK:UDEFined 3,1,2,3
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:RVCSequences:QAM16:UDEFined 4,3,6,5,4
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:RVCSequences:QAM64:UDEFined 2,2,4
CONFigure:WCDMa:SIGN:CELL:HSDPa:UDEFined:IRBuffer?
```

6.5.1.8 Configuring HSUPA Settings

```
// *****************************************************************************
// Configure 10 ms TTI, RLC PDU size, UE category and E-TFCI table index.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:HSUPa:TTI M10
CONFigure:WCDMa:SIGN:CELL:HSUPa:PDU 344
CONFigure:WCDMa:SIGN:CELL:HSUPa:UECategory:MANual 6
CONFigure:WCDMa:SIGN:CELL:HSUPa:UECategory:REPorted OFF
CONFigure:WCDMa:SIGN:CELL:HSUPa:ETFCi:TINDex 1

// *****************************************************************************
// Configure HARQ RV configuration, minimum set E-TFCI, happy bit delay
// condition, puncturing limit non-max, maximum channelisation code and
// initial serving grant.
// *****************************************************************************
```

```
CONFigure:WCDMa:SIGN:CELL:HSUPa:HRVersion RV0
CONFigure:WCDMa:SIGN:CELL:HSUPa:ETFCi:MSET 10
CONFigure:WCDMa:SIGN:CELL:HSUPa:HBDC 50
CONFigure:WCDMa:SIGN:CELL:HSUPa:PLPLnonmax 0.88
CONFigure:WCDMa:SIGN:CELL:HSUPa:MCCode S4
CONFigure:WCDMa:SIGN:CELL:HSUPa:ISGRant 14, SECondary

// *****************************************************************************
// Configure the HARQ profile: power offset and max retransmissions.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:HSUPa:HARQ:POFFset 1
CONFigure:WCDMa:SIGN:CELL:HSUPa:HARQ:RETX 8

// *****************************************************************************
// Configure E-AGCH settings:
// E-RNTIs of UE, absolute grant pattern (length, indices, scopes and types),
// pattern repetition and unscheduled TTIs.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:HSUPa:EAGCh:UEID #HAAAB, #H12AB
CONFigure:WCDMa:SIGN:CELL:HSUPa:EAGCh:PATTern:LENGth 4
CONFigure:WCDMa:SIGN:CELL:HSUPa:EAGCh:PATTern:INDex 10,12,14,16
CONFigure:WCDMa:SIGN:CELL:HSUPa:EAGCh:PATTern:SCOPe ON,ON,ON,ON
CONFigure:WCDMa:SIGN:CELL:HSUPa:EAGCh:PATTern:TYPE ON,OFF,ON,OFF
CONFigure:WCDMa:SIGN:CELL:HSUPa:EAGCh:PATTern:REPetition CONT
CONFigure:WCDMa:SIGN:CELL:HSUPa:EAGCh:UTTI DUMMy

// *****************************************************************************
// Configure E-RGCH / E-HICH settings:
// fill-up frames with dummies
// E-HICH: react on UL CRC, signature 2
// E-RGCH: signature 3, continuous user defined 4-bit pattern 0011
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:HSUPa:EHRCh:FUFDummies ON
CONFigure:WCDMa:SIGN:CELL:HSUPa:EHICh:MODE CRC
CONFigure:WCDMa:SIGN:CELL:HSUPa:EHICh:SIGNature 2
CONFigure:WCDMa:SIGN:CELL:HSUPa:ERGCh:SIGNature 3
CONFigure:WCDMa:SIGN:CELL:HSUPa:ERGCh:MODE CONT
CONFigure:WCDMa:SIGN:CELL:HSUPa:ERGCh:PATTern:LENGth 4
CONFigure:WCDMa:SIGN:CELL:HSUPa:ERGCh:PATTern '0011----'
```

6.5.1.9 Configuring CPC Settings

```
// *****************************************************************************
// Set DTX-DRX timing information.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:CPC:DTRX:DELay 32
CONFigure:WCDMa:SIGN:CELL:CPC:DTRX:OFFSet 1
CONFigure:WCDMa:SIGN:CELL:CPC:HLOPeration:SFORmat 4
```

```
// *****************************************************************************
// Set UL DTX, configure cycle 1 and 2.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:CPC:UDTX:ENABle ON
CONFigure:WCDMa:SIGN:CELL:CPC:UDTX:LPLength 15
CONFigure:WCDMa:SIGN:CELL:CPC:UDTX:CQITimer 32
CONFigure:WCDMa:SIGN:CELL:CPC:UDTX:CYCLe1:APATtern:TTI10 10
CONFigure:WCDMa:SIGN:CELL:CPC:UDTX:CYCLe1:BURSt 2
CONFigure:WCDMa:SIGN:CELL:CPC:UDTX:CYCLe2:ITHReshold 16
CONFigure:WCDMa:SIGN:CELL:CPC:UDTX:CYCLe2:DSG 32

// *****************************************************************************
// Set DL DRX, configure UE grant monitoring.
// *****************************************************************************

CONFigure:WCDMa:SIGN:CELL:CPC:DDRX:ENABle ON
CONFigure:WCDMa:SIGN:CELL:CPC:DDRX:CYCLe:APATtern 10
CONFigure:WCDMa:SIGN:CELL:CPC:DDRX:CYCLe:ITHReshold 16
CONFigure:WCDMa:SIGN:CELL:CPC:DDRX:GMONitoring:ENABle ON
CONFigure:WCDMa:SIGN:CELL:CPC:DDRX:GMONitoring:ITHReshold 128

// *****************************************************************************
// Set E-DCH TX start time restriction.
// *****************************************************************************

CONFigure:WCDMa:SIGN:CELL:CPC:MAC:CYCLe:TTI10 10
CONFigure:WCDMa:SIGN:CELL:CPC:MAC:CYCLe:ITHReshold 128
```

6.5.1.10 Configuring UE Measurement Report Settings

```
// *****************************************************************************
// Enable UE measurement report, set interval between two report messages
// and enable the evaluation of all information elements.
// *****************************************************************************
CONFigure:WCDMa:SIGN:UEReport:ENABle ON
CONFigure:WCDMa:SIGN:UEReport:RINTerval 5
CONFigure:WCDMa:SIGN:UEReport:CCELl:ENABle ON,ON,ON,ON,ON,ON
CONFigure:WCDMa:SIGN:UEReport:NCELl:ENABle ON,ON,ON,ON,ON
```

6.5.1.11 Configuring Message Monitoring

```
// *****************************************************************************
// Enable message monitoring for WCDMA, select address number 2 from the global
// logging PC address pool and query the corresponding IP address string.
// *****************************************************************************
CONFigure:WCDMa:SIGN:MMONitor:ENABle ON
CONFigure:WCDMa:SIGN:MMONitor:IPADdress IP2
CONFigure:WCDMa:SIGN:MMONitor:IPADdress?
```

6.5.1.12 Switching on the Cell Signal and the UE (Signaling)

```
// *****************************************************************************
// Connect the UE (switched off). Switch on the DL signal. Query the cell
// state until it equals ON,ADJ (DL signal available at RF connector).
// *****************************************************************************
WAITKEY >Ensure that the UE is connected to the instrument and switched off<
SOURce:WCDMa:SIGN:CELL:STATe ON
WHILE SOURce:WCDMa:SIGN:CELL:STATe:ALL? <> "ON,ADJ"

// *****************************************************************************
// Ensure that the reduced signaling mode is disabled.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:RSIGnaling OFF

// *****************************************************************************
// Switch on the UE and wait until it is registered and attached.
// *****************************************************************************
WAITKEY >Switch on the UE<
WHILE FETCh:WCDMa:SIGN:CSWitched:STATe? <> "REG"
WHILE FETCh:WCDMa:SIGN:PSWitched:STATe? <> "ATT"
```

6.5.1.13 Switching on the Cell Signal (Reduced Signaling)

```
// *****************************************************************************
// Connect the UE (switched off). Switch on the DL signal. Query the cell
// state until it equals ON,ADJ (DL signal available at RF connector).
// *****************************************************************************
WAITKEY >Ensure that the UE is connected to the instrument and switched off<
SOURce:WCDMa:SIGN:CELL:STATe ON
WHILE SOURce:WCDMa:SIGN:CELL:STATe:ALL? <> "ON,ADJ"

// *****************************************************************************
// Ensure that the reduced signaling mode is enabled.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:RSIGnaling ON
```

6.5.1.14 Configuring the I/Q Settings

```
// *****************************************************************************
// Query the properties of the outgoing baseband signal, required to configure
// the baseband input of the external fader. Configure the baseband input
// according to the baseband output of the external fader.
// *****************************************************************************
SENSe:WCDMa:SIGN:IQOut:CARRier1?
SENSe:WCDMa:SIGN:IQOut:CARRier2?
CONFigure:WCDMa:SIGN:IQIN:CARRier1 -30, -20
CONFigure:WCDMa:SIGN:IQIN:CARRier2 -30, -20
```

6.5.1.15 Sending / Receiving a Short Message (Signaling)

```
// *****************************************************************************
// Configure test loop behavior and delay time. Specify the message text to
// be sent to the UE and send the message.
// *****************************************************************************
CONFigure:WCDMa:SIGN:SMS:KTLoop OFF
CONFigure:WCDMa:SIGN:SMS:OUTGoing:RMCDelay 3
CONFigure:WCDMa:SIGN:SMS:OUTGoing:INTernal "Testing SMS 012!.#\*%+-/()<>?=;@$,"
CALL:WCDMa:SIGN:CSWitched:ACTion SSMS

// *****************************************************************************
// Reset parameters related to an already received SMS message.
// Wait until message has been received from the UE.
// Evaluate the text and length of the received message.
// *****************************************************************************
CLEan:WCDMa:SIGN:SMS:INComing:INFO:MTEXt
WAITKEY >Send short message from UE<
WHILE SENSe:WCDMa:SIGN:SMS:INFO:LRMessage:RFLag? <> "OFF"
SENSe:WCDMa:SIGN:INComing:INFO:MTEXt?
SENSe:WCDMa:SIGN:SMS:INComing:INFO:MLENgth?
```

6.5.1.16 Sending Date and Time Information to the UE

```
// *****************************************************************************
// Select a time source and configure date, time and DST +1h.
// Enable sending of the information during registration.
// Send the information to the UE now.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CELL:TIME:TSOurce DATE
CONFigure:WCDMa:SIGN:CELL:TIME:DATE 24,10,2012
CONFigure:WCDMa:SIGN:CELL:TIME:TIME 12,40,30
CONFigure:WCDMa:SIGN:CELL:TIME:DSTime P1H
CONFigure:WCDMa:SIGN:CELL:TIME:SREGister ON
CONFigure:WCDMa:SIGN:CELL:TIME:SNOW
```

6.5.1.17 Setting up a CS Connection (Signaling)

```
// *****************************************************************************
// Set up a mobile terminated connection.
// Query the connection state until it equals CEST (connection established).
// Query the IPv4 address assigned to the UE.
// *****************************************************************************
CALL:WCDMa:SIGN:CSWitched:ACTion CONNect
WHILE FETCh:WCDMa:SIGN:CSWitched:STATe? <> "CEST"
SENSe:WCDMa:SIGN:UESinfo:UEADdress:IPV4?
```

6.5.1.18 Setting up an HSPA Connection (Signaling)

```
// *****************************************************************************
// Ensure that test mode RMC plus HSPA is configured as connection type.
// Configure combined CS/PS connection setup.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CONNection:UETerminate TEST
CONFigure:WCDMa:SIGN:CONNection:TMODe:TYPE RHSPa
CONFigure:WCDMa:SIGN:CONNection:TMODe:HSPA:PROCedure CSPS

// *****************************************************************************
// Set up an RMC connection in the CS domain and an HSPA test mode connection
// in the PS domain.
// Query the connection state until the connections have been established.
// Check which kind of HSPA test mode has been activated.
// *****************************************************************************
CALL:WCDMa:SIGN:CSWitched:ACTion CONNect
WAITKEY >Accept call at UE<
WHILE FETCh:WCDMa:SIGN:CSWitched:STATe? <> "CEST"
WHILE FETCh:WCDMa:SIGN:PSWitched:STATe? <> "CEST"
SENSe:WCDMa:SIGN:CELL:CONFig?
```

6.5.1.19 Establishing a Reduced Signaling Connection

```
// *****************************************************************************
// Switch on the dedicated downlink channels.
// Query the connection state until the process is complete.
// *****************************************************************************
CALL:WCDMa:SIGN:RSIGnaling:ACTion ON
WHILE FETCh:WCDMa:SIGN:RSIGnaling:STATe? <> "ON"

// *****************************************************************************
// Please switch on the UE and configure it so that it synchronizes to the DL
// signal and provides a WCDMA uplink signal.
// Note the demodulation information displayed in the connection status pane.
// It indicates whether the power of the uplink signal is in range and the
// instrument can synchronize to the uplink signal.
// *****************************************************************************
```

6.5.1.20 Configuring and Executing a TPC Setup

To execute a TPC pattern, a connection has to be established before, see previous sections.

```
// *****************************************************************************
// Set TPC parameters: active TPC setup (phase discontinuity up),
// algorithm and step size, precondition and number of repetitions.
// Reach the precondition, execute the pattern and query the state.
// *****************************************************************************
```

```
CONFigure:WCDMa:SIGN:UL:TPC:SET PHUP
CONFigure:WCDMa:SIGN:UL:TPC:MODE A1S2
CONFigure:WCDMa:SIGN:UL:TPCSet:PREcondition:PHUP MINP
CONFigure:WCDMa:SIGN:UL:TPCSet:PCONfig:PHUP 4
CONFigure:WCDMa:SIGN:UL:TPC:PREcondition
CONFigure:WCDMa:SIGN:UL:TPC:PEXecute
CONFigure:WCDMa:SIGN:UL:TPC:STATe?

// *****************************************************************************
// Configure other TPC setups: closed loop target power type and value,
// user defined pattern for single and continuous execution,
// precondition and number of repetitions for phase discontinuity down,
// preconditions for continuous and single user defined pattern execution,
// number of 0 bits for test step EF and GH, segmentation for test steps.
// *****************************************************************************
CONFigure:WCDMa:SIGN:UL:TPC:TPOWer:REFerence DPCH
CONFigure:WCDMa:SIGN:UL:TPC:TPOWer -30
CONFigure:WCDMa:SIGN:UL:TPC:PATTern '000111'
CONFigure:WCDMa:SIGN:UL:TPCSet:PCONfig:PHDown 4
CONFigure:WCDMa:SIGN:UL:TPCSet:PREcondition:PHDown MINP
CONFigure:WCDMa:SIGN:UL:TPCSet:PREcondition:CONTinuous MINP
CONFigure:WCDMa:SIGN:UL:TPCSet:PREcondition:SINGle MINP
CONFigure:WCDMa:SIGN:UL:TPCSet:PCONfig:TSEF 110
CONFigure:WCDMa:SIGN:UL:TPCSet:PCONfig:TSGH 70
CONFigure:WCDMa:SIGN:UL:TPCSet:PCONfig:TSSegment ON
```

6.5.1.21 Retrieving Information Provided by the UE (Signaling)

```
// *****************************************************************************
// Wait until all requested measurement reports have been received.
// Query UE measurement reports for the current cell.
// *****************************************************************************
WHILE FETCh:WCDMa:SIGN:UEReport:STATe <> "RDY"
SENSe:WCDMa:SIGN:UEReport:CCELl?
SENSe:WCDMa:SIGN:UEReport:NCELl?

// *****************************************************************************
// Query all UE information results.
// *****************************************************************************
SENSe:WCDMa:SIGN:UESinfo:CONNection:CIRCuit?
SENSe:WCDMa:SIGN:UESinfo:EMERgency?
SENSe:WCDMa:SIGN:UESinfo:CONNection:PACKet?
SENSe:WCDMa:SIGN:UESinfo:DINFo?
SENSe:WCDMa:SIGN:UESinfo:RITYpe?
SENSe:WCDMa:SIGN:UESinfo:RIDentity?
SENSe:WCDMa:SIGN:UESinfo:IMEI?
SENSe:WCDMa:SIGN:UESinfo:CNUMber?
SENSe:WCDMa:SIGN:UESinfo:DNUMber?
SENSe:WCDMa:SIGN:UESinfo:TTY?
```

```
SENSe:WCDMa:SIGN:UESinfo:DULalignment?

// *****************************************************************************
// Query all UE capability results.
// *****************************************************************************
SENSe:WCDMa:SIGN:UECapability:PDCP?
SENSe:WCDMa:SIGN:UECapability:RLC?
SENSe:WCDMa:SIGN:UECapability:PDOWnlink?
SENSe:WCDMa:SIGN:UECapability:PUPLink?
SENSe:WCDMa:SIGN:UECapability:RFParameter?
SENSe:WCDMa:SIGN:UECapability:MMODe?
SENSe:WCDMa:SIGN:UECapability:MRAT?
SENSe:WCDMa:SIGN:UECapability:UEPosition?
SENSe:WCDMa:SIGN:UECapability:GENeral?
SENSe:WCDMa:SIGN:UECapability:HSDPa?
SENSe:WCDMa:SIGN:UECapability:HSUPa?
```

6.5.1.22 Performing an Inter-RAT Handover

```
// *****************************************************************************
// An inter RAT handover is a handover to another signaling application.
//
// Query a list of possible handover destinations (signaling applications).
// Select a handover destination from the list.
// Wait until the destination is ready to receive a handover.
// Initiate the handover.
//
// Destination parameters like operating band or channel can be changed using
// commands provided by the destination signaling application. Adjust these
// parameters before executing the following commands.
// *****************************************************************************
PREPare:WCDMa:SIGN:HANDover:CATalog:DESTination?
PREPare:WCDMa:SIGN:HANDover:DESTination 'GSM Sig1'
WHILE SOURce:GSM:SIGN:CELL:STATe:ALL? <> "RFH", "ADJ"
CALL:WCDMa:SIGN:CSWitched:ACTion HANDover
```

6.5.2 BER Tests

The BER measurement provided by the WCDMA signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:WCDMa:SIGN:BER:...`
- After a `*RST`, the measurement is switched off. Use `READ:WCDMa:SIGN:BER?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:WCDMa:SIGN:BER` and retrieve the results using `FETCh:WCDMa:SIGN:BER?`.

The examples in this section focus on commands directly related to the BER measurement. For general configuration of the signaling application refer to chapter 6.5.1, "Signaling Application", on page 604.

6.5.2.1 Configuring the BER Measurement

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Configure RMC with symmetric data rate, loop mode 2, disabled CRC and
// 100% of transport blocks filled.
// *****************************************************************************
CONFigure:WCDMa:SIGN:CONNection:UETerminate TEST
CONFigure:WCDMa:SIGN:CONNection:TMODe:TYPE RMC
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:DRATe R12K2, R12K2
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:TMODe MODE2
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:UCRC OFF
CONFigure:WCDMa:SIGN:CONNection:TMODe:RMC:DLRessources P1000

// *****************************************************************************
// Configure BER measurement settings: stop on limit failure, number of
// transport blocks to be measured, transport block reordering and limits
// *****************************************************************************
CONFigure:WCDMa:SIGN:BER:SCONdition SLFail
CONFigure:WCDMa:SIGN:BER:TBLocks 200
CONFigure:WCDMa:SIGN:BER:PNResync ON
CONFigure:WCDMa:SIGN:BER:LIMit 0.2,2,2,5,OFF,OFF,2
```

6.5.2.2 Setting up the RMC Connection

To set up the connection see chapter 6.5.1.17, "Setting up a CS Connection (Signaling)", on page 618

6.5.2.3 Performing a BER Measurement

```
// *****************************************************************************
// Start single-shot measurement.
// Return BER measurement results.
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:WCDMa:SIGN:BER
FETCh:WCDMa:SIGN:BER?
CALCulate:WCDMa:SIGN:BER?
FETCh:WCDMa:SIGN:BER:STATe?
```

```
// *****************************************************************************
// Start continuous measurement; wait for 5 ms and return BER results.
// Query measurement state and substates (should be "RUN,ADJ,ACT").
// *****************************************************************************
CONFigure:WCDMa:SIGN:BER:REPetition CONTinuous
INIT:WCDMa:SIGN:BER
Pause 5000
FETCh:WCDMa:SIGN:BER?
CALCulate:WCDMa:SIGN:BER?
FETCh:WCDMa:SIGN:BER:STATe:ALL?
```

6.5.3 HSDPA ACK Tests

The "HSDPA ACK" measurement provided by the WCDMA signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:WCDMa:SIGN:HACK:...`
- After a `*RST`, the measurement is switched off. Use `READ:WCDMa:SIGN:HACK:...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:WCDMa:SIGN:HACK` and retrieve the results using `FETCh:WCDMa:SIGN:HACK:...?`.

The examples in this section focus on commands directly related to the HSDPA ACK measurement. For general configuration of the signaling application refer to chapter 6.5.1, "Signaling Application", on page 604.

6.5.3.1 Configuring the HSDPA ACK Measurement

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Configure repetition mode and number of HSDPA subframes to be measured.
// *****************************************************************************
CONFigure:WCDMa:SIGN:HACK:REPetition SINGleshot
CONFigure:WCDMa:SIGN:HACK:MSFRames 3000
CONFigure:WCDMa:SIGN:HACK:HARQ ALL
```

6.5.3.2 Setting up an HSDPA Connection

To set up the connection see chapter 6.5.1.18, "Setting up an HSPA Connection (Signaling)", on page 619

6.5.3.3 Performing an HSDPA ACK Measurement

```
// ******************************************************************************
// Start the measurement and return the median CQI trace results for both
// carriers. Query the measurement state (should be "RDY").
// ******************************************************************************
INIT:WCDMA:SIGN:HACK
FETCh:WCDMa:SIGN:HACK:TRACe:MCQI:CARRier1:CURRent?
FETCh:WCDMa:SIGN:HACK:TRACe:MCQI:CARRier2:CURRent?
FETCh:WCDMa:SIGN:HACK:STATe?

// ******************************************************************************
// Read the other results obtained in the last measurement
// without re-starting the measurement.
// ******************************************************************************
FETCh:WCDMa:SIGN:HACK:TRACe:THRoughput:CARRier1:CURRent?
FETCh:WCDMa:SIGN:HACK:TRACe:THRoughput:CARRier2:CURRent?
FETCh:WCDMa:SIGN:HACK:TRACe:THRoughput:TOTal:CURRent?
FETCh:WCDMa:SIGN:HACK:THRoughput:CARRier1:ABSolute?
FETCh:WCDMa:SIGN:HACK:THRoughput:CARRier2:ABSolute?
FETCh:WCDMa:SIGN:HACK:THRoughput:CARRier1:RELative?
FETCh:WCDMa:SIGN:HACK:THRoughput:CARRier2:RELative?
FETCh:WCDMa:SIGN:HACK:TRANsmission:CARRier1?
FETCh:WCDMa:SIGN:HACK:TRANsmission:CARRier2?
FETCh:WCDMa:SIGN:HACK:BLER:CARRier1?
FETCh:WCDMa:SIGN:HACK:BLER:CARRier2?
FETCh:WCDMa:SIGN:HACK:MSFRames?
FETCh:WCDMa:SIGN:HACK:MCQI:CARRier1?
FETCh:WCDMa:SIGN:HACK:MCQI:CARRier2?
```

6.5.4 RLC Throughput Tests

The "RLC Throughput" measurement provided by the WCDMA signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:WCDMa:SIGN:THRoughput:...`
- After a `*RST`, the measurement is switched off. Use `READ:WCDMa:SIGN:THRoughput:...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:WCDMa:SIGN:THRoughput` and retrieve the results using `FETCh:WCDMa:SIGN:THRoughput:...?`.

The examples in this section focus on commands directly related to the RLC Throughput measurement. For general configuration of the signaling application refer to chapter 6.5.1, "Signaling Application", on page 604.

6.5.4.1 Configuring the RLC Throughput Measurement

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Configure repetition mode, result interval and result window size.
// *****************************************************************************
CONFigure:WCDMa:SIGN:THRoughput:REPetition SINGleshot
CONFigure:WCDMa:SIGN:THRoughput:UPDate 0.32
CONFigure:WCDMa:SIGN:THRoughput:WINDow 220

// *****************************************************************************
// Enable a connection to the DAU and configure the packet data rate.
// *****************************************************************************
CONFigure:WCDMa:SIGN:ETOE ON
CONFigure:WCDMa:SIGN:CONNection:PACKet:DRATe HSDPa, HSUPa
```

6.5.4.2 Setting up a Data Connection

Proceed as follows:

1. Configure the other settings of the signaling application as desired and configure the Data Application Unit (see DAU documentation).
2. Switch on the cell signal and attach the UE, see for example chapter 6.5.1.12, "Switching on the Cell Signal and the UE (Signaling)", on page 617.
3. Initiate a mobile originated call at the UE.
4. Generate IP traffic, e.g. using the IPerf measurement provided by the DAU.

6.5.4.3 Performing an RLC Throughput Measurement

```
// *****************************************************************************
// Start the measurement and return the contents of the result table.
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:WCDMA:SIGN:THRoughput
FETCh:WCDMa:SIGN:THRoughput?
FETCh:WCDMa:SIGN:THRoughput:STATe?

// *****************************************************************************
// Query the result traces obtained in the last measurement.
// *****************************************************************************
FETCh:WCDMa:SIGN:THRoughput:TRACe:DL:PDU:CURRent?
```

```
FETCh:WCDMa:SIGN:THRoughput:TRACe:DL:PDU:AVERage?
FETCh:WCDMa:SIGN:THRoughput:TRACe:DL:SDU:CURRent?
FETCh:WCDMa:SIGN:THRoughput:TRACe:DL:SDU:AVERage?

FETCh:WCDMa:SIGN:THRoughput:TRACe:UL:PDU:CURRent?
FETCh:WCDMa:SIGN:THRoughput:TRACe:UL:PDU:AVERage?
FETCh:WCDMa:SIGN:THRoughput:TRACe:UL:SDU:CURRent?
FETCh:WCDMa:SIGN:THRoughput:TRACe:UL:SDU:AVERage?
```

6.5.5 E-HICH Tests

The E-HICH measurement provided by the WCDMA signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:WCDMa:SIGN:EHICh:...`
- After a `*RST`, the measurement is switched off. Use `READ:WCDMa:SIGN:EHICh:...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:WCDMa:SIGN:EHICh` and retrieve the results using `FETCh:WCDMa:SIGN:EHICh:...?`.

The examples in this section focus on commands directly related to the E-HICH measurement. For general configuration of the signaling application refer to chapter 6.5.1, "Signaling Application", on page 604.

6.5.5.1 Configuring the E-HICH Measurement

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Configure repetition mode, measured subframes and limit.
// Select HARQ feedback pattern.
// *****************************************************************************
CONFigure:WCDMa:SIGN:EHICh:REPetition SINGleshot
CONFigure:WCDMa:SIGN:EHICh:MFRames 2000
CONFigure:WCDMa:SIGN:EHICh:LIMit 1.1
CONFigure:WCDMa:SIGN:CELL:HSUPa:EHICh:MODE ACK
```

6.5.5.2 Setting up an HSPA Connection

To set up the connection see chapter 6.5.1.18, "Setting up an HSPA Connection (Signaling)", on page 619

6.5.5.3 Performing an E-HICH Measurement

```
// *****************************************************************************
// Start the measurement and query the measurement results.
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:WCDMA:SIGN:EHICh
FETCh:WCDMa:SIGN:EHICh?
FETCh:WCDMa:SIGN:EHICh:STATe?
```

6.5.6 UL Logging Tests

The UL logging measurement provided by the WCDMA signaling application is programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:WCDMa:SIGN:ULLogging:...`
- After a `*RST`, the measurement is switched off. Use `READ:WCDMa:SIGN:ULLogging:...?` to initiate a single-shot measurement and retrieve the results. You can also start the measurement using `INIT:WCDMa:SIGN:ULLogging` and retrieve the results using `FETCh:WCDMa:SIGN:ULLogging:...?`.

The examples in this section focus on commands directly related to the ULLogging measurement. For general configuration of the signaling application refer to chapter 6.5.1, "Signaling Application", on page 604.

6.5.6.1 Configuring the UL Logging Measurement

```
// *****************************************************************************
// System-Reset
// *****************************************************************************
*RST; *OPC?
*CLS; *OPC?

// *****************************************************************************
// Configure repetition mode, measured subframes and first system frame number.
// *****************************************************************************
CONFigure:WCDMa:SIGN:ULLogging:REPetition SINGleshot
CONFigure:WCDMa:SIGN:ULLogging:MSFRames 2000
CONFigure:WCDMa:SIGN:ULLogging:SSFN 5
```

6.5.6.2 Setting up an HSPA Connection

To set up the connection see chapter 6.5.1.18, "Setting up an HSPA Connection (Signaling)", on page 619

6.5.6.3 Performing a UL Logging Measurement

```
// *****************************************************************************
// Start the measurement and query the measurement results.
// Query the measurement state (should be "RDY").
// *****************************************************************************
INIT:WCDMA:SIGN:ULLogging
FETCh:WCDMa:SIGN:ULLogging?
FETCh:WCDMa:SIGN:ULLogging:STATe?
```

6.6 Command Reference

The following sections provide detailed reference information on the remote control commands of the WCDMA signaling application.

6.6.1 Conventions and General Information

The following sections describe the most important conventions and general informations concerning the command reference.

6.6.1.1 SIGN<i>

SIGN<i> is used as abbreviation of "SIGNaling<instance>". For better readability only the abbreviated form (which is also accepted by the instrument) is given in the command reference.

The <instance> is relevant for instruments supporting several instances of the same firmware application. It can be omitted if the instrument supports only one instance, or to address the first instance.

See also: "Firmware Applications" in the R&S CMW user manual, chapter "Remote Control"

6.6.1.2 FETCh and READ Commands

All commands are used to retrieve measurement results:

- `FETCh...` returns the results of the current measurement cycle (single-shot measurement) after they are valid. `FETCh...` must be used after the measurement has been started (`INITiate...`, measurement states RUN or RDY).
- `READ...` starts a new single-shot measurement and returns the results.

See also: "Retrieving Measurement Results" in the R&S CMW user manual, chapter "Remote Control"

6.6.1.3 Reliability Indicator

The first value in the output arrays of `FETCh...?, READ...?` and `CALCulate...?` queries indicates the most severe error that has occurred during the measurement.

Example for an output array: 0, 10.22, 10.15, 10.01, 10.29, 100 (reliability = 0, followed by 5 numeric measurement values).

The reliability indicator has one of the following values:

- **0 (OK)**:
  Measurement values available, no error detected.
- **1 (Measurement Timeout)**:
  The measurement has been stopped after the (configurable) measurement timeout. Measurement results may be available, however, at least a part of the measurement provides only INValid results or has not completed the full statistic count.
- **2 (Capture Buffer Overflow)**:
  The measurement configuration results in a capture length exceeding the available memory.
- **3 (Overdriven) / 4 (Underdriven)**:
  The accuracy of measurement results may be impaired because the input signal level was too high / too low.
- **6 (Trigger Timeout)**:
  The measurement could not be started or continued because no trigger event was detected.
- **7 (Acquisition Error)**:

The R&S CMW could not properly decode the RF input signal.

- **8 (Sync Error)**:
The R&S CMW could not synchronize to the RF input signal.
- **9 (Uncal)**:
Due to an inappropriate configuration of resolution bandwidth, video bandwidth or sweep time, the measurement results are not within the specified data sheet limits.
- **15 (Reference Frequency Error)**:
The instrument has been configured to use an external reference signal but the reference oscillator could not be phase locked to the external signal (e.g. signal level too low, frequency out of range or reference signal not available at all).
- **16 (RF Not Available)**:
The measurement could not be started because the configured RF input path was not active. This problem may occur e.g. when a measurement is started in combined signal path mode and the master application has not yet activated the input path. The LEDs above the RF connectors indicate whether the input and output paths are active.
- **17 (RF Level not Settled) / 18 (RF Frequency not Settled)**:
The measurement could not be started because the R&S CMW was not yet ready to deliver stable results after a change of the input signal power / the input signal frequency.
- **19 (Call not Established)**:
For measurements: The measurement could not be started because no signaling connection to the DUT was established.
For DAU IMS service: Establishing a voice over IMS call failed.
- **20 (Call Type not Usable)**:
For measurements: The measurement could not be started because the established signaling connection had wrong properties.
For DAU IMS service: The voice over IMS settings could not be applied.
- **21 (Call Lost)**:
For measurements: The measurement was interrupted because the signaling connection to the DUT was lost.
For DAU IMS service: The voice over IMS call was lost.
- **23 (Missing Option)**:
The ARB file can not be played by the GPRF generator due to a missing option.
- **26 (Resource Conflict)**:
The application could not be started or has been stopped due to a conflicting hardware resource or software option that is allocated by another application.
Please stop the application that has allocated the conflicting resources and try again.
- **27 (No Sensor Connected)**:
The GPRF External Power Sensor measurement could not be started due to missing power sensor.
- **40 (ARB File CRC Error)**:
The ARB file CRC check failed. The ARB file is corrupt and not reliable.
- **42 (ARB Header Tag Invalid)**:
The ARB file selected in the GPRF generator contains an invalid header tag.
- **43 (ARB Segment Overflow)**:

The number of segments in the multi-segment ARB file is higher than the allowed maximum.

- **44 (ARB File not Found)**:
  The selected ARB file could not be found.
- **50 (Startup Error)**:
  The Data Application Unit (DAU), a DAU service or a DAU measurement could not be started. Please execute a DAU selftest.
- **51 (No Reply)**:
  The DAU has received no response, for example for a ping request.
- **52 (Connection Error)**:
  The DAU could not establish a connection to internal components. Please restart the instrument.
- **53 (Configuration Error)**:
  The current DAU configuration by the user is incomplete or wrong and could not be applied. Check especially the IP address configuration.
- **54 (Filesystem Error)**:
  The hard disk of the DAU is full or corrupt. Please execute a DAU selftest.
- **101 (Firmware Error)**:
  Indicates a firmware or software error. If you encounter this error for the first time, restart the instrument.
  If the error occurs again, consider the following hints:
  – Firmware errors can often be repaired by restoring the factory default settings. To restore these settings, restart your instrument and press the "Factory Default" softkey during startup.
  – If a software package (update) has not been properly installed this is often indicated in the "Setup" dialog, section "SW/HW-Equipment > Installed Software".
  – A software update correcting the error may be available. Updates are e.g. provided in the "CMW Customer Web" on GLORIS (registration required): https://extranet.rohde-schwarz.com.

  If you get firmware errors even with the properly installed latest software version, please send a problem report including log files to Rohde & Schwarz.
- **102 (Unidentified Error)**:
  Indicates an error not covered by other reliability values. For troubleshooting please follow the steps described for "101 (Firmware Error)".
- **103 (Parameter Error)**:
  Indicates that the measurement could not be performed due to internal conflicting parameter settings.
  A good approach to localize the conflicting settings is to start with a reset or preset or even restore the factory default settings. Then reconfigure the measurement step by step and check when the error occurs for the first time.
  If you need assistance to localize the conflicting parameter settings please contact Rohde & Schwarz (see http://www.service.rohde-schwarz.com).

6.6.2 General Settings

The following command enables a connection to the DAU.

CONFigure:WCDMa:SIGN<i>:ETOE <EndToEndEnable>

Enables the setup of a connection between the signaling unit and the Data Application Unit (DAU), required for IP-based data tests involving the DAU.

Only one signaling application with this parameter enabled can be active at a time (cell on / downlink signal present).

Parameters:

<EndToEndEnable> OFF | ON

*RST: OFF

Example: See Specifying General Settings

Firmware/Software: V3.0.20

Manual operation: See "Enable Data end to end" on page 513

6.6.3 Connection Control and States

The following commands control the connection to the UE.

CONFigure:WCDMa:SIGN<i>:CELL:RSIGnaling <Enable>

Enables or disables the reduced signaling mode.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Switching on the Cell Signal (Reduced Signaling)

Firmware/Software: V2.1.20

Manual operation: See "Cell Setup" on page 507

SOURce:WCDMa:SIGN<i>:CELL:STATe <Control>

Turns the generator (the cell) on or off.

See also: "Generator Control" in the R&S CMW user manual, chapter "Remote Control"

Setting parameters:

<Control> ON | OFF

Switch generator **ON** or **OFF**

*RST: OFF

Return values:

<GeneratorState> OFF | PENDing | ON

OFF: generator switched off
PEND: generator switched on but no signal available yet
ON: generator switched on, signal available

*RST: OFF

Example: See Switching on the Cell Signal and the UE (Signaling)

Firmware/Software: V1.0.15.0

Manual operation: See "Cell" on page 494

SOURce:WCDMa:SIGN<i>:CELL:STATe:ALL?

Returns detailed information about the "WCDMA Signaling" generator state.

Return values:

<MainState> OFF | ON | RFHandover

OFF: generator switched off
ON: generator has been turned on
RFHandover: ready to receive a handover from another signaling application

<SyncState> PENDing | ADJusted

PENDing: the generator has been turned on (off) but the signal is not yet (still) available
ADJusted: the physical output signal corresponds to the main generator state (signal off for main state OFF, signal on for main state ON)

Example: See Switching on the Cell Signal and the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0
V3.0.10: RFHandover added

Manual operation: See "Cell" on page 494

SENSe:WCDMa:SIGN<i>:CELL:CONFig?

Returns information corresponding to the gray/green icons displayed behind the cell state in the "Connection Status" area of the main view.

The icons indicate the type of a packet switched connection.

Return values:

<Config> WCDMa | HSDPa | HSPLus | DCHS | HSPA | HDUPlus | DDUPlus

WCDMa: R99 signal, no HSPA test mode
HSDPa: HSDPA
HSPLus: HSDPA+
DCHS: dual carrier and HSDPA+
HSPA: HSDPA and HSUPA
HDUPlus: HSDPA+ and HSUPA
DDUPlus: dual carrier and HSDPA+ and HSUPA

Example: See Setting up an HSPA Connection (Signaling)

Usage: Query only

Firmware/Software: V2.1.20
V2.1.30: added DCHS
V3.0.20: added HSPA, HDUPlus and DDUPlus

Manual operation: See "Cell" on page 494

CALL:WCDMa:SIGN<i>:CSWitched:ACTion <CSAction>

Controls the CS connection state. As a prerequisite for connection setup the DL signal has to be switched on, see `SOURce:WCDMa:SIGN<i>:CELL:STATe`.

Setting parameters:

<CSAction> CONNect | DISConnect | SSMS | UNRegister | HANDover

CONNect: Initiate a CS connection setup
DISConnect: Release a CS connection
SSMS: Send SMS
UNRegister: Unregister the UE completely (CS unregister and PS detach), i.e. change to state "On"
HANDover: Initiate a handover

Example: See Setting up a CS Connection (Signaling)

Usage: Event

Firmware/Software: V1.0.15.0
V1.0.15.23: added HANDover
V2.0.10: added SSMS

Manual operation: See "Connection control hotkeys" on page 508

CALL:WCDMa:SIGN<i>:PSWitched:ACTion <PSAction>

Controls the PS connection state. As a prerequisite for setup of a test mode connection in the PS domain, a test mode connection must be set up in the CS domain, see `CALL:WCDMa:SIGN<i>:CSWitched:ACTion`.

Setting parameters:

<PSAction> CONNect | DISConnect

CONNect: Initiate the setup of a mobile terminated HSDPA or HSPA test mode connection
DISConnect: Release the test mode connection

Usage: Event

Firmware/Software: V2.1.20

Manual operation: See "Connection control hotkeys" on page 508

CALL:WCDMa:SIGN<i>:RSIGnaling:ACTion <RSAction>

Switches the reduced signaling connection on or off, i.e. activates or deactivates the dedicated (and shared) downlink channels.

As a prerequisite for switching on the connection, the cell signal has to be switched on, see `SOURce:WCDMa:SIGN<i>:CELL:STATe`.

Setting parameters:

<RSAction> ON | OFF

ON: Switch on the reduced signaling connection
OFF: Switch off the reduced signaling connection

Example: See Establishing a Reduced Signaling Connection

Usage: Event

Firmware/Software: V2.1.20

Manual operation: See "Connection control hotkeys" on page 508

PREPare:WCDMa:SIGN<i>:HANDover:DESTination <Destination>

Selects the handover destination. A complete list of all supported values can be displayed using `PREPare:WCDMa:SIGN<i>:HANDover:CATalog:DESTination?`.

Parameters:

<Destination> Destination as string

Example: See Performing an Inter-RAT Handover

Firmware/Software: V3.0.10

Manual operation: See "Handover (hotkey)" on page 509

PREPare:WCDMa:SIGN<i>:HANDover:CATalog:DESTination?

Lists all handover destinations that can be selected using `PREPare:WCDMa:SIGN<i>:HANDover:DESTination`.

Return values:

<DestinationList> Comma separated list of all supported destinations. Each destination is represented as a string.

Example: See Performing an Inter-RAT Handover

Usage: Query only

Firmware/Software: V3.0.10

Manual operation: See "Handover (hotkey)" on page 509

FETCh:WCDMa:SIGN<i>:CSWitched:STATe?

Queries the CS connection state, see also chapter 6.2.7.1, "CS Connection States", on page 417.

Use `CALL:WCDMa:SIGN<i>:CSWitched:ACTion` to initiate a transition between different connection states.

The CS state changes to `ON` as soon as the signaling generator is started (see `SOURce:WCDMa:SIGN<i>:CELL:STATe`). To make sure that a WCDMA cell signal is actually available, query the cell state. It must be `ON, ADJ` (see `SOURce:WCDMa:SIGN<i>:CELL:STATe:ALL?`).

Return values:

<CS State> OFF | ON | REGister | ALERting | CESTablished | PAGing | CONNecting | IHANdover | OHANdover | RELeasing | SIGNaling

OFF: Signal is off
ON: Signal is on
REGister: Registered
ALERting: Alerting
CESTablished: Call established
PAGing: Paging in progress
CONNecting: Call setup in progress
IHANdover: Incoming handover in progress
OHANdover: Outgoing handover in progress
RELeasing: Disconnect in progress
SIGNaling: Signaling in progress

*RST: OFF

Example: See Switching on the Cell Signal and the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0
V1.0.15.23: added OHANdover
V3.0.10: added IHANdover

Manual operation: See "Circuit Switched, Packet Switched, Reduced Signaling" on page 494

FETCh:WCDMa:SIGN<i>:PSWitched:STATe?

Queries the PS connection state, see also chapter 6.2.7.2, "PS Connection States", on page 419.

Return values:

<PS State> OFF | ON | ATTached | CESTablished | RELeasing | CONNecting | SIGNaling

OFF: Signal is off
ON: Signal is on
ATTached: Attached
CESTablished: Connection established
CONNecting: Connection setup in progress
RELeasing: Disconnect in progress
SIGNaling: Signaling in progress

*RST: OFF

Example: See Switching on the Cell Signal and the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0
V2.1.20: added CESTablished, RELeasing, CONNecting

Manual operation: See "Circuit Switched, Packet Switched, Reduced Signaling" on page 494

FETCh:WCDMa:SIGN<i>:RSIGnaling:STATe?

Queries the reduced signaling connection state, see also chapter 6.2.7.3, "Connection States for Reduced Signaling", on page 421.

Return values:

<RSigState> OFF | PROCessing | ON

OFF: reduced signaling Off
ON: reduced signaling On
PROCessing: switching Channels On/Off

*RST: OFF

Example: See Establishing a Reduced Signaling Connection

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Circuit Switched, Packet Switched, Reduced Signaling" on page 494

6.6.4 Signaling Information

The following queries retrieve information from/about the connected mobile. This section is not relevant in reduced signaling mode.

6.6.4.1 UE Info

The following queries retrieve information about the connected mobile as shown in the "UE Info" section of the main view. This section is not relevant in reduced signaling mode.

SENSe:WCDMa:SIGN<i>:UESinfo:CONNection:CIRCuit?

Queries the type of an established CS connection. NAV indicates that no CS connection has been established.

Return values:

<CircuitConnect> Connection type as string

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "Connection Type Established" on page 505

SENSe:WCDMa:SIGN<i>:UESinfo:EMERgency?

Queries whether the established connection is an emergency call.

Return values:

<Active> OFF | ON

ON: emergency call
OFF: no emergency call

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "Connection Type Established" on page 505

SENSe:WCDMa:SIGN<i>:UESinfo:CONNection:PACKet?

Queries the type of an established PS connection. NAV indicates that no PS connection has been established.

Return values:

<PacketConnect> Connection type as string

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "Connection Type Established" on page 505

SENSe:WCDMa:SIGN<i>:UESinfo:DINFo?

Queries the demodulation info provided by the demodulator stage of the instrument while it perceives an uplink signal.

Return values:

<CMWDemodInfo> **'Uplink Power Underflow'**: the UL signal power is too low
'Uplink Power in Range': the UL signal power is in range
'Uplink Power Overflow': the UL signal power is too high

<Power> UFL | OK | OFL

UFL: the UL signal power is too low
OK: the UL signal power is in range
OFL: the UL signal power is too high

<Sync> NOSYnc | OK

NOSYnc: synchronization to the uplink signal failed
OK: successful synchronization to the uplink signal

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.20
V2.1.20: added <Power> and <Sync>

Manual operation: See "CMW Demod. Info" on page 495

SENSe:WCDMa:SIGN<i>:UESinfo:RITYpe?

Queries the type of the registration identity received from the UE during registration.

Return values:

<RIType> 'IMSI' | 'IMEI' | 'IMSISV' | 'TMSI' | 'UNKN'
Registration identity type as string. 'UNKN' means 'Unknown'.

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "Registration Identity (Type)" on page 505

SENSe:WCDMa:SIGN<i>:UESinfo:RIDentity?

Queries the registration identity received from the UE during registration.

Return values:

<Identity> Registration identity as string with up to 18 digits.

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "Registration Identity (Type)" on page 505

SENSe:WCDMa:SIGN<i>:UESinfo:IMEI?

Queries the IMEI of the UE.

Return values:

<IMEI> IMEI as string with up to 18 digits.

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "IMEI" on page 506

SENSe:WCDMa:SIGN<i>:UESinfo:CNUMber?

Queries the calling number for a UE originated call.

Return values:

<Number> Calling number as string with up to 129 digits.

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "UE Called / Calling Number" on page 506

SENSe:WCDMa:SIGN<i>:UESinfo:DNUMber?

Queries the number dialed at the UE.

Return values:

<Number> Dialed number as string with up to 129 digits.

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "UE Called / Calling Number" on page 506

SENSe:WCDMa:SIGN<i>:UESinfo:TTY?

Queries whether the UE supports Cellular Text Telephony (CTM).

Return values:

<TTY> 'supported' | 'not supported'

'supported': CTM supported
'not supported': CTM not supported

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "CTM Text Telephony" on page 506

SENSe:WCDMa:SIGN<i>:UESinfo:DULalignment?

Returns the offset between DL DPCH and UL DPCH at the RF connectors of the instrument.

Return values:

<DLULAlignment> Range: 0 chips to 10000 chips
Default unit: chips

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "Connection Status" on page 590

SENSe:WCDMa:SIGN<i>:UESinfo:UEADdress:IPV<n>?

Returns the IPv4 address (<n> = 4) or the IPv6 prefix (<n> = 6) assigned to the UE by the R&S CMW.

Suffix:

<n> 4,6

Return values:

<IPAddress> IP address/prefix as string

Example: See Setting up a CS Connection (Signaling)

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "UE IP Address V4/V6" on page 506

6.6.4.2 UE Capabilities

The following queries retrieve information about the connected mobile as shown in the "UE Capabilities" section of the main view. This section is not relevant in reduced signaling mode.

SENSe:WCDMa:SIGN<i>:UECapability:PDCP?

Returns UE capability information indicating in which way the UE supports the Packet Data Convergence Protocol (PDCP) described in 3GPP TS 25.323

Return values:

<SRNS> NO | YES
Support of lossless SRNS relocation

<RFC2507> NO | YES
Support of IP header compression according to RFC 2507

<RFC3095> NO | YES
Support of robust header compression according to RFC 3095

<RFC3095CtxReloc> NO | YES
Support of context relocation applied to the RFC 3095 header compression protocol

<HeaderComp> Maximum header compression context size supported by the UE. This parameter is only applicable if the UE supports header compression according to RFC 2507
Range: 1024 to 131072

<MaxROHC>	Maximum number of header compression context sessions supported by the UE. This parameter is only applicable if the UE supports header compression according to RFC3095. Range: 2 to 16384
<ReverseDecomp>	Number of packets that can be reverse decompressed by the decompressor in the UE Range: 0 to 65535
<PDUSizeChange>	NO | YES Support of lossless DL RLC PDU size change

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "PDCP" on page 498

SENSe:WCDMa:SIGN<i>:UECapability:RLC?

Returns UE capability information indicating in which way the UE supports the Radio Link Control Acknowledged Mode (RLC AM).

Return values:

<AMBufferSize>	Maximum total buffer size across all RLC AM entities supported by the UE Range: 10 to 1000
<MaxRLCWindow>	Maximum RLC window size supported by the UE Range: 0 to 4095
<AMEntities>	Maximum number of AM entities supported by the UE Range: 3 to 30

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "RLC" on page 499

SENSe:WCDMa:SIGN<i>:UECapability:PDOWnlink?

Returns UE capability information describing the capacity of the UE to process and store downlink channels.

Return values:

<SimultTranspCh>	Maximum number of downlink transport channels that the UE is capable to process simultaneously, not taking into account the rate of each transport channel Range: 4 to 32

<SimultCCTrCH>	Maximum number of downlink Coded Composite Transport Channels (CCTrCHs) that the UE is capable to process simultaneously. CCTrCH should be interpreted as consisting of DCH, FACH or DSCH. Range: 1 to 8
<TTITranspBlock>	Maximum total number of transport blocks received within Transmission Time Intervals (TTIs) that end within the same 10 ms interval. This includes all transport blocks that are to be simultaneously received by the UE on DCH, FACH, PCH and DSCH transport channels. Range: 4 to 512
<NumberOfTFC>	Maximum number of Transport Format Combinations (TFC) in a downlink transport format combination set that the UE can store Range: 16 to 1024
<NumberOfTF>	Maximum number of downlink Transport Formats (TF) that the UE can store, where all transport formats for all downlink transport channels are counted Range: 32 to 1024
<TurboDecoding>	NO | YES Support of turbo decoding
<RXBitsAll>	Maximum number of bits of all transport blocks being received at an arbitrary time instant. All bits are considered. Range: 640 bits to 163840 bits Default unit: bits
<RXBitsConv>	Maximum number of bits of all transport blocks being received at an arbitrary time instant. Only convolutionally coded bits are considered. Range: 640 bits to 163840 bits Default unit: bits
<RXBitsTurbo>	Maximum number of bits of all transport blocks being received at an arbitrary time instant. Only turbo coded bits are considered. Range: 640 bits to 163840 bits Default unit: bits
<DPCCHCodes>	Maximum number of DPCH codes to be simultaneously received. For DPCH in soft/softer handover, each DPCH is only calculated once. The capability does not include codes used for S-CCPCH. Range: 1 to 8
<PhysicalChBits>	Maximum number of physical channel bits received in any 10 ms interval (DPCH, PDSCH, S-CCPCH). For DPCH in soft/softer handover, each DPCH is only calculated once. Range: 600 bits to 76800 bits Default unit: bits

<SF512> NO | YES

Support for Spreading Factor (SF) 512 in downlink.

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "PHY Downlink" on page 499

SENSe:WCDMa:SIGN<i>:UECapability:PUPLink?

Returns UE capability information describing the capacity of the UE to process and store uplink channels.

Return values:

<SimultTranspCh> Maximum number of uplink transport channels that the UE is capable to process simultaneously, not taking into account the rate of each transport channel

Range: 4 to 32

<SimultCCTrCH> Maximum number of uplink Coded Composite Transport Channels (CCTrCHs) that the UE is capable to process simultaneously

Range: 1 to 8

<TTITranspBlock> Maximum total number of transport blocks transmitted within Transmission Time Intervals (TTIs) that start at the same time

Range: 4 to 512

<NumberOfTFC> Maximum number of Transport Format Combinations (TFC) in an uplink transport format combination set that the UE can store

Range: 16 to 1024

<NumberOfTF> Maximum number of uplink Transport Formats (TF) that the UE can store, where all transport formats for all uplink transport channels are counted

Range: 32 to 1024

<TurboDecoding> NO | YES

Support of turbo decoding

<TXBitsAll> Maximum number of bits of all transport blocks being transmitted at an arbitrary time instant. All bits are considered.

Range: 640 bits to 163840 bits
Default unit: bits

<TXBitsConv> Maximum number of bits of all transport blocks being transmitted at an arbitrary time instant. Only convolutionally coded bits are considered.

Range: 640 bits to 163840 bits
Default unit: bits

<TXBitsTurbo>	Maximum number of bits of all transport blocks being transmitted at an arbitrary time instant. Only turbo coded bits are considered. Range: 640 bits to 163840 bits Default unit: bits
<DPDCHBits>	Maximum number of DPDCH bits the UE can transmit in 10 ms. The value applies to UE operation in non-compressed mode (if the value is <9600) or in both compressed and non-compressed mode (if the value is ≥9600). Range: 600 bits to 57600 bits Default unit: bits
Example:	See Retrieving Information Provided by the UE (Signaling)
Usage:	Query only
Firmware/Software:	V1.0.15.20
Manual operation:	See "PHY Uplink" on page 501

SENSe:WCDMa:SIGN<i>:UECapability:RFParameter?

Returns RF UE capability information.

The value pairs are returned 17 times (band 1 to 14 and band 19 to 21).

Return values:

<Band1>	NO | YES Support of operating band 1
<PowerClass1>	UE power class for band 1 Range: 1 to 4
... <Band14>	NO | YES Support of operating band 14
<PowerClass14>	UE power class for band 14
<Band19>	NO | YES Support of operating band 19
<PowerClass19>	UE power class for band 19
... <Band21>	NO | YES Support of operating band 21
<PowerClass21>	UE power class for band 21
Example:	See Retrieving Information Provided by the UE (Signaling)
Usage:	Query only
Firmware/Software:	V1.0.15.20 V2.1.20: bands 19 to 21 added
Manual operation:	See "RF Parameters" on page 502

SENSe:WCDMa:SIGN<i>:UECapability:MMODe?

Returns UE capability information indicating whether the UE supports UTRA FDD or TDD or both.

Return values:

<UTRA>	FDD | TDD | BOTH
Example:	See Retrieving Information Provided by the UE (Signaling)
Usage:	Query only
Firmware/Software:	V1.0.15.20
Manual operation:	See "Multi Mode / RAT" on page 502

SENSe:WCDMa:SIGN<i>:UECapability:MRAT?

Returns UE capability information indicating the Radio Access Technologies that the UE supports.

Return values:

<SupportGSM>	NO | YES Indicates whether the UE supports GSM
<MultiCarrier>	NO | YES Indicates whether the UE supports multi carrier mode
<UTRANGERAN>	NO | YES Indicates whether the UE supports UTRAN to GERAN NACC
<HandoverGAN>	NO | YES Indicates whether the UE supports CS Handover to GAN
<PSInterRAT>	NO | YES Indicates whether the UE supports Inter-RAT PS Handover
<CipherAlgUEA0>	NO | YES Indicates whether the UE supports ciphering algorithm UEA0
<CipherAlgUEA1>	NO | YES Indicates whether the UE supports ciphering algorithm UEA1
<IntegrityUIA1>	NO | YES Indicates whether the UE supports integrity algorithm UIA1
Example:	See Retrieving Information Provided by the UE (Signaling)
Usage:	Query only
Firmware/Software:	V1.0.15.20
Manual operation:	See "Multi Mode / RAT" on page 502

SENSe:WCDMa:SIGN<i>:UECapability:UEPosition?

Returns UE capability information related to UE positioning.

Return values:

<LocationMethod> NO | YES

Indicates if a UE can measure its location by some means unrelated to UTRAN (e.g. if the UE has access to a standalone GPS receiver)

<NetworkAGPS> NONE | NETWork | UE | BOTH

Indicates if a UE supports the assisted GPS schemes "Network based" and/or "UE based"

<RefTimeGPS> NO | YES

Indicates if a UE has the capability to measure GPS reference time as defined in 3GPP TS 25.215

<IPDL> NO | YES

Indicates if a UE has the capability to use Idle Periods in the DownLink (IPDL) to enhance its "SFN-SFN observed time difference – type 2" measurement

<OTDOA> NO | YES

Indicates if a UE supports the Observed Time Difference Of Arrival (OTDOA) UE based schemes

<RXTXTimeDiff> NO | YES

Indicates if a UE has the capability to perform the Rx-Tx time difference type 2 measurement

<CELLURAPCH> NO | YES

Indicates whether the UE positioning measurements using the assisted GPS method are valid in CELL_PCH and URA_PCH RRC states

<SFNSFNTimeDiff> NO | YES

Indicates whether the UE has the capability to perform the SFN-SFN observed time difference type 2 measurement

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "UE Position" on page 503

SENSe:WCDMa:SIGN<i>:UECapability:GENeral?

Returns general UE capability information.

Return values:

<Release> Access Stratum Release Indicator, e.g. Rel. 99, Rel. 5

Range: 5 to 99

<BattConsumOpt> NO | YES

Indicates whether or not the UE benefits from NW-based battery consumption optimization

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "General" on page 504

SENSe:WCDMa:SIGN<i>:UECapability:HSDPa?

Returns UE capability information related to HSDPA.

Return values:

<HSPDSCH> NO | YES

Indicates whether the UE supports the HS-PDSCH or not

<DLCapHSDSCH> Supported DPCH data rate in case an HS-DSCH is configured simultaneously

Range: 32 kbit/s to 384 kbit/s
Default unit: kbit/s

<PhysLayerCatR5> HS-DSCH physical layer category of the UE for release 5 call setup

Range: 1 to 24

<PhysLayerCatR7> HS-DSCH physical layer category of the UE for release 7 call setup

Range: 1 to 24

<PhysLayerCatR8> HS-DSCH physical layer category of the UE for release 8 call setup

Range: 1 to 24

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V2.1.20
V2.1.30: added <PhysLayerCatR8>

Manual operation: See "HSDPA" on page 504

SENSe:WCDMa:SIGN<i>:UECapability:HSUPa?

Returns UE capability information related to HSUPA.

Return values:

<HSUPA> NO | YES

Indicates whether the UE supports HSUPA or not

<PhysLayerCat> E-DCH physical layer category of the UE

Range: 1 to 9

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V2.1.20

Manual operation: See "HSUPA" on page 505

6.6.4.3 UE Measurement Reports

The following queries check whether measurement reports from the connected mobile are pending and retrieve information from the received reports. This section is not relevant in reduced signaling mode.

FETCh:WCDMa:SIGN<i>:UEReport:STATe?

Queries the state of UE measurement reporting.

Return values:

<State> RDY | PENDing

RDY: Any requested reports have been received.
PENDing: The instrument is waiting for reports from the UE.

*RST: RDY

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Report" on page 585

SENSe:WCDMa:SIGN<i>:UEReport:CCELI?

Returns the UE measurement report contents for the current cell. See also "UTRA FDD (Current Cell)" on page 496.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_RSCP_Low> <2_RSCP_High>	Lower and upper CPICH RSCP Range: -120 dBm to -25 dBm Default unit: dBm
<3_EcNo_Low> <4_EcNo_High>	Lower and upper CPICH Ec/No Range: -24 dB to 0 dB Default unit: dB
<5_BLER_Low> <6_BLER_High>	Lower and upper TCH BLER Range: -10 to 0
<7_TxPowerLow> <8_TxPowerHigh>	Lower and upper transmitted UE power Range: -50 dBm to 34 dBm Default unit: dBm
<9_TimeDiffLow> <10_TimeDiffHigh>	Lower and upper Rx-Tx time difference Range: 768 chips to 1280 chips Default unit: chips
<11_PathlossLow>	Lower pathloss (no upper pathloss reported) Range: 46 dB to 158 dB Default unit: dB

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V1.0.15.20

Manual operation: See "UTRA FDD (Current Cell)" on page 496

SENSe:WCDMa:SIGN<i>:UEReport:NCELl?

Returns the UE measurement report contents for carrier 2. See also UTRA FDD (Carrier 2).

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_RSCP_Low> <2_RSCP_High>	Lower and upper CPICH RSCP Range: -120 dBm to -25 dBm Default unit: dBm
<3_EcNo_Low> <4_EcNo_High>	Lower and upper CPICH Ec/No Range: -24 dB to 0 dB Default unit: dB
<5_RSSI_Low> <6_RSSI_High>	Lower and upper RSSI Range: -50 dBm to 34 dBm Default unit: dBm

<7_TimeDiffLow> <8_TimeDiffHigh>	Lower and upper SFN-CFN time difference Range: 768 chips to 1280 chips Default unit: chips
<9_PathlossLow>	Lower pathloss (no upper pathloss reported) Range: 46 dB to 158 dB Default unit: dB

Example: See Retrieving Information Provided by the UE (Signaling)

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "UTRA FDD (Carrier 2)" on page 497

6.6.5 Routing Settings

The following commands configure the signal input and output paths.

6.6.5.1 Signal Routing

The following commands configure the scenario, select the paths for the generated downlink signal (output) and the analyzed signal (input) and define external attenuation values.

ROUTe:WCDMa:SIGN<i>:SCENario:SCELl <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>

Activates the standard cell scenario and selects the RF input (RX) and output (TX) path, i.e. RF connectors and RX/TX modules. To query the active scenario, use `ROUTe:WCDMa:SIGN<i>:SCENario?`.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Connector names:

- RF1C | RF2C | RF3C | RF4C = RF 1 COM to RF 4 COM, front panel
- RFAC | RFBC = virtual names for the RF COM connectors
- RF1O | RF3O = RF 1 OUT | RF 3 OUT, front panel
- RFAO = virtual name for the RF OUT connectors

Parameters:

<RXConnector> RF1C | RF2C | RF3C | RF4C | RFAC | RFBC
RF connector for the input path

<RXConverter> RX1 | RX2 | RX3 | RX4
RX module for the input path

<TXConnector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC
RF connector for the output path

<TXConverter> TX1 | TX2 | TX3 | TX4
TX module for the output path

Example: See Specifying General Settings

Firmware/Software: V2.0.10

Manual operation: See "Scenario" on page 513

ROUTe:WCDMa:SIGN<i>:SCENario:DCARrier <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>, <TX2Connector>, <TX2Converter>

Activates the scenario "Dual Carrier", using two RF output (TX) paths and one RF input (RX) path. Selects the RF connectors and RX/TX modules to be used. To query the active scenario, use `ROUTe:WCDMa:SIGN<i>:SCENario?`.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Connector names:

- RF1C | RF2C | RF3C | RF4C = RF 1 COM to RF 4 COM, front panel
- RFAC | RFBC = virtual names for the RF COM connectors

- RF1O | RF3O = RF 1 OUT | RF 3 OUT, front panel
- RFAO = virtual name for the RF OUT connectors

Parameters:

<RXConnector> RF1C | RF2C | RF3C | RF4C | RFAC | RFBC
RF connector for the input path

<RXConverter> RX1 | RX2 | RX3 | RX4
RX module for the input path

<TXConnector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC
RF connector for the first output path

<TXConverter> TX1 | TX2 | TX3 | TX4
TX module for the first output path. Select different modules for the two paths.

<TX2Connector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC
RF connector for the second output path

<TX2Converter> TX1 | TX2 | TX3 | TX4
TX module for the second output path. Select different modules for the two paths.

Example: See Specifying General Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS404

Manual operation: See "Scenario" on page 513

ROUTe:WCDMa:SIGN<i>:SCENario:SCFading[:EXTernal] <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>, <IQConnector>

Activates the "Standard Cell Fading: External" scenario and selects the RF connectors, RX/TX modules and digital I/Q output connector to be used. To query the active scenario, use `ROUTe:WCDMa:SIGN<i>:SCENario?`.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Connector names:

- RF1C | RF2C | RF3C | RF4C = RF 1 COM to RF 4 COM, front panel

- RFAC | RFBC = virtual names for the RF COM connectors
- RF1O | RF3O = RF 1 OUT | RF 3 OUT, front panel
- RFAO = virtual name for the RF OUT connectors
- IQ2O | IQ4O | IQ6O | IQ8O = DIG IQ OUT 2 to 8, rear panel

Parameters:

<RXConnector> RF1C | RF2C | RF3C | RF4C | RFAC | RFBC
RF connector for the input path

<RXConverter> RX1 | RX2 | RX3 | RX4
RX module for the input path

<TXConnector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC
RF connector for the output path

<TXConverter> TX1 | TX2 | TX3 | TX4
TX module for the output path

<IQConnector> IQ2O | IQ4O | IQ6O | IQ8O
DIG IQ OUT connector for external fading of the output path

Example: See Specifying General Settings

Firmware/Software: V3.0.10

Options: R&S CMW-KS410

Manual operation: See "Scenario" on page 513

ROUTe:WCDMa:SIGN<i>:SCENario:SCFading:INTernal <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>

Activates the "Standard Cell Fading: Internal" scenario and selects the RF input (RX) and output (TX) path, i.e. RF connectors and RX/TX modules. To query the active scenario, use `ROUTe:WCDMa:SIGN<i>:SCENario?`.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Connector names:

- RF1C | RF2C | RF3C | RF4C = RF 1 COM to RF 4 COM, front panel
- RFAC | RFBC = virtual names for the RF COM connectors
- RF1O | RF3O = RF 1 OUT | RF 3 OUT, front panel
- RFAO = virtual name for the RF OUT connectors

Parameters:

<RXConnector> RF1C | RF2C | RF3C | RF4C | RFAC | RFBC

RF connector for the input path

<RXConverter> RX1 | RX2 | RX3 | RX4

RX module for the input path

<TXConnector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC

RF connector for the output path

<TXConverter> TX1 | TX2 | TX3 | TX4

TX module for the output path

Example: See Specifying General Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Scenario" on page 513

ROUTe:WCDMa:SIGN<i>:SCENario:DCFading[:EXTernal] <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>, <TX2Connector>, <TX2Converter>, <IQConnector>, <IQ2Connector>

Activates the "Dual Carrier Fading: External" scenario and selects the RF connectors, RX/TX modules and digital I/Q output connectors to be used. To query the active scenario, use `ROUTe:WCDMa:SIGN<i>:SCENario?`.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Connector names:

- RF1C | RF2C | RF3C | RF4C = RF 1 COM to RF 4 COM, front panel
- RFAC | RFBC = virtual names for the RF COM connectors
- RF1O | RF3O = RF 1 OUT | RF 3 OUT, front panel
- RFAO = virtual name for the RF OUT connectors
- IQ2O | IQ4O | IQ6O | IQ8O = DIG IQ OUT 2 to 8, rear panel

Parameters:

<RXConnector> RF1C | RF2C | RF3C | RF4C | RFAC | RFBC

RF connector for the input path

<RXConverter>	RX1 | RX2 | RX3 | RX4 RX module for the input path
<TXConnector>	RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC RF connector for the first output path
<TXConverter>	TX1 | TX2 | TX3 | TX4 TX module for the first output path. Select different modules for the two paths.
<TX2Connector>	RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC RF connector for the second output path
<TX2Converter>	TX1 | TX2 | TX3 | TX4 TX module for the second output path. Select different modules for the two paths.
<IQConnector>	IQ2O | IQ4O | IQ6O | IQ8O DIG IQ OUT connector for external fading of the first output path. Select different connectors for the two paths.
<IQ2Connector>	IQ2O | IQ4O | IQ6O | IQ8O DIG IQ OUT connector for external fading of the second output path. Select different connectors for the two paths.

Example: See Specifying General Settings

Firmware/Software: V3.0.10

Options: R&S CMW-KS404 and R&S CMW-KS410

Manual operation: See "Scenario" on page 513

CONFigure:WCDMa:SIGN<i>:SCENario:DCFading:EXTernal:RXDiversity <Enable>

Enables / disables preparation of dual carrier downlink signal for RX diversity handling by external fader.

Parameters:

<Enable> OFF | ON

ON: second carrier uses frequency of first carrier
OFF: carriers use different frequencies

*RST: OFF

Example: See Specifying General Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS404 and R&S CMW-KS410

Manual operation: See "RX Diversity" on page 513

ROUTe:WCDMa:SIGN<i>:SCENario:DCFading:INTernal <RXConnector>, <RXConverter>, <TXConnector>, <TXConverter>, <TX2Connector>, <TX2Converter>

Activates the "Dual Carrier Fading: Internal" scenario, using two RF output (TX) paths and one RF input (RX) path. Selects the RF connectors and RX/TX modules to be used. To query the active scenario, use `ROUTe:WCDMa:SIGN<i>:SCENario?`.

Depending on the installed hardware and the active sub-instrument or instance <i> only a subset of the described parameter values is allowed. The *RST values and the mapping of virtual connector names to physical connectors also depend on the active sub-instrument or instance <i>.

All instruments are equipped with the RF 1 and RF 2 connectors and one RX and TX module. Additional RF connectors and RX/TX modules are optionally available for R&S CMW270 and R&S CMW500, but not for R&S CMW280.

See also: "Signal Path Settings" in the R&S CMW user manual, chapter "Remote Control"

Connector names:

- RF1C | RF2C | RF3C | RF4C = RF 1 COM to RF 4 COM, front panel
- RFAC | RFBC = virtual names for the RF COM connectors
- RF1O | RF3O = RF 1 OUT | RF 3 OUT, front panel
- RFAO = virtual name for the RF OUT connectors

Parameters:

<RXConnector> RF1C | RF2C | RF3C | RF4C | RFAC | RFBC

RF connector for the input path

<RXConverter> RX1 | RX2 | RX3 | RX4

RX module for the input path

<TXConnector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC

RF connector for the first output path

<TXConverter> TX1 | TX2 | TX3 | TX4

TX module for the first output path. Select different modules for the two paths.

<TX2Connector> RF1C | RF1O | RF2C | RF3C | RF3O | RF4C | RFAC | RFAO | RFBC

RF connector for the second output path

<TX2Converter> TX1 | TX2 | TX3 | TX4

TX module for the second output path. Select different modules for the two paths.

Example: See Specifying General Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KS404, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Scenario" on page 513

ROUTe:WCDMa:SIGN<i>:SCENario?

Returns the active scenario.

Return values:

<Scenario> SCEL | DCARrier | SCFading | DCFading

SCEL: Standard Cell
DCARrier: Dual Carrier
SCFading: Standard Cell Fading
DCFading: Dual Carrier Fading

<Fader> EXTernal | INTernal

Only returned for fading scenarios, e.g. SCF, DCF
Indicates whether internal or external fading is active.

Usage: Query only

Firmware/Software: V2.0.10
V2.1.30: DCARrier added
V3.0.10: SCFading and DCFading added
V3.0.30: <Fader> added

Manual operation: See "Scenario" on page 513

ROUTe:WCDMa:SIGN<i>?

Returns the configured routing settings. The number of returned values depends on the active scenario (6 to 10 values).

Connector names:

- RF1C | RF2C | RF3C | RF4C = RF 1 COM to RF 4 COM, front panel
- RF1O | RF3O = RF 1 OUT | RF 3 OUT, front panel
- IQ2O | IQ4O | IQ6O | IQ8O = DIG IQ OUT 2 to 8, rear panel

Return values:

<Scenario> SCEL | DCARrier | SCFading | DCFading

SCEL: Standard Cell
DCARrier: Dual Carrier
SCFading: Standard Cell Fading
DCFading: Dual Carrier Fading

<Master> For future use - returned value not relevant

<RXConnector> RF1C | RF2C | RF3C | RF4C

RF connector for the input path

<RXConverter> RX1 | RX2 | RX3 | RX4

RX module for the input path

<TXConnector>	RF1C | RF1O | RF2C | RF3C | RF3O | RF4C RF connector for output path 1
<TXConverter>	TX1 | TX2 | TX3 | TX4 TX module for output path 1
<TX2Connector>	RF1C | RF1O | RF2C | RF3C | RF3O | RF4C RF connector for output path 2, only returned for scenarios with two RF output paths
<TX2Converter>	TX1 | TX2 | TX3 | TX4 TX module for output path 2, only returned for scenarios with two RF output paths
<IQConnector>	IQ2O | IQ4O | IQ6O | IQ8O DIG IQ OUT connector for the first output path, only returned for scenarios with external fading
<IQ2Connector>	IQ2O | IQ4O | IQ6O | IQ8O DIG IQ OUT connector for the second output path, only returned for scenarios with two RF output paths plus external fading

Usage: Query only

Firmware/Software: V2.0.10
V2.1.30: added <TX2Connector>, <TX2Converter> and scenario DCARrier
V3.0.10: added <IQConnector>, <IQ2Connector> and scenarios SCFading, DCFading

Manual operation: See "Scenario" on page 513

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:EATTenuation:OUTPut <ExtAttenuation>

Defines an external attenuation (or gain, if the value is negative), to be applied to the RF output connector.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<ExtAttenuation> Range: -50 dB to 90 dB
*RST: 0 dB
Default unit: dB

Example: See Specifying General Settings

Firmware/Software: V2.1.30

Manual operation: See "RF Output (TX) > External Attenuation" on page 516

CONFigure:WCDMa:SIGN<i>:RFSettings:EATTenuation:INPut <ExtAttenuation>

Defines an external attenuation (or gain, if the value is negative), to be applied to the RF input connector.

Parameters:

<ExtAttenuation>	Range:	-50 dB to 90 dB
	*RST:	0 dB
	Default unit:	dB

Example: See Specifying General Settings

Firmware/Software: V1.0.15.0

Manual operation: See "RF Input (RX) > External Attenuation" on page 517

6.6.5.2 Signal Settings

The following commands provide settings for the downlink and uplink signals.

SENSe:WCDMa:SIGN<i>:IQOut:CARRier<carrier>?

Queries properties of the baseband signal at the I/Q output.

Suffix:

<carrier>	1..2 Selects the carrier to be queried - only relevant for dual carrier scenario

Return values:

<SampleRate>	M100 Fixed value, indicating a sample rate of 100 Msps (100 MHz)

<PEP>	Peak envelope power of the baseband signal Range: -60 dBFS to 0 dBFS Default unit: dBFS
<CrestFactor>	Crest factor of the baseband signal Range: 0 dB to 60 dB Default unit: dB

Example: See Configuring the I/Q Settings

Usage: Query only

Firmware/Software: V3.0.10

Manual operation: See "Sample Rate (Out / In)" on page 514

CONFigure:WCDMa:SIGN<i>:IQIN:CARRier<carrier> <PEP>, <Level>

Specifies properties of the baseband signal at the I/Q input.

Suffix:

<carrier>	1..2 Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<PEP>	Peak envelope power of the incoming baseband signal Range: -60 dBFS to 0 dBFS Default unit: dBFS
<Level>	Average level of the incoming baseband signal (without noise) Range: depends on crest factor and level of outgoing base-band signal Default unit: dBFS

Example: See Configuring the I/Q Settings

Firmware/Software: V3.0.10

Manual operation: See "Baseband PEP (Out / In)" on page 515

CONFigure:WCDMa:SIGN<i>:CARRier<carrier>:BAND <OperationBand>

Selects the Operating Band (OB).

For dual carrier both downlink carriers use the same band in the current software version. If you change it for one carrier, it is also changed for the second carrier.

Suffix:

<carrier>	1..2 Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<OperationBand> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OBS1 | OBS2 | OBS3 | OB19 | OB20 | OB21 | OBL1

OB1, ..., OB14: Operating Band I to XIV
OB19, ..., OB21: Operating Band XIX to XXI
OBS1: Operating Band S
OBS2: Operating Band S 170 MHz
OBS3: Operating Band S 190 MHz
OBL1: Operating Band L

*RST: OB1

Example: See Specifying General Settings

Firmware/Software: V2.1.30

Options: For S and L operating bands: R&S CMW-KS425

Manual operation: See "RF Frequency > ..." on page 517

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:CHANnel:DL <ChannelNumber>

Selects the DL channel number. The channel number must be valid for the current operating band, for dependencies see chapter 6.2.11, "Operating Bands", on page 436.

The related UL channel number is calculated and set automatically. For dual carrier the channel number of the other carrier is calculated and set as well.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<ChannelNumber> Range: depends on operating band
*RST: carrier 1: 10563, carrier 2: 10588

Example: See Specifying General Settings

Firmware/Software: V2.1.30

Manual operation: See "RF Frequency > ..." on page 517

CONFigure:WCDMa:SIGN<i>:RFSettings:CHANnel:UL <ChannelNumber>

Selects the UL channel number. The channel number must be valid for the current operating band, for dependencies see chapter 6.2.11, "Operating Bands", on page 436.

The related DL channel number is calculated and set automatically.

Parameters:

<ChannelNumber> Range: depends on operating band
*RST: 9613

Example: See Specifying General Settings

Firmware/Software: V2.0.10

Manual operation: See "RF Frequency > ..." on page 517

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:DL <Band>, <Channel>

Selects the operating band and the DL channel number. The channel number must be valid for the operating band, for dependencies see chapter 6.2.11, "Operating Bands", on page 436.

The related UL channel number is calculated and set automatically. For dual carrier the channel number of the other carrier is calculated and set as well.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Band> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OBS1 | OBS2 | OBS3 | OB19 | OB20 | OB21 | OBL1

OB1, ..., OB14: Operating Band I to XIV
OB19, ..., OB21: Operating Band XIX to XXI
OBS1: Operating Band S
OBS2: Operating Band S 170 MHz
OBS3: Operating Band S 190 MHz
OBL1: Operating Band L

*RST: OB1

<Channel> Range: depends on operating band
*RST: carrier 1: 10563, carrier 2: 10588

Return values:

<Frequency> A query returns band, channel number and corresponding carrier center frequency

Range: depends on operating band
*RST: carrier 1: 2112.6E+6 Hz, carrier 2: 2117.6E+6 Hz
Default unit: Hz

Example: See Specifying General Settings

Firmware/Software: V3.0.10

Options: For S and L operating bands: R&S CMW-KS425

Manual operation: See "RF Frequency > ..." on page 517

CONFigure:WCDMa:SIGN<i>:RFSettings:UL <Band>, <Channel>

Selects the operating band and the UL channel number. The channel number must be valid for the operating band, for dependencies see chapter 6.2.11, "Operating Bands", on page 436.

The related DL channel number is calculated and set automatically.

Parameters:

<Band> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OBS1 | OBS2 | OBS3 | OB19 | OB20 | OB21 | OBL1

OB1, ..., OB14: Operating Band I to XIV
OB19, ..., OB21: Operating Band XIX to XXI
OBS1: Operating Band S
OBS2: Operating Band S 170 MHz
OBS3: Operating Band S 190 MHz
OBL1: Operating Band L

*RST: OB1

<Channel> Range: depends on operating band
*RST: 9613

Return values:

<Frequency> A query returns band, channel number and corresponding carrier center frequency

Range: depends on operating band
*RST: 1.9226E+9 Hz
Default unit: Hz

Example: See Specifying General Settings

Firmware/Software: V3.0.10

Options: For S and L operating bands: R&S CMW-KS425

Manual operation: See "RF Frequency > ..." on page 517

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:FREQuency:DL <Frequency>

Selects the DL carrier center frequency. The frequency must correspond to a channel valid for the current operating band, for dependencies see chapter 6.2.11, "Operating Bands", on page 436.

The related UL frequency is calculated and set automatically. For dual carrier the frequency of the other carrier is calculated and set as well.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Frequency>	Range:	depends on operating band
	*RST:	carrier 1: 2112.6E+6 Hz, carrier 2: 2117.6E+6 Hz
	Default unit:	Hz

Example: See Specifying General Settings

Firmware/Software: V3.0.10

Manual operation: See "RF Frequency > ..." on page 517

CONFigure:WCDMa:SIGN<i>:RFSettings:FREQuency:UL <Frequency>

Selects the UL carrier center frequency. The frequency must correspond to a channel valid for the current operating band, for dependencies see chapter 6.2.11, "Operating Bands", on page 436.

The related DL frequency is calculated and set automatically.

Parameters:

<Frequency>	Range:	depends on operating band
	*RST:	1.9226E+9 Hz
	Default unit:	Hz

Example: See Specifying General Settings

Firmware/Software: V3.0.10

Manual operation: See "RF Frequency > ..." on page 517

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:COPower <OutChannelPow>

Sets the base level of the generator. For dual carrier it can be set per carrier.

The allowed value range can be calculated as follows:

Range (Base Level) = Range (Output Power) - External Attenuation - Insertion Loss + Baseband Level

Range (Output Power) = -130 dBm to -5 dBm (RFx Com) or -120 dBm to 8 dBm (RFx Out); please also notice the ranges quoted in the data sheet.

Insertion Loss is only relevant for internal fading, *Baseband Level* only for external fading.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<OutChannelPow>	Range:	see above
	*RST:	-56.1 dBm
	Default unit:	dBm

Example: See Specifying General Settings

Firmware/Software: V2.1.30

Manual operation: See "RF Power Downlink > Output Power (Ior)" on page 518

CONFigure:WCDMa:SIGN<i>:RFSettings:COPower:TOTal <TotalOutChPwr>

Sets the total base level of the generator.

For dual carrier this is the sum of the two carrier powers. If you modify the total power level, both carrier powers are increased/decreased by the same amount so that the new total power level is reached.

The allowed value range per carrier can be calculated as follows:

Range (Base Level) = Range (Output Power) - External Attenuation - Insertion Loss + Baseband Level

Range (Output Power) = -130 dBm to -5 dBm (RFx Com) or -120 dBm to 8 dBm (RFx Out); please also notice the ranges quoted in the data sheet.

Insertion Loss is only relevant for internal fading, *Baseband Level* only for external fading.

Parameters:

<TotalOutChPwr>
Range: see above
*RST: -56.1 dBm
Default unit: dBm

Example: See Specifying General Settings

Firmware/Software: V2.1.30

Manual operation: See "RF Power Downlink > Output Power (Ior)" on page 518

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:AWGN <Enable>[, <Level>]

Enables or disables AWGN insertion via the signaling unit and sets the total AWGN level within the channel bandwidth.

For dual carrier the same settings are applied to both carriers. Thus it is sufficient to configure one carrier.

Suffix:

<carrier>
1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Enable>
OFF | ON
Enables or disables the AWGN signal
*RST: OFF

<Level> The range of the AWGN level can be calculated as follows from the range of the output power stated below:
Min (AWGN) = Min (Output Power) - External Attenuation
Max (AWGN) = Max (Output Power) - External Attenuation - Base Level

Range: -130 dBm to -5 dBm for the output power at RF COM, -120 dBm to 8 dBm at RF OUT; please also notice the ranges quoted in the data sheet
*RST: -70 dBm
Default unit: dBm

Example: See Specifying General Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS410

Manual operation: See "RF Power Downlink > AWGN Noise (Ioc)" on page 518

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:GMTFactor?

Queries the ratio of the Output Channel Power (Ior) to the AWGN Noise power (Ioc). INV indicates that AWGN noise is disabled.

Suffix:
<carrier> 1..2
Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:
<Ratio> Range: -25.4 dB to 44.9 dB
*RST: INV
Default unit: dB

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS410

Manual operation: See "RF Power Downlink > Geometric Factor (Ior/Ioc)" on page 519

CONFigure:WCDMa:SIGN<i>:RFSettings:CARRier<carrier>:TOPower?

Queries the sum of the Output Channel Power (Ior) and the AWGN Noise power (Ioc).

Suffix:
<carrier> 1..2
Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:
<TotalOutputPow> Default unit: dBm

Example: See Specifying General Settings

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "RF Power Downlink > Total Output Power (Ior+Ioc)" on page 519

CONFigure:WCDMa:SIGN<i>:RFSettings:TOPower:TOTal?

Queries the sum of the Output Channel Power (Ior) and the AWGN Noise power (Ioc).

For dual carrier the result indicates the sum of the Ior and Ioc values of both carriers.

Return values:
<CombTotOutPwr> Default unit: dBm

Example: See Specifying General Settings

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "RF Power Downlink > Total Output Power (Ior+Ioc)" on page 519

CONFigure:WCDMa:SIGN<i>:RFSettings:ENPMode <Mode>

Selects the expected nominal power mode. The expected nominal power of the UL signal can be defined manually or calculated automatically, according to the UL power control settings.

For manual configuration see:

- `CONFigure:WCDMa:SIGN<i>:RFSettings:ENPower` on page 669
- `CONFigure:WCDMa:SIGN<i>:RFSettings:MARGin` on page 670

Parameters:
<Mode> MANual | ULPC

MANual: The expected nominal power and margin are specified manually.
ULPC: The expected nominal power is calculated according to the UL power control settings.

*RST: ULPC

Example: See Specifying General Settings

Firmware/Software: V2.1.20

Manual operation: See "RF Power Uplink > ..." on page 519

CONFigure:WCDMa:SIGN<i>:RFSettings:ENPower <ExpectedPower>

Sets the expected nominal power of the measured RF signal.

Parameters:

<ExpectedPower> The range of the expected nominal power can be calculated as follows:
Range (Expected Power) = Range (Input Power) + External Attenuation - User Margin

Range: –47 dBm to 34 dBm for the input power at the RF COM connectors (please notice also the ranges quoted in the data sheet).
*RST: 0 dBm
Default unit: dBm

Example: See Specifying General Settings

Firmware/Software: V1.0.15.0

Manual operation: See "RF Power Uplink > ..." on page 519

CONFigure:WCDMa:SIGN<i>:RFSettings:MARGin <UserMargin>

Sets the margin that the R&S CMW adds to the expected nominal power in order to determine the reference level in manual mode.

The reference level minus the external input attenuation must be within the power range of the selected input connector; refer to the data sheet.

Refer also to the following commands:

- `CONFigure:WCDMa:SIGN<i>:RFSettings:ENPMode` on page 669
- `CONFigure:WCDMa:SIGN<i>:RFSettings:ENPower` on page 669
- `CONFigure:WCDMa:SIGN<i>:RFSettings:EATTenuation:INPut` on page 661

Parameters:

<UserMargin> Range: 0 dB to (34 dB + External Attenuation - Expected Nominal Power)
*RST: 0 dB
Default unit: dB

Example: See Specifying General Settings

Firmware/Software: V2.1.20

Manual operation: See "RF Power Uplink > ..." on page 519

6.6.6 Internal Fading

The following commands configure the internal fader of the R&S CMW.

6.6.6.1 Fading Simulator

The following commands configure the fading simulator of the internal fader.

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:ENABle <Enable>

Enables/disables the fading simulator.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring Internal Fading

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Enable" on page 521

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:STANdard <Standard>

Selects one of the multipath propagation condition profiles defined in Annex B.2.2 of 3GPP TS 25.101.

Parameters:

<Standard> C1 | C2 | C3 | C4 | C5 | C6 | PA3 | PB3 | VA3 | VA30 | VA12

C1 to **C6**: Case 1 to Case 6
PA3 | PB3: ITU PA3 / PB3
VA3 | VA30 | VA12: ITU VA3 / VA30 / VA120

*RST: C1

Example: See Configuring Internal Fading

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Profile" on page 521

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:RESTart:MODE <RestartMode>

Sets the restart mode of the fading simulator.

Parameters:

<RestartMode> AUTO | MANual

AUTO: fading automatically starts with the DL signal
MANual: fading is started and restarted manually (see CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:RESTart)

*RST: AUTO

Example: See Configuring Internal Fading

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Restart Event" on page 521

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:RESTart

Restarts the fading process in `MANual` mode (see CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:RESTart:MODE).

Usage: Event

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Restart Event" on page 521

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:GLOBal:SEED <Seed>

Sets the start seed for the pseudo-random fading algorithm.

Parameters:

<Seed> Range: 0 to 9
*RST: 0

Example: See Configuring Internal Fading

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Start Seed" on page 521

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:ILOSs:MODE <InsertLossMode>

Sets the insertion loss mode.

Parameters:

<InsertLossMode> NORMal | USER

NORMal: the insertion loss is determined by the fading profile
USER: the insertion loss can be adjusted by the user

*RST: NORM

Example: See Configuring Internal Fading

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Insertion Loss" on page 521

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:ILOSs:LOSS <InsertionLoss>

Sets the insertion loss for the fading simulator.

A setting is only allowed in `MANual` mode (see `CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:ILOSs:MODE`).

Parameters:

<InsertionLoss> Range: 0 dB to 18 dB
*RST: 0 dB
Default unit: dB

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Insertion Loss" on page 521

CONFigure:WCDMa:SIGN<i>:FADing:FSIMulator:DSHift?

Queries the maximum Doppler frequency resulting from the configured internal fading profile.

Return values:

<Frequency> Range: 0 Hz to 2048 Hz
Default unit: Hz

Example: See Configuring Internal Fading

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Doppler Frequency" on page 521

6.6.6.2 DL Settings

The following commands query noise power information.

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:POWer:NOISe?

Queries the calculated noise power on the downlink carrier.

Suffix:
<carrier> 1..2
Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:
<NoisePower> Default unit: dBm

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Noise (System BW) Power" on page 522

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:POWer:NOISe:TOTal?

Queries the total noise power.

Suffix:
<carrier> 1..2
Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:
<NoisePower> Default unit: dBm

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Noise (Total BW) Power" on page 522

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:POWer:SUM?

Queries the calculated total power (signal + noise) on the downlink carrier.

Suffix:
<carrier> 1..2
Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:
<Power> Default unit: dBm

Example: See Configuring Internal Fading

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Signal + Noise (System BW) Power" on page 522

6.6.6.3 Fading Module AWGN

The following commands configure the AWGN generator of the internal fader.

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:AWGN:ENABle <Enable>

Enables or disables AWGN insertion via the fading module.

For dual carrier the same settings are applied to both carriers. Thus it is sufficient to configure one carrier.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring Internal Fading

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Enable" on page 522

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:AWGN:NOISe <Noise>

Sets the total AWGN level within the channel bandwidth, applicable to AWGN inserted via the internal fading module.

For dual carrier the same settings are applied to both carriers. Thus it is sufficient to configure one carrier.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Noise> Range: depends on connector, external attenuation, base level and insertion loss
*RST: -70 dBm
Default unit: dBm

Example: See Configuring Internal Fading

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Noise" on page 522

CONFigure:WCDMa:SIGN<i>:FADing:CARRier<carrier>:AWGN:SNRatio?

Queries the signal to noise ratio for the AWGN inserted on the internal fading module.

Suffix:

<carrier> 1..2
Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:

<Ratio> Range: -50 dB to 30 dB
Default unit: dB

Example: See Configuring Internal Fading

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS410, R&S CMW-KE100 and R&S CMW-KE400

Manual operation: See "Signal/Noise Ratio" on page 523

6.6.7 Physical Channel Downlink Settings

The commands in the following sections define characteristics of the physical downlink channels.

6.6.7.1 General Settings

The following commands define general physical downlink channel settings.

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:APOWer?

Queries the accumulated power (total power of all active channels relative to the base level of the generator).

Suffix:

<carrier> 1..2

Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:

<Power> Range: -80 dB to 10 dB

Default unit: dB

Example: See Configuring Physical Channel DL Settings

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "Accumulated Power" on page 524

CONFigure:WCDMa:SIGN<i>:DL:LEVel:ADJust

Corrects the power levels of all enabled channels to minimize the difference between the total power level of the channels and the base level

Example: See Configuring Physical Channel DL Settings

Usage: Event

Firmware/Software: V1.0.15.0

Manual operation: See "Accumulated Power" on page 524

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:OCNS:LEVel?

Queries the total OCNS channel power (relative to the base level of the generator). If no OCNS channels are present, INV is returned.

Suffix:

<carrier> 1..2

Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:

<Level> Range: -99 dB to 0 dB

Default unit: dB

Example: See Configuring Physical Channel DL Settings

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "OCNS" on page 524

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:OCNS:TYPE <Type>

Selects the type of OCNS channels to be generated, see chapter 6.2.9.5, "Orthogonal Channel Noise Simulator (OCNS)", on page 428.

You can select the type manually or use the automatic mode.

Suffix:

<carrier>	1..2 Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Type>	R99 | R5 | R6 | R7 | AUTO *RST: AUTO

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30
V3.0.30: added R7

Manual operation: See "OCNS" on page 524

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:CONFlict?

Queries the channelization code conflict status of the physical channels:

- **OFF**: channel causes no code conflict
- **ON**: code settings of this channel conflict with the code settings of another channel

Suffix:

<carrier>	1..2 Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:

<OCNS>	OFF | ON
<PCPICH>	OFF | ON
<SCPICH>	OFF | ON
<PCCPCH>	OFF | ON
<SCCPCH>	OFF | ON
<PICH>	OFF | ON
<AICH>	OFF | ON
<DPCH>	OFF | ON
<HSSCCH1>	OFF | ON
<HSSCCH2>	OFF | ON
<HSSCCH3>	OFF | ON
<HSSCCH4>	OFF | ON
<HSPDSCH>	OFF | ON
<EAGCH>	OFF | ON
<EHICH>	OFF | ON

<ERGCH>	OFF | ON
<FDPCH>	OFF | ON
Example:	See Configuring Physical Channel DL Settings
Usage:	Query only
Firmware/Software:	V2.1.30
Manual operation:	See "Code Conflict" on page 524

6.6.7.2 R99 Channels

The following commands configure the R99 channels (no HSPA).

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:PCPich <Level>

Sets the level of the P-CPICH.

Suffix:

<carrier>	1..2 Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Level>
Range: -80 dB to 0 dB
*RST: carrier 1: -3.3 dB, carrier 2: -4.4 dB
Default unit: dB

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30
V3.1.10: ON / OFF no longer allowed, always ON

Manual operation: See "Channel Table > Level" on page 525

CONFigure:WCDMa:SIGN<i>:DL:LEVel:SCPich <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:PSCH <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:SSCH <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:PCCPch <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:SCCPch <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:PICH <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:AICH <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:DPCH <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:FDPCh <Level>

Set the level of the channel indicated by the last mnemonic. Setting a power level also activates the channel.

Parameters:

<Level>
Range: -80 dB to 0 dB, AICH: -50 dB to 0 dB
*RST: S-CPICH: OFF (-3.3 dB), P-SCH: -8.3 dB, S-SCH: -8.3 dB, P-CCPCH: -5.3 dB, S-CCPCH: -5.3 dB, PICH: -8.3 dB, AICH: -8.3 dB, DPCH: -10.3 dB, F-DPCH: -10.3 dB
Additional parameters: OFF | ON (disables the channel | enables the channel using the previous/default level)

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0
V3.0.30: F-DPCH added

Options: For S-CPICH: R&S CMW-KS410
For F-DPCH: R&S CMW-KS413

Manual operation: See "Channel Table > Level" on page 525

CONFigure:WCDMa:SIGN<i>:DL:CODE:SCPich <ChannelCode>
CONFigure:WCDMa:SIGN<i>:DL:CODE:SCCPch <ChannelCode>
CONFigure:WCDMa:SIGN<i>:DL:CODE:PICH <ChannelCode>
CONFigure:WCDMa:SIGN<i>:DL:CODE:AICH <ChannelCode>
CONFigure:WCDMa:SIGN<i>:DL:CODE:DPCH <ChannelCode>
CONFigure:WCDMa:SIGN<i>:DL:CODE:FDPCh <ChannelCode>

Set the channelization code number of the channel indicated by the last mnemonic.

Parameters:

<ChannelCode> Range: see table below
*RST: see table below

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0
V2.1.20: *RST values changed
V3.0.30: F-DPCH added

Options: For S-CPICH: R&S CMW-KS410
For F-DPCH: R&S CMW-KS413

Manual operation: See "Channel Table > Code" on page 526

Channel	Minimum	Maximum	*RST
S-CPICH	0	255	11
S-CCPCH	0	63	2
PICH	0	255	2
AICH	0	255	3
DPCH	0	depends on connection type and data rate	3
F-DPCH	0	255	6

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:PCPich?

Queries the channelization code number of the P-CPICH.

Suffix:

<carrier> 1..2
Selects the carrier for which the information shall be queried - only relevant for dual carrier scenario

Return values:

<ChannelCode> The returned value is fixed.
Range: 0

Usage: Query only

Firmware/Software: V2.1.30

Manual operation: See "Channel Table > Code" on page 526

CONFigure:WCDMa:SIGN<i>:DL:CODE:PCCPch?

Queries the channelization code number of the P-CCPCH.

Return values:

<ChannelCode> The returned value is fixed.
Range: 1

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "Channel Table > Code" on page 526

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:PCPich:SLEVel <SignalledLevel>

Defines the P-CPICH power level to be reported to the UE.

Suffix:
<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:
<SignalledLevel> Range: -10 dBm to 50 dBm
*RST: 31 dBm
Default unit: dBm

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Manual operation: See "P-CPICH Enhanced > Signalized Level" on page 526

CONFigure:WCDMa:SIGN<i>:DL:ENHanced:SCPich:SSCode <SecScrambCode>

Defines index k used for calculation of a secondary scrambling code number for the S-CPICH (see also chapter 6.2.9.3, "Scrambling Codes", on page 426).

If the secondary scrambling code is deactivated, the primary scrambling code is used (see `CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:SCODe`).

Parameters:
<SecScrambCode> Range: 1 to 15
*RST: 1
Additional parameters: OFF | ON (disables | enables the secondary scrambling code)

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0
V2.1.20: *RST value modified and 0 removed from range

Options: R&S CMW-KS410

Manual operation: See "S-CPICH Enhanced > 2nd Scrambling Code" on page 526

CONFigure:WCDMa:SIGN<i>:DL:ENHanced:SCPich:PHASe <Phase>

Defines the phase of the S-CPICH in degrees, relative to the P-CPICH phase.

Parameters:

<Phase>
Range: -315 deg to 0 deg
Increment: 45 deg
*RST: 0 deg
Default unit: deg

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "S-CPICH Enhanced > Phase" on page 527

CONFigure:WCDMa:SIGN<i>:DL:ENHanced:AICH:TTIMing <TransmTiming>

Defines the minimum allowed time delay between two consecutive RACH preambles.

Parameters:

<TransmTiming> Minimum time delay
Range: 3 slots to 4 slots
*RST: 3 slots

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "AICH Enhanced > Transmission Timing" on page 527

CONFigure:WCDMa:SIGN<i>:DL:ENHanced:AICH:ACKNowledge <Acknowledge>

Defines how the R&S CMW acknowledges RACH preambles received from the UE.

Parameters:

<Acknowledge> POSitive | NEGative

POSitive: The R&S CMW acknowledges or negatively acknowledges the preambles appropriately.
NEGative: The R&S CMW always responds with negative acknowledgements.

*RST: POS

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "AICH Enhanced > Acknowledge" on page 527

CONFigure:WCDMa:SIGN<i>:DL:ENHanced:DPCH:SSCode <SecScrambCode>

Defines index k used for calculation of a secondary scrambling code number for the DPCH (see also chapter 6.2.9.3, "Scrambling Codes", on page 426).

If the secondary scrambling code is deactivated, the primary scrambling code is used (see `CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:SCODe`).

Parameters:

<SecScrambCode> Range: 1 to 15
*RST: 1
Additional parameters: OFF | ON (disables | enables the secondary scrambling code)

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0
V2.1.20: *RST value modified and 0 removed from range

Manual operation: See "DPCH Enhanced > 2nd Scrambling Code" on page 527

CONFigure:WCDMa:SIGN<i>:DL:ENHanced:DPCH:POFFset <PowerOffset>

Defines the power of the DPCCH relative to the power of the DPDCH. The DPDCH power is configured as DPCH power, see `CONFigure:WCDMa:SIGN<i>:DL:LEVel:DPCH`.

Parameters:

<PowerOffset> Range: 0 dB to 6 dB
*RST: 0 dB
Default unit: dB

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "DPCH Enhanced > Power Offset" on page 527

CONFigure:WCDMa:SIGN<i>:DL:ENHanced:DPCH:TOFFset <TimingOffset>

Defines the offset between the DL P-CCPCH timing and the DL DPCH timing in multiples of 256 chips (1/10 slot).

Parameters:

<TimingOffset> Range: 0 to 149
*RST: 0

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "DPCH Enhanced > Timing Offset" on page 527

6.6.7.3 HS-SCCH Configuration

The following commands configure an HS-SCCH set with up to four HS-SCCH channels.

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:HSSCch<no> <Level>

Sets the level of an HS-SCCH channel. Setting a power level also enables the channel.

Suffix:

<no> 1..4
Selects the HS-SCCH to be configured

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Level> Range: -80 dB to 0 dB
*RST: carrier 1: -10.3 dB, carrier 2: -11.4 dB (first two channels ON)
Default unit: dB
Additional parameters: OFF | ON (disables | enables the channel)

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

Manual operation: See "Level" on page 528

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:HSSCch<no> <ChannelCode>

Sets the channelization code number of an HS-SCCH channel.

Suffix:

<no> 1..4
Selects the HS-SCCH to be configured

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<ChannelCode> Range: 0 to 127
*RST: Channel 1 to 4: 2, 7, 8, 9

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

Manual operation: See "Channel Code" on page 528

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:HSSCch<no>:UEID <UEID>

Sets the UE identity for an HS-SCCH channel.

In the current software version only one UE ID is configured for the HS-SCCH set of one carrier. Changing the value for one channel changes also the values of the other channels.

Suffix:

<no> 1..4
Selects the HS-SCCH to be configured

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<UEID> Range: 0 (#H0) to 65535 (#HFFFF)
*RST: #HAAAA

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "UE ID" on page 529

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:HSSCch<no>:IDDummy <DummyUEID>

Sets the dummy UE identity to be sent in subframes which are not allocated to the UE. Individual values can be set per HS-SCCH.

Suffix:

<no> 1..4
Selects the HS-SCCH to be configured

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<DummyUEID> Range: 0 (#H0) to 65535 (#HFFFF)
*RST: Channel 1 to 4: #H5555, #12AA, #H1AAA, #H1FAA

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "UE ID Dummy" on page 529

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSSCch:SELection <Type>

Selects the HS-SCCH that carries the UE ID in scheduled subframes.

The number <n> used below is set via `CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSSCch:NUMBer` on page 687.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Type> CH1 | CH2 | CH3 | CH4 | RANDom | AUTomatic

CH1 to **CH4**: The UE ID is transferred on the selected HS-SCCH.
RANDom: The HS-SCCH for each transmission is selected at random among the channels 1 to <n>.
AUTomatic: For a R5 connection, the UE ID is transferred on the HS-SCCH sequence 1, 2,…, <n>, 1, 2 and so on. For a R7/R8 connection, the UE ID is transferred on the appropriate HS-SCCH automatically selected depending on the used modulation scheme.

*RST: AUT

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Selection" on page 529

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSSCch:NUMBer <Number>

Configures the number of HS-SCCHs contained in the HS-SCCH set. <Number> = n means that the set contains the HS-SCCHs number 1 to n.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Number> Range: 1 to 4
*RST: 2

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Number of HSSCCH" on page 530

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSSCch: USFRames <Type>

Defines the transmission in unscheduled HS-SCCH subframes.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Type> DUMMy | DTX

DUMMy: maintain HS-SCCH power and transfer dummy UE ID, see `CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:HSSCch<no>:IDDummy` on page 686

DTX: switch off output power in unscheduled subframes

*RST: DUMM

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Unscheduled Subframes" on page 530

6.6.7.4 HS-PDSCH Configuration

The following commands configure the HS-PDSCH.

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:LEVel:HSPDsch <Level>

Sets the level of the HS-PDSCH summed over all active codes. Setting a power level also enables the channel.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Level> Range: -80 dB to 0 dB
*RST: carrier 1: -9.3 dB, carrier 2: -10.4 dB
Default unit: dB
Additional parameters: OFF | ON (disable | enable the channel)

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

Manual operation: See "Level" on page 531

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:CODE:HSPDsch <ChannelCode>

Sets the first channelization code number of the HS-PDSCH.

The number of assigned codes depends on the HSDPA channel configuration. For a fixed reference channel for example it depends on the H-Set. For a user defined channel the number is configured directly.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<ChannelCode> Range: 0 to 16 - <number of assigned codes>
*RST: 1

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

Manual operation: See "Channel Code" on page 532

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSPDsch:POFFset <Control>[, <PwrOffsetManual>]

Selects whether the measurement power offset Γ is set manually or calculated automatically. Optionally a second parameter can be sent to modify the manual power offset value. It is not relevant for automatic calculation.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Control> AUTO | MANual

AUTO: The correct value Γ is calculated automatically.
MANual: The value Γ is set manually via the parameter `<PwrOffsetManual>`.

*RST: AUTO

<PwrOffsetManual> Range: -6 dB to 13 dB
*RST: 13 dB
Default unit: dB

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Meas. Power Offset Control, Meas. Power Offset" on page 532

CONFigure:WCDMa:SIGN<i>:DL:CARRier<carrier>:ENHanced:HSPDsch:USFRames <Type>

Defines the transmission in unscheduled HS-DSCH subframes.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Type> DUMMy | DTX

DUMMy: maintain the HS-DSCH power by sending dummy data
DTX: switch off the output power

*RST: DUMM

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Unscheduled Subframes" on page 532

6.6.7.5 HSUPA DL Channel Configuration

The following commands configure the downlink channels related to HSUPA.

CONFigure:WCDMa:SIGN<i>:DL:LEVel:EAGCh <Level>

Sets the level of the E-AGCH. Setting a power level also activates the channel.

Parameters:

<Level> Range: -80 dB to 0 dB
*RST: -9.3 dB
Default unit: dB
Additional parameters: OFF | ON (disables the channel | enables the channel using the previous/default level)

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Level" on page 533

CONFigure:WCDMa:SIGN<i>:DL:LEVel:EHICh <Level>
CONFigure:WCDMa:SIGN<i>:DL:LEVel:ERGCh <Level>

Set the level of the channel indicated by the last mnemonic. Setting a power level also activates the channel indicated by the last mnemonic.

E-HICH and E-RGCH use the same power level. Setting the level for one channel sets the same level for the other channel.

Disabling the E-HICH disables also the E-RGCH. Enabling the E-RGCH enables also the E-HICH.

Parameters:

<Level>
Range: -80 dB to 0 dB
*RST: E-HICH: -12.3 dB, E-RGCH: OFF (-12.3 dB)
Default unit: dB
Additional parameters: OFF | ON (disables the channel | enables the channel using the previous/default level)

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Level" on page 533

CONFigure:WCDMa:SIGN<i>:DL:CODE:EAGCh <ChannelCode>

Sets the channelization code number of the E-AGCH.

Parameters:

<ChannelCode>
Range: 0 to 255
*RST: 3

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Channel Code" on page 533

CONFigure:WCDMa:SIGN<i>:DL:CODE:EHICh <ChannelCode>
CONFigure:WCDMa:SIGN<i>:DL:CODE:ERGCh <ChannelCode>

E-HICH and E-RGCH use the same channelization code number. Any of the two commands sets the channelization code number for both channels.

Parameters:

<ChannelCode>	Range:	0 to 127
	*RST:	6

Example: See Configuring Physical Channel DL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Channel Code" on page 533

6.6.8 Physical Channel Uplink Settings

The following sections describe the commands related to uplink settings. Most values are signaled to the UE.

6.6.8.1 Miscellaneous Settings

The following commands define uplink settings located at the highest level of the "Physical Uplink Settings" section in the GUI.

CONFigure:WCDMa:SIGN<i>:UL:MUEPower <MaxUEpower>

Sets the maximum allowed output power of the UE transmitter (averaged over the transmit slot).

Parameters:

<MaxUEpower>	Range:	-50 dBm to 33 dBm
	*RST:	33 dBm
	Default unit:	dBm

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Maximum UE Power" on page 536

CONFigure:WCDMa:SIGN<i>:UL:UEPClass:MANual <UEPowerClass>

Configures the UE power class value to be used by the R&S CMW if no reported value is available or usage of the reported value is disabled, see `CONFigure:WCDMa:SIGN<i>:UL:UEPClass:REPorted`.

Parameters:

<UEPowerClass> PC1 | PC2 | PC3 | PC3B | PC4

Power class 1, 2, 3, 3bis, 4

*RST: PC1

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V2.1.20

Manual operation: See "UE Power Class" on page 536

CONFigure:WCDMa:SIGN<i>:UL:UEPClass:REPorted <UseReported>

Enable or disable usage of the UE power class value reported by the UE.

When disabled, the power class value must be set manually, see `CONFigure:WCDMa:SIGN<i>:UL:UEPClass:MANual`. The manually set value is also used if no reported value is available.

Parameters:

<UseReported> OFF | ON

*RST: ON

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V2.1.20

Manual operation: See "UE Power Class" on page 536

CONFigure:WCDMa:SIGN<i>:UL:POFFset <PowerOffset>

Sets the DPCCH power offset, used by the UE to calculate the initial DPCCH power for random access.

Parameters:

<PowerOffset> Range: -164 dB to -6 dB

*RST: -80 dB

Default unit: dB

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "DPCCH Power Offset" on page 536

SENSe:WCDMa:SIGN<i>:UL:EIPower?

Queries the expected initial DPCCH power.

Return values:

<ExpDPCCHPower>	Range:	-160 dBm to 33 dBm
	*RST:	-20.6 dBm
	Default unit:	dBm

Example: See Configuring Physical Channel UL Settings

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Expected Initial DPCCH Power" on page 536

CONFigure:WCDMa:SIGN<i>:UL:SCODe <ScramblingCode>

Sets the long code number that the UE shall use to scramble the uplink WCDMA signal.

Parameters:

<ScramblingCode>	Range:	#H0 to #HFFFFFF
	*RST:	#H0

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Uplink Scrambling Code" on page 537

6.6.8.2 Open Loop Power Control and PRACH Settings

The following commands define basic parameters related to open loop power control and the physical random access procedure.

CONFigure:WCDMa:SIGN<i>:UL:OLPControl:CVALue <ConOffsetValue>

Sets the constant offset value for the initial preamble power.

Parameters:

<ConOffsetValue>	Range:	-35 dB to -10 dB
	*RST:	-29 dB
	Default unit:	dB

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Constant Offset Value" on page 537

CONFigure:WCDMa:SIGN<i>:UL:OLPControl:INTerference <Interference>

Estimated UL interference contained in System Information Block type 7.

Parameters:

<Interference> Range: -110 dBm to -70 dBm
*RST: -80 dBm
Default unit: dBm

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Manual operation: See "UL Interference" on page 537

SENSe:WCDMa:SIGN<i>:UL:OLPControl:EIPPower?

Queries the expected initial preamble power.

Return values:

<ExpPreamblePwr> Range: -160 dBm to 33 dBm
*RST: -18.6 dBm
Default unit: dBm

Example: See Configuring Physical Channel UL Settings

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Exp. Initial Preamble Power" on page 537

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:SIGNature <Signature>

Specifies which of the 16 signatures defined by 3GPP TS 25.213 are available and associated with the PRACH. The information is coded in a 16-bit number where the bits from left to right indicate the availability of signature 15 to signature 0 (0=not available, 1=available).

Parameters:

<Signature> Range: #B0000000000000000 to #B1111111111111111
*RST: #B1111111111111111

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Preamble Signature" on page 538

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:SUBChannels <SubChannels>

Specifies which of the 12 PRACH subchannels are available. The information is coded in a 12-bit number where the bits from left to right indicate the availability of subchannel 11 to subchannel 0 (0=not available, 1=available).

The default format is decimal, but you can also enter binary numbers (#B000000000000 to #B111111111111).

Parameters:

<SubChannels> Range: #B000000000000 to #B111111111111
*RST: #B000000000001

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Preamble Subchannels" on page 538

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:MRETrans <Retransmission>

Sets the maximum number of preambles to be transmitted before a single preamble cycle is terminated.

Parameters:

<Retransmission> Range: 1 to 64
*RST: 6

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Preamble Maximum Retransmission" on page 538

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:AICH <Preambles>

Specifies the number of preambles to be received before the instrument transmits the AICH.

Parameters:

<Preambles> Range: 1 to 6
*RST: 1

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS410

Manual operation: See "Preambles before AICH Transmission" on page 538

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:SSIZe <StepSize>

Specifies the transmit power difference between two consecutive preambles.

Parameters:

<StepSize> Range: 1 dB to 8 dB
*RST: 3 dB
Default unit: dB

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Preamble Step Size" on page 539

CONFigure:WCDMa:SIGN<i>:UL:PRACh:PREamble:MCYCles <MaxCycles>

Specifies the maximum number of times the preamble cycle is repeated.

Parameters:

<MaxCycles> Range: 1 to 32
*RST: 2

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Preamble Part Max Cycles" on page 539

CONFigure:WCDMa:SIGN<i>:UL:PRACh:MESSage:POFFset <PowerOffset>

Specifies the power difference between the last preamble transmitted and the RACH message part.

Parameters:

<PowerOffset> Range: -5 dB to 10 dB
*RST: -5 dB
Default unit: dB

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0: Query only
V2.1.20: Setting also supported

Options: R&S CMW-KS410

Manual operation: See "Message Part Power Offset" on page 539

CONFigure:WCDMa:SIGN<i>:UL:PRACh:MESSage:LENGth <MsgPartLength>

Specifies the length of the RACH Transmission Time Interval (TTI).

Parameters:

<MsgPartLength> Range: 0.01 s to 0.02 s
Increment: 0.01 s
*RST: 0.02 s
Default unit: s

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0: Query only
V2.1.20: Setting also supported

Options: R&S CMW-KS410

Manual operation: See "Message Part Length" on page 539

CONFigure:WCDMa:SIGN<i>:UL:PRACh:DRXCycle <CycleLength>

Specifies the DRX cycle length.

Parameters:

<CycleLength> Cycle length in multiples of 2 frames

Range: 6 to 9
*RST: 8

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0: Query only
V2.1.20: Setting also supported

Options: R&S CMW-KS410

Manual operation: See "DRX Cycle Length" on page 539

6.6.8.3 TX Power Control Settings

The following commands configure TPC settings and execute TPC setups.

CONFigure:WCDMa:SIGN<i>:UL:TPC:SET <SetType>

Selects the active TPC setup. A query returns also properties of the active setup.

Parameters:

<SetType> CLOop | ALTernating | ALL1 | ALL0 | SALT | SAL1 | SAL0 | CONTinuous | TSE | TSF | PHUP | PHDown | TSABc | TSEF | TSGH | MPEDch | CTFC

CLOop: Closed Loop
ALTernating: Alternating
ALL1: All 1
ALL0: All 0
SALT: Single Pattern + Alternating
SAL1: Single Pattern + All 1
SAL0: Single Pattern + All 0
CONTinuous: Continuous Pattern
TSE: TPC Test Step E
TSF: TPC Test Step F
PHUP: Phase Discontinuity Up
PHDown: Phase Discontinuity Down
TSABc: TPC Test Step ABC
TSEF: TPC Test Step EF
TSGH: TPC Test Step GH
MPEDch: Max. Power E-DCH
CTFC: Change of TFC

*RST: CLO

Return values:

<PreCondition> NONE | ALTernating | MAXPower | MINPower | TPOWer

Precondition of the active setup

<PConfig> Active setup configuration information. The content depends on the setup type:
- closed loop: target power in dBm
- single and continuous patterns: user defined pattern
- phase discontinuity: number of repetitions
- test step EF, GH: number of 0 bits
- others: presentation of the fixed pattern

<Trigger> ONCE | PERiodic

Type of generated trigger signal, see chapter 6.2.13.8, "Generating TPC Trigger Signals", on page 447

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V1.0.15.0
V2.1.20: setups TSABc, TSEF, TSGH
V3.0.30: setups MPEDch, CTFC

Options: R&S CMW-KS401 for MPEDch
R&S CMW-KS410 for CTFC

Manual operation: See "Active TPC Setup" on page 540

CONFigure:WCDMa:SIGN<i>:UL:TPC:PRECondition

Reach the precondition defined for the active TPC pattern setup. Corresponds to pressing the "Precond." button.

Example: See Configuring and Executing a TPC Setup

Usage: Event

Firmware/Software: V1.0.15.0

Manual operation: See "TPC State" on page 540

CONFigure:WCDMa:SIGN<i>:UL:TPC:PEXecute

Execute the active TPC pattern setup. Corresponds to pressing the "Execute" button. For pattern setups with precondition it is recommended to press the "Precond." button first (`CONFigure:WCDMa:SIGN<i>:UL:TPC:PRECondition`).

Example: See Configuring and Executing a TPC Setup

Usage: Event

Firmware/Software: V1.0.15.0

Manual operation: See "TPC State" on page 540

CONFigure:WCDMa:SIGN<i>:UL:TPC:STATe?

Queries the current TPC state.

Return values:

<State> IDLE | CONTinous | ALTernating | TPLocked | TPUNlocked | MAXPower | MINPower | TRANsition | SINGle | SEARching | FAILed | MRESource | SCONflict | SCHanged

IDLE: no connection established
CONTinuous: transmitting continuous pattern
ALTernating: transmitting alternating pattern
TPLocked: closed loop target power reached
TPUNlocked: reaching closed loop target power failed
MAXPower: maximum power reached
MINPower: minimum power reached
TRANsition: transition to a state, e.g. to maximum power
SINGle: transmitting a single user defined pattern
Only relevant for "Max. Power E-DCH" setup:
SEARching: setup started, max power not yet reached
FAILed: test procedure failed in state "Searching"
MRESource: required resources are blocked/not available
SCONflict: settings are inappropriate for the setup
SCHanged: relevant settings changed after setup execution

*RST: IDLE

Example: See Configuring and Executing a TPC Setup

Usage: Query only

Firmware/Software: V1.0.15.0
V3.0.30: added SEARching, FAILed, MRESource, SCONflict, SCHanged

Manual operation: See "TPC Condition" on page 541

CONFigure:WCDMa:SIGN<i>:UL:TPC:MPEDch:STATe?

Queries the E-TFCI information for the TPC setup "Max. Power E-DCH".

Return values:

<CurrentETFCI> Monitored "Current E-TFCI" value

Range: 0 to 127

<TargetETFCI> Calculated "Target E-TFCI" value

Range: 0 to 127

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

Manual operation: See "Max. Power E-DCH Condition" on page 541

CONFigure:WCDMa:SIGN<i>:UL:TPC:MODE <Mode>

Defines the power control algorithm and the TPC step size configured at the UE.

Parameters:

<Mode> A2S1 | A1S1 | A1S2

A2S1: algorithm 2, step size 1 dB
A1S1: algorithm 1, step size 1 dB
A1S2: algorithm 1, step size 2 dB

*RST: A1S1

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V1.0.15.0

Manual operation: See "Alg. / Step Size" on page 542

CONFigure:WCDMa:SIGN<i>:UL:TPC:PATTern <Pattern>

Sets the "User Defined Pattern" to be used for "Single Pattern" and "Continuous Pattern".

Parameters:

<Pattern> String to specify the pattern.

Range: up to 60 zeros and ones
*RST: '00000000001111111111'

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V1.0.15.0

Manual operation: See "User Defined Pattern" on page 542

CONFigure:WCDMa:SIGN<i>:UL:TPC:TPOWer:REFerence <Reference>

Selects the type of the closed loop target power.

Parameters:

<Reference> TOTal | DPCH

TOTal: maximum total uplink power
DPCH: maximum DPCH power

*RST: TOT

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V3.0.10

Manual operation: See "Target Power" on page 542

CONFigure:WCDMa:SIGN<i>:UL:TPC:TPOWer <TargetPower>

Specifies a target power for the target power precondition and for the closed loop setup.

The allowed range depends on the active setup:

- Setup "Max. Power E-DCH": 0 dBm to 33 dBm
- Other setups: -50 dBm to 33 dBm

Parameters:

<TargetPower> Range: depends on active setup, see above
*RST: -20 dBm
Default unit: dBm

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V1.0.15.0

Manual operation: See "Target Power" on page 542

CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PREcondition:SINGle <Condition>
CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PREcondition:PHUP <Condition>
CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PREcondition:PHDown <Condition>

Select the preconditions for "Single Pattern", "Phase Discontinuity Up" and "Phase Discontinuity Down".

Parameters:

<Condition> ALTernating | MAXPower | MINPower | TPOWer
*RST: ALT

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V1.0.15.0
V2.1.20: TPOWer added

Manual operation: See "TPC Setup" on page 543

CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PREcondition:CONTinuous <Condition>

Select the precondition for "Continuous Pattern".

Parameters:

<Condition> NONE | ALTernating | MAXPower | MINPower | TPOWer
*RST: NONE

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V1.0.15.0
V2.1.20: TPOWer added

Manual operation: See "TPC Setup" on page 543

CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:TSEF <Length>

Defines the number of 0 bits to be sent before the all 1 pattern is started for TPC setup "TPC Test Step EF".

Parameters:

<Length> Range: 100 to 170
*RST: 120

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V2.1.20

Manual operation: See "TPC Setup" on page 543

CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:TSGH <Length>

Defines the number of 0 bits to be sent before the all 1 pattern is started for TPC setup "TPC Test Step GH".

Parameters:

<Length> Range: 60 to 170
*RST: 80

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V2.1.20

Manual operation: See "TPC Setup" on page 543

CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:TSSegment <Enable>

Enables or disables segmentation for test steps E, F, G and H.

Parameters:

<Enable> OFF | ON
*RST: OFF

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V2.1.20

Manual operation: See "TPC Setup" on page 543

CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:PHUP <Repetition>
CONFigure:WCDMa:SIGN<i>:UL:TPCSet:PCONfig:PHDown <Repetition>

Define the number of times the pattern shall be repeated for Phase Discontinuity Up/ Down.

Parameters:

<Repetition> Range: 1 to 13
*RST: 13

Example: See Configuring and Executing a TPC Setup

Firmware/Software: V1.0.15.0

Manual operation: See "TPC Setup" on page 543

6.6.8.4 Gain Factor Settings

The following commands configure gain factors and power offsets for uplink channels.

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:RMC<no> <BetaC>, <BetaD>

Specifies the UE gain factors β_c (DPCCH) and β_d (DPDCH) for RMC connections with the selected data rate.

Suffix:

<no> 1..5
Selects the RMC data rate
1: 12.2 kbps
2: 64 kbps
3: 144 kbps
4: 384 kbps
5: 768 kbps

Parameters:

<BetaC> Range: 1 to 15
*RST: 8, 5, 4, 4, 4 for <no> 1 to 5

<BetaD> Range: 1 to 15
*RST: 15

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0
V2.1.30: added <no> = 5
V3.0.10: R&S CMW-KS410 no longer required

Manual operation: See "βC, βD" on page 544

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:VOICe <BetaC>, <BetaD>

Specifies the UE gain factors β_c (DPCCH) and β_d (DPDCH) for voice connections.

Parameters:

<BetaC> Range: 1 to 15
*RST: 11

<BetaD> Range: 1 to 15
*RST: 15

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0
V3.0.10: R&S CMW-KS410 no longer required

Manual operation: See "βC, βD" on page 544

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:VIDeo <BetaC>, <BetaD>

Specifies the UE gain factors β_c (DPCCH) and β_d (DPDCH) for video connections.

Parameters:

<BetaC>	Range:	1 to 15
	*RST:	9
<BetaD>	Range:	1 to 15
	*RST:	15

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V1.0.15.0
V3.0.10: R&S CMW-KS410 no longer required

Manual operation: See "βC, βD" on page 544

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSDPa <BetaC>, <BetaD>, <DeltaACK>, <DeltaNACK>, <DeltaCQI>

Specifies the UE gain factors and power offsets for HSDPA connections.

Parameters:

<BetaC>	Range:	1 to 15
	*RST:	9
<BetaD>	Range:	1 to 15
	*RST:	15
<DeltaACK>	Range:	0 to 8
	*RST:	5
<DeltaNACK>	Range:	0 to 8
	*RST:	5
<DeltaCQI>	Range:	0 to 8
	*RST:	2

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V2.1.20
V3.0.10: required option changed

Options: R&S CMW-KS401

Manual operation: See "βC, βD" on page 544

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:EDPCch <Delta>

Specifies the signaled value ΔE-DPCCH for HSUPA.

Parameters:

<Delta>	Range:	0 to 8
	*RST:	5

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSUPA" on page 544

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:ETFCi:NUMBer <Number>

Specifies how many pairs of reference E-TFCIs and assigned power offset values are signaled to the UE.

Parameters:

<Number> Range: 1 to 8
*RST: 1

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSUPA" on page 544

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:ETFCi:REFerence <ETFCI>...

Specifies the E-TFCI values of the first n pairs of reference E-TFCIs and power offsets, with n = 1 to 8.

Parameters:

<ETFCI> Comma separated list of up to 8 values
Range: 0 to 127
*RST: 11,67,71,75,81,90,100,127

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSUPA" on page 544

CONFigure:WCDMa:SIGN<i>:UL:GFACtor:HSUPa:ETFCi:POFFset <PowerOffset>...

Specifies the power offset values of the first n pairs of reference E-TFCIs and power offsets, with n = 1 to 8.

Parameters:

<PowerOffset> Comma separated list of up to 8 values
Range: 0 to 29
*RST: 4,18,23,26,27,28,29,29

Example: See Configuring Physical Channel UL Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSUPA" on page 544

6.6.9 Connection Configuration

The commands in this section select a connection type and define parameters for the supported connection types.

6.6.9.1 Miscellaneous Settings

The following commands define settings located at the highest level of the "Connection Configuration" section in the GUI.

CONFigure:WCDMa:SIGN<i>:CONNection:UETerminate <Type>

Selects the connection type to be used for UE terminating connections initiated by the instrument.

Parameters:

<Type> VOICe | VIDeo | SRB | TEST

*RST: TEST

Example: See Configuring Connection Types

Firmware/Software: V1.0.15.0
V2.1.20: *RST = RMC
V3.0.20: RMC substituted by TEST (RMC still supported as alias)

Manual operation: See "UE term. Connection" on page 546

CONFigure:WCDMa:SIGN<i>:CONNection:SRBData <Downlink>, <Uplink>

Selects the SRB data rate for downlink and uplink.

Parameters:

<Downlink> R1K7 | R2K5 | R3K4 | R13K6

R1K7: 1.7 kbps
R2K5: 2.5 kbps
R3K4: 3.4 kbps
R13K6: 13.6 kbps

*RST: R13K6

<Uplink> R1K7 | R2K5 | R3K4 | R13K6

R1K7: 1.7 kbps
R2K5: 2.5 kbps
R3K4: 3.4 kbps
R13K6: 13.6 kbps

*RST: R13K6

Example: See Configuring Connection Types

Firmware/Software: V1.0.15.0

Manual operation: See "SRB Data Rate" on page 546

6.6.9.2 Voice Connection Settings

The following commands configure voice connections.

CONFigure:WCDMa:SIGN<i>:CONNection:VOICe:CODec <Codec>

Selects the AMR voice codec type to be used: narrowband or wideband.

Parameters:

<Codec> NB | WB

NB: narrowband
WB: wideband

*RST: NB

Example: See Configuring Connection Types

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Voice Codec" on page 547

CONFigure:WCDMa:SIGN<i>:CONNection:VOICe:AMR:NARRow <Rate>

Selects the mode of the NB AMR codec. The basic modes support one fixed bit-rate. Mode M supports several bit-rates.

Parameters:

<Rate>	A | B | C | D | E | F | G | H | M **A**: 12.2 kbps **B**: 10.2 kbps **C**: 7.95 kbps **D**: 7.4 kbps **E**: 6.7 kbps **F**: 5.9 kbps **G**: 5.15 kbps **H**: 4.75 kbps **M**: A + C + F + H *RST: A
Example:	See Configuring Connection Types
Firmware/Software:	V1.0.15.0
Options:	R&S CMW-KS410
Manual operation:	See "NB AMR" on page 547

CONFigure:WCDMa:SIGN<i>:CONNection:VOICe:AMR:WIDE <Rate>

Selects the mode of the WB AMR codec. The basic modes support one fixed bit-rate. Mode M supports several bit-rates.

Parameters:

<Rate>	A | B | C | D | E | F | G | H | I | M **A**: 23.85 kbps **B**: 23.05 kbps **C**: 19.85 kbps **D**: 18.25 kbps **E**: 15.85 kbps **F**: 14.25 kbps **G**: 12.65 kbps **H**: 8.85 kbps **I**: 6.60 kbps **M**: G + H + I *RST: I
Firmware/Software:	V1.0.15.0
Options:	R&S CMW-KS410
Manual operation:	See "WB AMR" on page 547

6.6.9.3 Video Connection Settings

The following command is related to video connections.

CONFigure:WCDMa:SIGN<i>:CONNection:VIDeo:DRATe?

Queries the data rate for video calls.

Return values:

<Rate>	R64K **R64K**: 64 kbps
Usage:	Query only
Firmware/Software:	V1.0.15.0
Manual operation:	See "Data Rate" on page 547

6.6.9.4 SRB Connection Settings

The following command configures "SRB only" connections.

CONFigure:WCDMa:SIGN<i>:CONNection:SRBSingle:TYPE <Type>

Selects the radio resource control state to which the UE is commanded when an "SRB only" connection is set up.

Parameters:

<Type>	CDCH | CFACh **CDCH**: Cell_DCH **CFACh**: CELL_FACH *RST: CDCH
Example:	See Configuring Connection Types
Firmware/Software:	V1.0.15.0
Options:	R&S CMW-KS410
Manual operation:	See "Type" on page 548

6.6.9.5 Test Mode Connection Settings

The following commands configure RMC and HSPA test mode connections.

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:TYPE <Type>

Selects the test mode connection type.

Parameters:

<Type> RMC | HSPA | RHSPa

RMC: RMC in CS domain
HSPA: HSPA in PS domain
RHSPa: RMC plus HSPA

*RST: RMC

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401 for HSPA, RHSPa

Manual operation: See "Type" on page 548

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:KTLReconfig <Enable>

Specifies whether the test loop is kept closed when the operating band or the carrier frequency is reconfigured during an established test mode connection with test loop.

Parameters:

<Enable> OFF | ON

ON: keep test loop closed
OFF: open test loop, perform reconfiguration, close test loop

*RST: OFF

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Manual operation: See "Keep Test Loop during Reconfiguration" on page 549

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:DRATe <Downlink>, <Uplink>

Selects the information bit rate of the downlink and uplink reference channel.

Parameters:

<Downlink> R12K2 | R64K | R144k | R384k

R12K2: 12.2 kbps
R64K: 64 kbps
R144k: 144 kbps
R384k: 384 kbps

*RST: R12K2

<Uplink> R12K2 | R64K | R144k | R384k | R768k

R12K2: 12.2 kbps
R64K: 64 kbps
R144k: 144 kbps
R384k: 384 kbps
R768k: 768 kbps

*RST: R12K2

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS410

Manual operation: See "RMC" on page 549

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:TMODe <Type>

Selects the test mode that the UE enters after connecting to the UTRAN.

Parameters:

<Type> OFF | MODE1 | MODE2

OFF: no loop
MODE1: loop mode 1
MODE2: loop mode 2

*RST: MODE2

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Manual operation: See "RMC" on page 549

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:RLCMode <Mode>

Selects the RLC mode for RMC transmission with loop mode 1.

Parameters:

<Mode> TRANsparent | ACKNowledge

*RST: TRAN

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Manual operation: See "RMC" on page 549

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:UCRC <Enable>

Enables or disables the uplink Cyclic Redundancy Check (CRC) for Loop Mode 2. This setting is only relevant when an RMC with symmetric DL/UL data rate is used.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Manual operation: See "RMC" on page 549

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:DLRessources <FilledBlocks>

Selects the percentage of DL RMC transport blocks that are filled with information bits.

The percentages are rounded, indicated in one-tenth of a percent and correspond to values 1/n, indicating that out of n transport blocks, only one is fully filled with data, (n – 1) blocks are empty.

Example: P0125 = 125 ‰ = 0.125 = 1/8. Each 8^{th} block is filled.

Parameters:

<FilledBlocks> P0031 | P0033 | P0036 | P0038 | P0042 | P0045 | P0050 | P0056 | P0062 | P0071 | P0083 | P0100 | P0125 | P0167 | P0250 | P0500 | P1000

P0031: 1/32
P0033: 1/30
P0036: 1/28
P0038: 1/26
P0042: 1/24
P0045: 1/22
P0050: 1/20
P0056: 1/18
P0062: 1/16
P0071: 1/14
P0083: 1/12
P0100: 1/10
P0125: 1/8
P0167: 1/6
P0250: 1/4
P0500: 1/2
P1000: all blocks filled

*RST: P1000

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS410

Manual operation: See "RMC" on page 549

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:RMC:DATA <Pattern>

Selects the bit pattern transmitted as user information on the DTCH.

Besides "All 0", "All 1" and "Alternating 0101...", pseudo-random bit sequences of variable length are available.

Parameters:

<Pattern> ALL0 | ALL1 | ALTernating | PRBS9 | PRBS11 | PRBS13 | PRBS15

*RST: PRBS9

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Manual operation: See "RMC" on page 549

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:PROCedure <Procedure>

Selects whether an HSPA test mode connection is set up automatically when a test mode connection is established, or can be set up manually later on.

Parameters:

<Procedure> CSPS | CSOPs

CSPS: Establish both an RMC connection in the CS domain and an HSPA test mode connection in the PS domain.
CSOPs: Establish only an RMC connection in the CS domain. You can trigger an HSPA connection setup manually later on if desired.

*RST: CSPS

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSPA" on page 550

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:DIRection <Direction>

Selects the HSPA test mode direction.

Parameters:

<Direction> HSDPa | HSPA

HSDPa: HSDPA only
HSPA: HSDPA + HSUPA

*RST: HSDP

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSPA" on page 550

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:DATA <Pattern>

Selects the bit pattern to be transmitted as user information on the HS-DSCH.

Besides "All 0", "All 1" and "Alternating 0101...", pseudo-random bit sequences of variable length are available.

Parameters:

<Pattern> ALL0 | ALL1 | ALTernating | PRBS9 | PRBS11 | PRBS13 | PRBS15

*RST: PRBS9

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSPA" on page 550

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:EINSertion <ErrorInsertion>

Configures the rate of HS-DSCH data to be sent with an incorrect CRC value.

Parameters:

<ErrorInsertion> Range: 10 % to 90 %
*RST: 10 %
Default unit: %
Additional parameters: OFF | ON (disables the error insertion | enables the error insertion using the previous value)

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSPA" on page 550

CONFigure:WCDMa:SIGN<i>:CONNection:TMODe:HSPA:USDU <Size>

Specifies the HSUPA UL RLC SDU size as an integer multiple of the HSDPA DL RLC SDU size of 2936 bits.

The command accepts a continuous range of values, but sets the nearest multiple of 2936:

2936 | 5872 | 8808 | 11744 | 14680 | 17616 | 20552 | 23488 | 26424 | 29360

Parameters:

<Size> Range: 2936 to 29360
*RST: 8808

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSPA" on page 550

6.6.9.6 Packet Data Settings

The commands in this section configure parameters for end to end data connections, involving the Data Application Unit (DAU).

CONFigure:WCDMa:SIGN<i>:CONNection:PACKet:DRATe <Downlink>, <Uplink>

Specifies data rates for end to end data connections in downlink and uplink direction.

Parameters:

<Downlink> R8 | R16 | R32 | R64 | R128 | R384 | HSDPa

R8 to **R384**: 8 kbps to 384 kbps
HSDPa: HSDPA connection

*RST: R384

<Uplink> R8 | R16 | R32 | R64 | R128 | R384 | HSUPa

R8 to **R384**: 8 kbps to 384 kbps
HSUPa: HSUPA connection

*RST: R384

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401 for HSDPa and HSUPa

Manual operation: See "Data Rate" on page 552

CONFigure:WCDMa:SIGN<i>:CONNection:PACKet:HSDPa:RWINdow <Mode>[, <ReceivingWindow>]

Specifies the size of the receiver window in the UE.

Parameters:

<Mode> AUTO | MANual

Automatic calculation | manual configuration of the window size

*RST: AUTO

<ReceivingWindow>	Manually configured window size applicable to <Mode> = MANual The value is rounded to the nearest of the following values: 1 | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 768 | 1024 | 1536 | 2047 | 2560 | 3072 | 3584 | 4095 Range: 1 to 4095 *RST: 2047

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Receiving Window Size" on page 552

CONFigure:WCDMa:SIGN<i>:CONNection:PACKet:HSDPa:TIMer <Mode>[, <T1ReleaseTimer>]

Specifies the timeout value of the re-ordering release timer T1.

Parameters:

<Mode>	AUTO | MANual Automatic calculation | manual configuration of the timeout value *RST: AUTO
<T1ReleaseTimer>	Manually configured value applicable to <Mode> = MANual The value is rounded to the nearest of the following values [s]: 0.01 | 0.02 | 0.03 … 0.1 | 0.12 | 0.14 | 0.16 | 0.2 | 0.3 | 0.4 Range: 0.01 s to 0.4 s *RST: 0.05 s Default unit: s

Example: See Configuring Connection Types

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "T1 Release Timer" on page 552

6.6.10 Network Settings

The commands in this section configure parameters of the simulated radio network.

6.6.10.1 General Network Settings

The following commands define general cell properties.

CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:SCODe <Code>

Specifies index i for calculation of the primary scrambling code number by multiplication with 16 (see chapter 6.2.9.3, "Scrambling Codes", on page 426).

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Code> Range: #H0 to #H1FF
*RST: carrier 1: #H0, carrier 2: #H1

Example: See Configuring Network Settings

Firmware/Software: V2.1.30

Manual operation: See "Primary Scrambling Code" on page 553

CONFigure:WCDMa:SIGN<i>:CELL:PSDomain <Enable>

Enables or disables the support of packet switched connections by the emulated UTRAN cell.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Packet Switched Domain" on page 554

6.6.10.2 Network Identity Settings

The following commands configure identities of the simulated radio network.

CONFigure:WCDMa:SIGN<i>:CELL:MCC <Value>

Specifies the 3-digit Mobile Country Code (MCC). Leading zeros may be omitted.

Parameters:

<Value> Range: 0 to 999
*RST: 1

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "MCC" on page 554

CONFigure:WCDMa:SIGN<i>:CELL:MNC <Value>, <NrOfDigits>

Specifies the Mobile Network Code (MNC). A two or three-digit MNC can be set. Leading zeros may be omitted.

Parameters:

<Value> Range: 0 to 99 or 999 depending on <NrOfDigits>
*RST: 1

<NrOfDigits> D2 | D3

D2: 2-digit MNC
D3: 3-digit MNC

*RST: D2

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "MNC" on page 554

CONFigure:WCDMa:SIGN<i>:CELL:NTOPeration <Mode>

Selects the network operation mode indicating whether a Gs interface is present in the network (mode I) or not (mode II).

Parameters:

<Mode> M1 | M2

M1: mode I, Gs interface present
M2: mode II, Gs interface not present

*RST: M1

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Network Mode Operation" on page 554

CONFigure:WCDMa:SIGN<i>:CELL:LAC <Value>

Specifies the location area code for CS services.

Parameters:

<Value> Range: #H0 to #HFFFF
*RST: #H1

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Location Area Code" on page 555

CONFigure:WCDMa:SIGN<i>:CELL:RAC <Value>

Specifies the routing area code for PS services (8-digit binary number).

Parameters:

<Value> Range: #B0 to #B11111111
*RST: #B0

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Routing Area Code" on page 555

CONFigure:WCDMa:SIGN<i>:CELL:URA <Value>

Specifies the UTRAN Registration Area (URA) identity (16-digit binary number).

Parameters:

<Value> Range: #B0 to #B1111111111111111
*RST: #B1

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0: Query only
V2.1.20: Setting supported

Manual operation: See "URA Identity" on page 555

CONFigure:WCDMa:SIGN<i>:CELL:RNC <Value>

Specifies the Radio Network Controller (RNC) identity (12-digit binary number).

Parameters:

<Value> Range: #B0 to #B111111111111
*RST: #B1

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "RNC Identity" on page 555

CONFigure:WCDMa:SIGN<i>:CELL:IDENtity <Value>

Specifies the cell identity (28-digit binary number).

Parameters:

<Value> Range: #B0 to #B1111111111111111111111111111
*RST: #B1

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Cell Identity" on page 555

CONFigure:WCDMa:SIGN<i>:CELL:IDNode <Value>

Specifies the Node B identity (16-digit binary number).

Parameters:

<Value> Range: #B0 to #B1111111111111111
*RST: #B1

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Node B Identity" on page 555

CONFigure:WCDMa:SIGN<i>:CELL:BINDicator <Enable>

Specifies whether the band indicator shall be broadcasted as part of the system information or not.

Parameters:

<Enable> OFF | ON

ON: broadcast band indicator
OFF: do not broadcast band indicator

*RST: ON

Example: See Configuring Network Settings

Firmware/Software: V3.0.10

Manual operation: See "Band Indicator" on page 555

6.6.10.3 Security Settings

The following commands configure parameters related to the authentication procedure and other security procedures.

CONFigure:WCDMa:SIGN<i>:CELL:SECurity:AUTHenticat <Enable>

Enables or disables authentication, to be performed during registration.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Authentication" on page 556

CONFigure:WCDMa:SIGN<i>:CELL:SECurity:ENABle <Enable>

Enables or disables the security mode during authentication. With enabled security mode, the UE performs an integrity check.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Security" on page 556

CONFigure:WCDMa:SIGN<i>:CELL:SECurity:SKEY <SecretKey>

Defines the secret key K as 32-digit hexadecimal number. Leading zeros may be omitted.

K is used for the authentication procedure including a possible integrity check.

Parameters:

<SecretKey> Range: #H0 to #HFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
*RST: #H000102030405060708090A0B0C0D0E0F

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Secret Key" on page 556

CONFigure:WCDMa:SIGN<i>:CELL:SECurity:OPC <OPC>

Specifies the key OP_c as 32-digit hexadecimal number.

Parameters:

<OPC>	Range:	#H00000000000000000000000000000000 to #HFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
	*RST:	#H00000000000000000000000000000000

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "OPc" on page 556

CONFigure:WCDMa:SIGN<i>:CELL:SECurity:SIMCard <SIMcardType>

Selects the type of the SIM card used for registration.

Parameters:

<SIMcardType> C3G | C2G | MILenage

C3G: 3G USIM
C2G: 2G SIM
MILenage: USIM with MILENAGE algorithm set

*RST: C3G

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: C2G and MILenage: R&S CMW-KS410

Manual operation: See "SIM Card Type" on page 556

6.6.10.4 UE Identity

The following commands configure the default IMSI.

CONFigure:WCDMa:SIGN<i>:CELL:UEIDentity:USE <Enable>

Specifies whether the default IMSI shall be used. The default IMSI is defined via `CONFigure:WCDMa:SIGN<i>:CELL:UEIDentity:IMSI`.

You can only enable the default IMSI but not disable it. Instead it is disabled automatically when registration is performed with a different IMSI.

Parameters:
<Enable> ON
*RST: ON

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0
V2.0.10: value OFF removed

Manual operation: See "In Use" on page 557

CONFigure:WCDMa:SIGN<i>:CELL:UEIDentity:IMSI <Value>

Specifies the default IMSI that the instrument can use before the UE is registered.

Parameters:
<Value> String value, containing 15 digits.
*RST: '001010123456063'

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Default IMSI" on page 557

6.6.10.5 Requested UE Data

The parameters in this section specify which information shall be requested from the UE and whether registration shall be performed or not.

CONFigure:WCDMa:SIGN<i>:CELL:REQuest:ADETach <Enable>

Enables or disables the CS registration and PS attach procedure.

Parameters:
<Enable> OFF | ON
*RST: ON

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "Attach/Detach" on page 558

CONFigure:WCDMa:SIGN<i>:CELL:REQuest:IMEI <Enable>

Enables or disables the request of the IMEI from the UE.

Parameters:
<Enable> OFF | ON
*RST: ON

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Manual operation: See "IMEI Request" on page 558

6.6.10.6 Cell Reselection Settings

The following commands define cell reselection information to be broadcasted to the UE.

CONFigure:WCDMa:SIGN<i>:CELL:RESelection:SEARch <Sintrasearch>, <Sintersearch>, <Ssearchrat>

Defines the thresholds $S_{intrasearch}$, $S_{intersearch}$ and S $search_{RAT\ m\ =\ GSM}$ required for cell reselection. They are transmitted to the UE in the system information.

Parameters:

<Sintrasearch> Range: -32 dB to 20 dB
Increment: 2 dB
*RST: -32 dB
Default unit: dB

<Sintersearch> Range: -32 dB to 20 dB
Increment: 2 dB
*RST: -32 dB
Default unit: dB

<Ssearchrat> Range: -32 dB to 20 dB
Increment: 2 dB
*RST: -32 dB
Default unit: dB

Example: See Configuring Network Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS410

Manual operation: See "S intrasearch" on page 558

CONFigure:WCDMa:SIGN<i>:CELL:RESelection:QUALity <Qqualmin>, <Qrxlevmin>

Defines the levels $Q_{qualmin}$ and $Q_{rxlevmin}$ required for cell reselection. They are transmitted to the UE in the system information.

Parameters:

<Qqualmin> Range: -24 dB to 0 dB
*RST: -24 dB
Default unit: dB

<Qrxlevmin>	Range:	-115 dBm to -25 dBm
	Increment:	2 dB
	*RST:	-115 dBm
	Default unit:	dBm

Example: See Configuring Network Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS410

Manual operation: See "Q qualmin" on page 559

6.6.10.7 Timer and Constants

The commands in this section configure timer and constants.

CONFigure:WCDMa:SIGN<i>:CELL:TOUT:T3212 <Value>
CONFigure:WCDMa:SIGN<i>:CELL:TOUT:T3312 <Value>

Set the timeout value for timer T3212 and T3312.

Parameters:

<Value>	Range:	0 to 255
	*RST:	0
	Default unit:	6 minutes for T3212, 2 seconds for T3312

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Network > TimeOut > T3212/T3312" on page 560

CONFigure:WCDMa:SIGN<i>:CELL:TOUT:OSYNch <Value>

Sets the "out of synch" timeout value.

This value specifies the time after which the instrument, having waited for a signal from the connected UE, releases the connection and returns to state Registered.

Parameters:

<Value>	Range:	2 s to 30 s
	*RST:	4 s
	Default unit:	s

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "Network > TimeOut > OutOfSynch" on page 560

CONFigure:WCDMa:SIGN<i>:CELL:TOUT:PREPetitions <Repetitions>

Specifies the number of paging procedures to be performed if the UE does not answer paging.

Parameters:

<Repetitions> Range: 0 to 65535
*RST: 3

Example: See Configuring Network Settings

Firmware/Software: V2.0.10

Options: R&S CMW-KS410

Manual operation: See "Network > Paging Repetitions" on page 560

CONFigure:WCDMa:SIGN<i>:CELL:TOUT:PPIF <Indications>

Number of paging indicators that the R&S CMW transmits in each PICH frame.

Parameters:

<Indications> 18 | 36 | 72 | 144
*RST: 18

Example: See Configuring Network Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS410

Manual operation: See "Network > Paging Indications per Frame" on page 560

CONFigure:WCDMa:SIGN<i>:CELL:TOUT:ATOFfset <Offset>

Specifies a delay value, used by the RRC for calculation of the activation time in peer messages.

Low values correspond to fast signaling, high values to slow signaling.

Parameters:

<Offset> Range: 0 to 10
*RST: 0

Example: See Configuring Network Settings

Firmware/Software: V2.1.30

Manual operation: See "Network > Activation Time Offset" on page 560

CONFigure:WCDMa:SIGN<i>:CELL:TOUT:N313 <Value>

Sets a maximum value for counter N313.

The UE shall count successive "out of sync" indications received from layer 1. When the maximum value is reached, the UE considers a "radio link failure" condition and a connection release.

Parameters:

<Value> N1 | N2 | N4 | N10 | N20 | N50 | N100 | N200

Maximum counter value prefixed by N.

*RST: N20

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "UE > N313" on page 560

CONFigure:WCDMa:SIGN<i>:CELL:TOUT:T313 <Value>

Sets the timeout value for timer T313.

Parameters:

<Value> Range: 0 s to 15 s
*RST: 3 s
Default unit: s

Example: See Configuring Network Settings

Firmware/Software: V1.0.15.0

Options: R&S CMW-KS410

Manual operation: See "UE > T313 Timeout" on page 561

6.6.10.8 Reject Causes

The commands in this section configure the rejection of location update requests and attach requests received from the UE.

CONFigure:WCDMa:SIGN<i>:CELL:RCAuse:LOCation <CauseNumber>

Enables or disables the rejection of location update requests and selects the rejection cause to be transmitted.

Parameters:

<CauseNumber> C2 | C3 | C6 | C11 | C12 | C13 | C15 | C96 | C99 | C100 | C111

C2: IMSI unknown in HLR
C3: Illegal Mobile Subscriber
C6: Illegal Mobile Equipment
C11: PLMN not allowed
C12: Location Area not allowed
C13: Roaming not allowed in location area
C15: No suitable cells in location area
C96: Invalid mandatory information
C99: Information element non-existent or not implemented
C100: Conditional information element error
C111: Protocol error, unspecified

*RST: C11, OFF
Additional parameters: OFF | ON (disables | enables the rejection of requests)

Example: See Configuring Network Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Location Update Reject Cause" on page 561

CONFigure:WCDMa:SIGN<i>:CELL:RCAuse:ATTach <CauseNumber>

Enables or disables the rejection of attach requests and selects the rejection cause to be transmitted.

Parameters:

<CauseNumber>	C2 | C3 | C4 | C5 | C6 | C11 | C12 | C13 | C15 | C17 | C20 | C21 | C22 | C23 | C32 | C33 | C34 | C38 | C95 | C96 | C97 | C98 | C99 | C100 | C101 | C111 **C2**: IMSI unknown in HLR **C3**: Illegal Mobile Subscriber **C4**: IMSI unknown in VLR **C5**: IMEI not accepted **C6**: Illegal Mobile Equipment **C11**: PLMN not allowed **C12**: Location Area not allowed **C13**: Roaming not allowed in location area **C15**: No suitable cells in location area **C17**: Network failure **C20**: MAC failure **C21**: Synch failure **C22**: Congestion **C23**: GSM authentication unacceptable **C32**: Service option unsupported **C33**: Service option not subscribed **C34**: Service option temporarily out of order **C38**: Call not identified **C95**: Semantically incorrect message **C96**: Invalid mandatory information **C97**: Message type non-existent or not implemented **C98**: Message type not compatible with protocol state **C99**: Information element non-existent or not implemented **C100**: Conditional information element error **C101**: Message not compatible with protocol state **C111**: Protocol error, unspecified *RST: C11, OFF Additional parameters: OFF | ON (disables | enables the rejection of requests)

Example: See Configuring Network Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Gmm Attach Reject Cause" on page 561

6.6.10.9 Neighbor Cell Settings

The following commands define neigbour cell information to be broadcasted to the UE.

CONFigure:WCDMa:SIGN<i>:NCELl:ALL:THResholds:HIGH <Valid>, <High>

Configures a common reselection threshold value "threshXhigh" applicable to all technologies (except WCDMA).

Alternatively to a common threshold you can also use individual thresholds. They are defined per technology via the commands `CONFigure:WCDMa:SIGN<i>:NCELl:<Technology>:THResholds:HIGH`. The parameter `<Valid>` selects whether common or individual thresholds are used.

Parameters:

<Valid> OFF | ON

OFF: use individual thresholds defined by separate commands
ON: use common threshold defined by this command

*RST: OFF

<High> Range: 0 to 31
*RST: 5

Firmware/Software: V3.0.20

Manual operation: See "Threshold" on page 562

CONFigure:WCDMa:SIGN<i>:NCELl:GSM:THResholds:HIGH <High>

Configures the reselection threshold value "threshXhigh" for GSM neighbor cells.

Parameters:

<High> Range: 0 to 31
*RST: 0

Example: See Configuring Network Settings

Firmware/Software: V3.0.20

Manual operation: See "Threshold" on page 562

CONFigure:WCDMa:SIGN<i>:NCELl:LTE:THResholds:HIGH <High>

Configures the reselection threshold value "threshXhigh" for LTE neighbor cells.

Parameters:

<High> Range: 0 to 31
*RST: 5

Example: See Configuring Network Settings

Firmware/Software: V3.0.20

Manual operation: See "Threshold" on page 562

CONFigure:WCDMa:SIGN<i>:NCELl:WCDMa:CELL<n> <Enable>, <Band>, <Channel>, <ScramblingCode>

Configures an entry of the neighbor cell list for WCDMA.

For channel number ranges depending on operating bands see chapter 6.2.11, "Operating Bands", on page 436.

Suffix:

<n> 1..16
Number of the entry

Parameters:

<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<Band> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OB19 | OB20 | OB21 | OBS1 | OBS2 | OBS3 | OBL1

OB1, ..., OB14: Operating Band I to XIV
OB19, ..., OB21: Operating Band XIX to XXI
OBS1: Operating Band S
OBS2: Operating Band S 170 MHz
OBS3: Operating Band S 190 MHz
OBL1: Operating Band L

*RST: OB1

<Channel> Downlink channel number

Range: depends on operating band
*RST: 10563

<ScramblingCode> Primary scrambling code

Range: #H0 to #H1FF
*RST: #H0

Example: See Configuring Network Settings

Firmware/Software: V3.0.20

Manual operation: See "WCDMA FDD" on page 562

CONFigure:WCDMa:SIGN<i>:NCELl:GSM:CELL<n> <Enable>, <Band>, <Channel>

Configures an entry of the neighbor cell list for GSM.

Suffix:

<n> 1..16
Number of the entry

Parameters:

<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<Band> G04 | GT081 | G085 | G09 | G18 | G19

GSM 400, GSM T810, GSM 850, GSM 900, GSM 1800, GSM 1900

*RST: G09

<Channel> Channel number used for the Broadcast Control Channel (BCCH)

Range: 0 to 1023, depending on GSM band, see table below

*RST: 20

Example: See Configuring Network Settings

Firmware/Software: V3.0.20

Manual operation: See "GSM" on page 563

Table 6-26: Channel number range depending on GSM band

Band	Channel Number
G04	259 to 340
GT081	350 to 425
G085	128 to 251
G09	0 to 124, 955 to 1023
G18	512 to 885
G19	512 to 810

CONFigure:WCDMa:SIGN<i>:NCELl:LTE:CELL<n> <Enable>, <Band>, <Channel>

Configures an entry of the neighbor cell list for LTE.

Suffix:

<n> 1..8

Number of the entry

Parameters:

<Enable> OFF | ON

Enables or disables the entry

*RST: OFF

<Band> OB1 | OB2 | OB3 | OB4 | OB5 | OB6 | OB7 | OB8 | OB9 | OB10 | OB11 | OB12 | OB13 | OB14 | OB15 | OB16 | OB17 | OB18 | OB19 | OB20 | OB21 | OB22 | OB23 | OB24 | OB25 | OB26 | OB27 | OB28 | OB29 | OB30 | OB31 | OB32 | OB33 | OB34 | OB35 | OB36 | OB37 | OB38 | OB39 | OB40 | OB41 | OB42 | OB43 | UDEFined

Operating band 1 to 43, UDEFined = user defined band

*RST: OB1

<Channel> Downlink channel number

Range: depends on operating band
*RST: 300

Example: See Configuring Network Settings

Firmware/Software: V3.0.20

Manual operation: See "LTE" on page 563

6.6.10.10 Time Settings

The commands in this section configure and send date and time information to the UE.

CONFigure:WCDMa:SIGN<i>:CELL:TIME:TSOurce <SourceTime>

Selects the date and time source.

The time source DATE is configured via the following commands:

- CONFigure:WCDMa:SIGN<i>:CELL:TIME:DATE
- CONFigure:WCDMa:SIGN<i>:CELL:TIME:TIME
- CONFigure:WCDMa:SIGN<i>:CELL:TIME:DSTime

Parameters:

<SourceTime> CMWTime | DATE

CMWTime: Windows date and time
DATE: Date and time specified via remote commands

*RST: CMWT

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Time Source" on page 563

CONFigure:WCDMa:SIGN<i>:CELL:TIME:DATE <Day>, <Month>, <Year>

Specifies the UTC date for the time source `DATE` (see `CONFigure:WCDMa:SIGN<i>:CELL:TIME:TSOurce` on page 735).

Parameters:

<Day>	Range:	1 to 31
	*RST:	11
<Month>	Range:	1 to 12
	*RST:	11
<Year>	Range:	2011 to 9999
	*RST:	2011

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Date / Time (UTC)" on page 563

CONFigure:WCDMa:SIGN<i>:CELL:TIME:TIME <Hour>, <Minute>, <Second>

Specifies the UTC time for the time source `DATE` (see `CONFigure:WCDMa:SIGN<i>:CELL:TIME:TSOurce` on page 735).

Parameters:

<Hour>	Range:	0 to 23
	*RST:	11
<Minute>	Range:	0 to 59
	*RST:	11
<Second>	Range:	0 to 59
	*RST:	0

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Date / Time (UTC)" on page 563

CONFigure:WCDMa:SIGN<i>:CELL:TIME:DSTime <Enable>

Specifies a Daylight Saving Time (DST) offset for the time source `DATE` (see `CONFigure:WCDMa:SIGN<i>:CELL:TIME:TSOurce` on page 735).

Parameters:
<Enable> P1H | P2H

P1H: +1h offset if DST is ON
P2H: +2h offset if DST is ON

*RST: OFF (P1H)
Additional parameters: OFF | ON (disables | enables DST)

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Daylight Saving Time" on page 564

CONFigure:WCDMa:SIGN<i>:CELL:TIME:SNOW

Triggers the transfer of the date and time information to the UE.

Example: See Sending Date and Time Information to the UE

Usage: Event

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Send Time" on page 564

CONFigure:WCDMa:SIGN<i>:CELL:TIME:SREGister <Enable>

Specifies whether the date and time information is sent to the UE during the registration and attach procedure or not.

Parameters:
<Enable> OFF | ON

ON: send date and time at registration/attach
OFF: do not send date and time at registration/attach

*RST: OFF

Example: See Sending Date and Time Information to the UE

Firmware/Software: V3.0.30

Options: R&S CMW-KS410

Manual operation: See "Send Time" on page 564

6.6.11 HSDPA Settings

The commands in this section configure for example the transport channel HS-DSCH.

6.6.11.1 Miscellaneous Settings

The following commands correspond to the first part of the "HSDPA" section in the GUI.

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:FBCYcle <FeedbackCycle>

Specifies the time after which the UE sends a new CQI value on the HS-DPCCH (CQI feedback cycle).

The CQI transmission can also be disabled completely.

Parameters:

<FeedbackCycle> Range: 2 ms to 160 ms
*RST: 4 ms
Default unit: s
Additional parameters: OFF | ON (disables | enables CQI transmission)

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "CQI Feedback Cycle, CQI Repetition Factor" on page 565

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RFACtor <Factor>

Specifies how often the UE transmits the same CQI value per feedback cycle (CQI repetition factor).

Parameters:

<Factor> Range: 1 to 4
*RST: 1

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "CQI Feedback Cycle, CQI Repetition Factor" on page 565

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:ANRFactor <Factor>

Specifies the number of transmissions of the same ACK/NACK (ACK/NACK repetition factor).

Parameters:

<Factor> Range: 1 to 4
*RST: 1

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "ACK/NACK Repetition Factor" on page 565

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UECategory:MANual <UECatManual>

Configures the UE category to be used by the R&S CMW if no reported value is available or usage of the reported value is disabled, see `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UECategory:REPorted`.

Parameters:

<UECatManual> Range: 1 to 24
*RST: 12

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

Manual operation: See "UE Category" on page 565

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UECategory:REPorted <UseReported>

Enable or disable usage of the UE category value reported by the UE.

When disabled, the UE category must be set manually, see `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UECategory:MANual`. The manually set value is also used if no reported value is available.

Parameters:

<UseReported> OFF | ON
*RST: ON

Return values:

<UECatReported> UE category reported by the UE (NAV indicates that none has been reported)
Range: 1 to 24

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

Manual operation: See "UE Category" on page 565

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:TYPE <ChannelType>

Selects the configuration type of the High Speed Downlink Shared Channel (HS-DSCH).

Parameters:

<ChannelType> FIXed | CQI | UDEFined

FIXed: fixed reference channel
CQI: channel for CQI reporting tests
UDEFined: user defined channel configuration

*RST: FIXed

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401 for FIXed, CQI
R&S CMW-KS411 for UDEFined

Manual operation: See "Configuration Type" on page 566

6.6.11.2 Fixed Reference Channel Configuration

The following command configures a fixed reference channel.

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:FIXed:HSET <HSet>

Selects an H-Set for the fixed reference channel.

Parameters:

<HSet> H1M1 | H1M2 | H2M1 | H2M2 | H3M1 | H3M2 | H4M1 | H5M1 | H6M1 | H6M2 | H8M3 | H8MT | H1MI | H8MI | H3A1 | H3A2 | H8A3 | H8AI | HAM1 | HAM2 | HAA1 | HAA2 | HCM1 | HCMT | H6A1 | H6A2 | H1AI

Single carrier H-Sets:
H1M1 to **H6M1**, **HAM1**: H-Set 1 to 6, 10 (QPSK)
H1M2 to **H3M2**, **H6M2**, **HAM2**: H-Set 1 to 3, 6, 10 (16-QAM)
H8M3: H-Set 8 (64-QAM)
H1MI, **H8MI**: H-Set 1, 8 (maximum input)
H8MT: H-Set 8 (maximum throughput)
Dual carrier H-Sets:
H1AI: H-Set 1A (maximum input)
H3A1, **H6A1**, **HAA1**, **HCM1**: H-Set 3A, 6A, 10A, 12 (QPSK)
H3A2, **H6A2**, **HAA2**: H-Set 3A, 6A, 10A (16-QAM)
H8A3: H-Set 8A (64-QAM)
H8AI: H-Set 8A (maximum input)
HCMT: H-Set 12 (maximum throughput)

*RST: H5M1

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20
V2.1.30: additional values H3A1 | H3A2 | H8A3 | H8AI | HAM1 | HAM2 | HAA1 | HAA2 | HCM1 | HCMT | H6A1 | H6A2
V3.0.10: additional value H1AI

Options: R&S CMW-KS401
R&S CMW-KS403 for H-Set 8
R&S CMW-KS404 for dual carrier H-Sets

Manual operation: See "H-Set" on page 566

6.6.11.3 CQI Test Channel Configuration

The following commands configure a CQI reporting test channel.

CONFigure:WCDMa:SIGN<i>:CELL:CARRier2:HSDPa:CQI:ENABle <Enable>

Enables or disables the usage of the second carrier for data transport via the HS-DSCH.

Parameters:

<Enable> OFF | ON
*RST: ON

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS404

Manual operation: See "2nd Carrier Enable" on page 567

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TINDex <TableIndex>

Specifies the method to be used for selection of the CQI table index.

Parameters:

<TableIndex> FIXed | SEQuence | CONFormance | FOLLow

FIXed
A fixed mapping table row is used.
See also `CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:CQI:FIXed`

SEQuence
A sequence of mapping table rows is used.
See also `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:SEQuence`

CONFormance
A CQI reporting test is to be performed.
See also `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:CONFormance`

FOLLow
The CQI value to be used is proposed by the UE.
See also `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:FOLLow`

*RST: FIX

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "CQI Table Index, CQI Tables" on page 567

CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:CQI:FIXed <FixedValue>

Selects the CQI table index to be used if `FIXed` is configured via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TINDex`.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<FixedValue> Range: 1 to 30
*RST: 16

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

Manual operation: See "CQI Table Index, CQI Tables" on page 567

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:SEQuence <MinValue>, <MaxValue>

Selects the range of CQI table indices to be used cyclically if `SEQuence` is configured via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TINDex`.

Parameters:

<MinValue>	Range:	1 to 30
	*RST:	1
<MaxValue>	Range:	1 to 30
	*RST:	30

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "CQI Table Index, CQI Tables" on page 567

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:FOLLow <MinValue>, <MaxValue>

Defines the allowed range of CQI table indices. A value proposed by the UE is accepted if it is located within the range and `FOLLow` is configured via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TINDex`.

Parameters:

<MinValue>	Range:	1 to 30
	*RST:	1
<MaxValue>	Range:	1 to 30
	*RST:	30

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "CQI Table Index, CQI Tables" on page 567

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:CONFormance <Value>

Defines the CQI value to be used in the first stage of a CQI reporting test where the downlink transport format is fixed and the frequency distribution of the reported CQI values is calculated.

To use this value, configure `CONFormance` via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TINDex`.

Parameters:

<Value>	Range:	1 to 30
	*RST:	16

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "CQI Table Index, CQI Tables" on page 567

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:TTI?

Queries the minimum distance between two consecutive transmission time intervals in which the HS-DSCH is allocated to the UE.

Return values:

<TTI> Range: 1 to 3

Example: See Configuring HSDPA Settings

Usage: Query only

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "Inter TTI Distance" on page 568

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:HARQ <Number>

Specifies the number of HARQ processes.

Parameters:

<Number> Range: 1 to 8
*RST: 6

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "Number of HARQ Processes" on page 569

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QPSK <Sequence>

Specifies an RV coding sequence to be used for signals with QPSK modulation.

If `UDEFined` is selected, the sequence is defined via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QPSK:UDEFined`.

Parameters:

<Sequence> S1 | S2 | S3 | S4 | S5 | S6 | S7 | UDEFined

S1: {0}
S2: {6}
S3: {0,2,5,6}
S4: {6,2,1,5}
S5: {0,0,0,0}
S6: {6,6,6,6}
S7: {6,0,4,5}
UDEFined: user defined sequence

*RST: S3

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "RV Coding Sequences" on page 569

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QPSK:UDEFined <Length>, <Sequence>...

Specifies an RV coding sequence to be used for signals with QPSK modulation if `UDEFined` is set via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QPSK`.

Parameters:

<Length> The first <Length> entries of the user defined coding sequence are used.

Range: 1 to 8
*RST: 8

<Sequence> Up to 8 values separated by commas.
If you specify n values, they overwrite the first n entries of the user defined sequence.

Range: 0 to 7
*RST: 0

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "RV Coding Sequences" on page 569

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QAM<no> <Sequence>

Specifies an RV coding sequence to be used for signals with 16-QAM or 64-QAM modulation.

If UDEFined is selected, the sequence is defined via CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QAM<no>:UDEFined.

Suffix:

<no> 16,64
16-QAM or 64-QAM modulation

Parameters:

<Sequence> S1 | S2 | S3 | S4 | S5 | S6 | S7 | UDEFined

S1: {0}
S2: {6}
S3: {0,2,5,6}
S4: {6,2,1,5}
S5: {0,0,0,0}
S6: {6,6,6,6}
S7: {6,0,4,5}
UDEFined: user defined sequence

*RST: S4

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401 for 16-QAM
R&S CMW-KS403 for 64-QAM

Manual operation: See "RV Coding Sequences" on page 569

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QAM<no>:UDEFined <Length>, <Sequence>...

Specifies an RV coding sequence to be used for signals with 16-QAM or 64-QAM modulation if UDEFined is set via CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:CQI:RVCSequences:QAM<no>.

Suffix:

<no> 16,64
16-QAM or 64-QAM modulation

Parameters:

<Length> The first <Length> entries of the user defined coding sequence are used.

Range: 1 to 8
*RST: 8

<Sequence> Up to 8 values separated by commas.
If you specify n values, they overwrite the first n entries of the user defined sequence.

Range: 0 to 7
*RST: 0

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS401 for 16-QAM
R&S CMW-KS403 for 64-QAM

Manual operation: See "RV Coding Sequences" on page 569

6.6.11.4 User Defined Channel Configuration

The following commands configure a user defined HSDPA channel.

CONFigure:WCDMa:SIGN<i>:CELL:CARRier2:HSDPa:UDEFined:ENABle
<Enable>

Enables or disables the usage of the second carrier for data transport via the HS-DSCH.

Parameters:
<Enable> OFF | ON
*RST: ON

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS404 and R&S CMW-KS411

Manual operation: See "Enable (Carrier 2)" on page 570

CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:TTI
<TTI>

Specifies the minimum distance between two consecutive transmission time intervals in which the HS-DSCH is allocated to the UE.

Suffix:
<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<TTI>	Range:	1 to 3
	*RST:	3

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Inter TTI Distance" on page 570

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:HARQ <Number>

Specifies the number of HARQ processes.

Parameters:

<Number>	Range:	1 to 8
	*RST:	2

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS411

Manual operation: See "Number of HARQ Processes" on page 570

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:IRBuffer?

Queries the calculated size (no. of bits) of the virtual IR buffer used in the H-ARQ process.

Return values:

<BufferSize>	Range:	0 bits to 384E+3 bits
	Default unit:	bits

Example: See Configuring HSDPA Settings

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "IR Buffer Size" on page 570

CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:TBLock <Index>

Specifies the value of the Transport Format and Resource Indicator (TFRI) signaled to the UE. A query returns also the resulting transport block size.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Index> Transport block size index (TFRI value)

Range: 0 to 62
*RST: 41

Return values:

<Size> Used transport block size resulting from the settings

Range: 0 bits to 28.8E+3 bits
Default unit: bits

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Transport Block Size Index" on page 571

CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined:NCODes <Number>

Specifies the number of HS-PDSCH channelization codes to be assigned to the UE.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Number> Range: 1 to 15
*RST: 5

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411

Manual operation: See "Number of Physical Channel Codes" on page 571

CONFigure:WCDMa:SIGN<i>:CELL:CARRier<carrier>:HSDPa:UDEFined: MODulation <Modulation>

Selects the modulation scheme to be used.

Suffix:

<carrier> 1..2
Selects the carrier to be configured - only relevant for dual carrier scenario

Parameters:

<Modulation> QPSK | Q16 | Q64

QPSK, 16-QAM, 64-QAM

*RST: QPSK

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.30

Options: R&S CMW-KS411 for QPSK and 16-QAM
R&S CMW-KS411 and R&S CMW-KS403 for 64-QAM

Manual operation: See "Modulation" on page 571

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QPSK <Sequence>

Specifies an RV coding sequence to be used for signals with QPSK modulation.

If `UDEFined` is selected, the sequence is defined via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QPSK:UDEFined`.

Parameters:

<Sequence> S1 | S2 | S3 | S4 | S5 | S6 | S7 | UDEFined

S1: {0}
S2: {6}
S3: {0,2,5,6}
S4: {6,2,1,5}
S5: {0,0,0,0}
S6: {6,6,6,6}
S7: {6,0,4,5}
UDEFined: user defined sequence

*RST: S3

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS411

Manual operation: See "RV Coding Sequences" on page 571

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QPSK:UDEFined <Length>, <Sequence>...

Specifies an RV coding sequence to be used for signals with QPSK modulation if `UDEFined` is set via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QPSK`.

Parameters:

<Length> The first <Length> entries of the user defined coding sequence are used.

Range: 1 to 8
*RST: 8

<Sequence> Up to 8 values separated by commas.
If you specify n values, they overwrite the first n entries of the user defined sequence.
Range: 0 to 7
*RST: 0

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS411

Manual operation: See "RV Coding Sequences" on page 571

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QAM<no> <Sequence>

Specifies an RV coding sequence to be used for signals with 16-QAM or 64-QAM modulation.

If `UDEFined` is selected, the sequence is defined via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QAM<no>:UDEFined`.

Suffix:
<no> 16,64
16-QAM or 64-QAM modulation

Parameters:
<Sequence> S1 | S2 | S3 | S4 | S5 | S6 | S7 | UDEFined
S1: {0}
S2: {6}
S3: {0,2,5,6}
S4: {6,2,1,5}
S5: {0,0,0,0}
S6: {6,6,6,6}
S7: {6,0,4,5}
UDEFined: user defined sequence
*RST: S4

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS411 for 16-QAM
R&S CMW-KS411 and R&S CMW-KS403 for 64-QAM

Manual operation: See "RV Coding Sequences" on page 571

CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QAM<no>:UDEFined <Length>, <Sequence>...

Specifies an RV coding sequence to be used for signals with 16-QAM or 64-QAM modulation if `UDEFined` is set via `CONFigure:WCDMa:SIGN<i>:CELL:HSDPa:UDEFined:RVCSequences:QAM<no>`.

Suffix:

<no> 16,64
16-QAM or 64-QAM modulation

Parameters:

<Length> The first <Length> entries of the user defined coding sequence are used.

Range: 1 to 8
*RST: 8

<Sequence> Up to 8 values separated by commas.
If you specify n values, they overwrite the first n entries of the user defined sequence.

Range: 0 to 7
*RST: 0

Example: See Configuring HSDPA Settings

Firmware/Software: V2.1.20

Options: R&S CMW-KS411 for 16-QAM
R&S CMW-KS411 and R&S CMW-KS403 for 64-QAM

Manual operation: See "RV Coding Sequences" on page 571

6.6.12 HSUPA Settings

The commands in this section configure for example the HSUPA system information and the contents transmitted via E-AGCH, E-RGCH and E-HICH.

6.6.12.1 Miscellaneous Settings

The following commands correspond to the highest level of the "HSUPA" section in the GUI.

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:TTI <TTI>

Selects the Transmission Time Interval (TTI) for the E-DCH. The value must be compatible with the UE category (2 ms TTI only allowed for category 2, 4 and 6).

Parameters:

<TTI> M2 | M10

M2: 2 ms
M10: 10 ms

*RST: M10

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "TTI Mode" on page 573

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:PDU <Size>

Selects the RLC PDU size to be signaled to the UE in order to configure its UL RLC PDU size.

Parameters:

<Size> Range: 112 to 5000
Increment: 8
*RST: 336

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "RLC PDU Size" on page 573

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:UECategory:MANual <UECatManual>

Configures the UE category to be used by the R&S CMW if no reported value is available or usage of the reported value is disabled, see `CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:UECategory:REPorted`.

Parameters:

<UECatManual> Range: 1 to 6
*RST: 6

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "UE Category" on page 573

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:UECategory:REPorted <UseReported>

Enable or disable usage of the UE category value reported by the UE.

When disabled, the UE category must be set manually, see `CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:UECategory:MANual`. The manually set value is also used if no reported value is available.

Parameters:

<UseReported> OFF | ON
*RST: ON

Return values:

<UECatReported> UE category reported by the UE (NAV indicates that none has been reported)
Range: 1 to 6

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "UE Category" on page 573

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ETFCi:TINDex <Index>

Specifies the "E-TFCI table index" value signaled to the UE (use table 0 or table 1 defined in Annex B of 3GPP TS 25.321).

Parameters:

<Index> 0 | 1
*RST: 0

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "E-TFCI Table Index" on page 573

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HRVersion <Version>

Specifies the "HARQ RV Configuration" value signaled to the UE.

Parameters:

<Version> RV0 | TABLe

RV0: use always redundancy version 0
TABLe: determine the redundancy version using a table as specified in 3GPP TS 25.212

*RST: RV0

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "H-ARQ Redundancy Versions" on page 574

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ETFCi:MSET <MinSet>

Specifies the "E-DCH minimum set E-TFCI" value signaled to the UE.

Parameters:

<MinSet> Range: 0 to 127
*RST: 9
Additional parameters: OFF | ON (disable | enable transmission of the information element)

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Minimum Set E-TFCI" on page 574

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HBDConition <Delay>

Specifies the "Happy bit delay condition" value signaled to the UE.

Parameters:

<Delay> Only the following values are allowed (in ms):
2 | 10 | 20 | 50 | 100 | 200 | 500 | 1000
If you enter another value, the nearest allowed value is set instead.

Range: 2 ms to 1000 ms
*RST: 100 ms
Default unit: ms

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Happy Bit Delay Condition" on page 574

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:PLPLnonmax <Limit>

Specifies the "$PL_{non-max}$" value signaled to the UE.

Parameters:

<Limit> Range: 0.44 to 1
Increment: 0.04
*RST: 0.84

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Puncturing Limit $PL_{non-max}$" on page 574

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:MCCode <Code>

Specifies the "Maximum channelisation codes" value signaled to the UE. Depending on several other HSUPA parameters, e.g. the UE category, only a subset of values is allowed.

Parameters:

<Code> S64 | S32 | S16 | S8 | S4 | S24 | S22 | S224

S64, S32, S16, S8, S4: one code, SF 64 to SF 4
S24: two codes, SF 4
S22: two codes, SF 2
S224: four codes, two with SF 2 and two with SF 4

*RST: S224

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Maximum Channelisation Code" on page 574

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ISGRant <Grant>[, <Type>]

Specifies initial serving grant parameters signaled to the UE. If you only want to modify the <Grant> you may omit the <Type> parameter.

Parameters:

<Grant> "Serving Grant value" information element

Range: 0 to 38
*RST: 13 (OFF)
Additional parameters: OFF | ON (disable | enable transmission of the initial serving grant parameters)

<Type>	PRIMary | SECondary "Primary/Secondary Grant Selector" information element *RST: PRIM
Example:	See Configuring HSUPA Settings
Firmware/Software:	V3.0.20
Options:	R&S CMW-KS401
Manual operation:	See "Initial Serving Grant" on page 575

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HARQ:POFFset <PowerOffset>

Specifies the HARQ profile parameter "E-DCH MAC-d flow power offset" signaled to the UE.

Parameters:

<PowerOffset>	Range: 0 dB to 6 dB *RST: 0 dB Default unit: dB
Example:	See Configuring HSUPA Settings
Firmware/Software:	V3.0.20
Options:	R&S CMW-KS401
Manual operation:	See "HARQ Power Offset" on page 575

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:HARQ:RETX <Number>

Specifies the HARQ profile parameter "E-DCH MAC-d flow maximum number of retransmissions" signaled to the UE.

Parameters:

<Number>	Range: 0 to 15 *RST: 7
Example:	See Configuring HSUPA Settings
Firmware/Software:	V3.0.20
Options:	R&S CMW-KS401
Manual operation:	See "Max Nr Of Retransmissions" on page 575

6.6.12.2 E-AGCH Settings

The following commands configure the contents transmitted via the E-AGCH.

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:UEID <Primary>[, <Secondary>]

Specifies the primary [and secondary] E-RNTI of the UE.

Parameters:

<Primary> Range: #H0 to #HFFFF
*RST: #HAAAA

<Secondary> Range: #H0 to #HFFFF
*RST: #H12AA

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Primary / Secondary UE-ID" on page 576

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:LENGth <Length>

Specifies the length of the absolute grant pattern.

Parameters:

<Length> Range: 1 to 8 (for 10 ms TTI: 1 to 4)
*RST: 1

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "AG Pattern" on page 576

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:INDex <Index>...

Specifies the absolute grant indices of the absolute grant pattern.

A query returns all 8 defined indices. A setting configures the first n indices (n = 1 to 8).

Only the first m indices are considered for transmission, with m specified via `CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:LENGth`.

Parameters:

<Index> Comma separated list of up to 8 values

Range: 0 to 31
*RST: 10
Additional parameters: OFF | ON (disables | enables transmission of the index value, OFF results in an unscheduled TTI)

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "AG Pattern" on page 576

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:SCOPe <Scope>...

Specifies the absolute grant scopes of the absolute grant pattern.

A query returns all 8 defined scopes. A setting configures the first n scopes (n = 1 to 8).

Only the first m scopes are considered for transmission, with m specified via `CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:LENGth`.

Parameters:

<Scope> OFF | ON

Comma separated list of up to 8 values
OFF: absolute grant applies to all HARQ processes
ON: absolute grant applies to one HARQ process only

*RST: OFF

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "AG Pattern" on page 576

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:TYPE <Type>...

Specifies the ID types of the absolute grant pattern.

A query returns all 8 defined types. A setting configures the first n types (n = 1 to 8).

Only the first m types are considered for transmission, with m specified via `CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:LENGth`.

Parameters:

<Type> OFF | ON

Comma separated list of up to 8 values
OFF: use primary UE-ID
ON: use secondary UE-ID

*RST: OFF

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "AG Pattern" on page 576

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:REPetition <Repetition>

Specifies whether the absolute grant pattern shall be transmitted only once or continuously.

Parameters:

<Repetition> ONCE | CONTinuous

*RST: CONT

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "AG Pattern Repetition" on page 577

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:PATTern:EXECute

Triggers the execution of a single absolute grant pattern (repetition ONCE).

Usage: Event

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "AG Pattern Execution" on page 577

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EAGCh:UTTI <UnscheduledTTI>

Defines the transmission in unscheduled TTIs.

Parameters:

<UnscheduledTTI> DUMMy | DTX

DUMMy: send absolute grants to dummy UE-IDs
DTX: switch E-AGCH off

*RST: DTX

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Unscheduled TTI" on page 578

6.6.12.3 E-RGCH and E-HICH Settings

The following commands configure the contents transmitted via E-RGCH and E-HICH.

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EHRCh:FUFDummies <Enable>

Enables or disables filling-up the frame with dummies. This is only relevant for 10 ms TTI. Here E-RGCH and E-HICH messages for the UE are transmitted in 12 slots per frame. The command defines the behavior in the remaining three slots.

Parameters:

<Enable> OFF | ON

OFF: switch channels off (DTX)
ON: fill-up with dummies, continuous signal

*RST: OFF

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Fill-Up Frame With Dummies" on page 578

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EHICh:MODE <Mode>

Specifies the HARQ acknowledgement indicator sequence transmitted via the E-HICH.

Parameters:

<Mode> CRC | ALTernating | ACK | NACK | DTX

CRC: react on UL CRC (ACK, NACK or DTX)
ALTernating: alternating ACK, NACK
ACK: all ACK
NACK: all NACK
DTX: all DTX

*RST: CRC

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HARQ Feedback (E-HICH)" on page 579

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:EHICh:SIGNature <Signature>

Specifies the E-HICH signature.

Parameters:
<Signature> Range: 0 to 39
*RST: 1

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HARQ Feedback (E-HICH)" on page 579

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:MODE <Mode>

Specifies the relative grant sequence transmitted via the E-RGCH.

For definition of a user defined pattern see `CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern`.

Parameters:
<Mode> ALTernating | UP | DOWN | DTX | CONTinuous | SINGle

ALTernating: alternating UP, DOWN - per TTI
UP: all UP
DOWN: all DOWN
DTX: all DTX
CONTinuous: continuous user defined pattern
SINGle: single user defined pattern

*RST: ALT

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Relative Grant (E-RGCH)" on page 579

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:SIGNature <Signature>

Specifies the E-RGCH signature.

Parameters:
<Signature> Range: 0 to 39
*RST: 0

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Relative Grant (E-RGCH)" on page 579

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern:EXECute

Triggers the execution of a single relative grant pattern (mode SINGle).

Usage: Event

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Relative Grant (E-RGCH)" on page 579

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern:LENGth <Length>

Specifies the length of the user defined relative grant pattern.

Parameters:

<Length> Range: 1 to 8 (for 10 ms TTI: 1 to 4)
*RST: 1

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Relative Grant (E-RGCH)" on page 579

CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern <Pattern>

Specifies the bits of the user defined relative grant pattern. Bits exceeding the configured pattern length are ignored, see `CONFigure:WCDMa:SIGN<i>:CELL:HSUPa:ERGCh:PATTern:LENGth`.

Parameters:

<Pattern> String containing exactly 8 bits
0 = DOWN, 1 = UP, - = DTX
*RST: '00000000'

Example: See Configuring HSUPA Settings

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Relative Grant (E-RGCH)" on page 579

6.6.13 Continuous Packet Connectivity

The commands in this section configure such CPC measures as for example discontinuous transmission and reception in the CELL_DCH.

6.6.13.1 General CPC Settings

The following commands correspond to the UE DTX DRX settings and the DPCCH format settings.

CONFigure:WCDMa:SIGN<i>:CELL:CPC:DTRX:DELay <EnableDelay>

Frame delay the UE waits until enabling a new timing pattern for DRX/DTX operation, see Continuous Packet Connectivity (CPC).

Parameters:

<EnableDelay> Only the following values are allowed (in frames):
0 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128
If you enter another value, the nearest allowed value is set instead.

Range: 0 frames to 128 frames
*RST: 0 frames

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DTX DRX Enable Delay" on page 581

CONFigure:WCDMa:SIGN<i>:CELL:CPC:DTRX:OFFSet <Offset>

Defines the settings for the discontinuous transmission and reception, see Continuous Packet Connectivity (CPC).

Parameters:

<Offset> subframe offset to spread the DPCCH transmissions from different UEs

Range: 0 Subframe to 159 Subframe
*RST: 0 Subframe

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DTX DRX Offset" on page 581

CONFigure:WCDMa:SIGN<i>:CELL:CPC:HLOPeration:SFORmat <SlotFormat>

Configures HS-SCCH less operation in order to reduce the HS-SCCH overhead and UE battery consumption, see Continuous Packet Connectivity (CPC).

Parameters:

<SlotFormat> Uplink DPCCH slot format, see Supported uplink DPCCH slot formats

Range: 1 to 4
*RST: 1

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UL DPCCH Slot Format" on page 582

6.6.13.2 Uplink DTX

The following commands configure the discontinuous transmission in the uplink.

CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CQITimer <Timer>

Number of subframes after an HS-DSCH reception during which the CQI reports have higher priority than the DTX pattern and are transmitted according to the regular CQI pattern, see Continuous Packet Connectivity (CPC).

Parameters:

<Timer> Only the following values are allowed (in subframes):
0 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512
If you enter another value, the nearest allowed value is set instead.

Range: 0 Subframe to 512 Subframe
*RST: 0 Subframe

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "CQI DTX Timer" on page 582

CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:APATtern:TTI<ms> <Pattern>

Defines the UL transmission reduced to DPCCH activity patttern, needed to maintain synchronization and power control loop in the UE DTX cycle, see Continuous Packet Connectivity (CPC).

Suffix:

<no>	1..2
<ms>	2,10

Parameters:

<Pattern> Only the following values are allowed for UE DTX cycle 1 (in subframes):
1 | 5 | 10 | 20 for 10 ms TTI
1 | 4 | 5 | 8 | 10 | 16 | 20 for 2 ms TTI
Only the following values are allowed for UE DTX cycle 2 (in subframes):
5 | 10 | 20 | 40 | 80 | 160 for 10 ms TTI
4 | 5 | 8 | 10 | 16 | 20 | 32 | 40 | 64 | 80 | 128 | 160 for 2 ms TTI
If you enter another value, the nearest allowed value is set instead.

Range: 1 Subframe to 160 Subframes
*RST: 10 Subframe

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DTX Cycle 1/2 > DPCCH Activity Pattern" on page 583

CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:BURSt <Burst>

Length of DPCCH transmission during UE DTX cycle, see Continuous Packet Connectivity (CPC).

Suffix:

<no>	1..2

Parameters:

<Burst> Only the following values are allowed (in subframes):
1 | 2 | 5
If you enter another value, the nearest allowed value is set instead.

Range: 1 Subframe to 5 Subframe
*RST: 1 Subframe

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DTX Cycle 1/2 > UE DPCCH Burst" on page 583

CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:DSG <DefaultSG>

Indicates E-DCH serving grant index to be used in DTX-cycle-2, see Continuous Packet Connectivity (CPC).

Suffix:
<no> 2

Parameters:
<DefaultSG> **0 to 37**: indicates E-DCH serving grant index as defined in 3GPP TS 25.321
38: zero grant
Range: 0 to 38
*RST: 0

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DTX Cycle 2 > Default SG" on page 583

CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:CYCLe<no>:ITHReshold <Threshold>

Defines when to activate the UE DTX cycle 2 after the last uplink data transmission, see Continuous Packet Connectivity (CPC).

Suffix:
<no> 2

Parameters:
<Threshold> Only the following values are allowed (in E-DCH TTI):
1 | 4 | 8 | 16 | 32 | 64 | 128 | 256
If you enter another value, the nearest allowed value is set instead.
Range: 1 E-DCH TTI to 256 E-DCH TTI
*RST: 8 E-DCH TTI

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DTX Cycle 2 > Inactivity Threshold" on page 583

CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:ENABle <Enable>

Defines the settings for the discontinuous transmission in the uplink, see Continuous Packet Connectivity (CPC).

Parameters:

<Enable>	OFF | ON enables/disables UL DTX *RST: OFF
Example:	See Configuring CPC Settings
Firmware/Software:	V3.0.30
Options:	R&S CMW-KS413
Manual operation:	See "Enable" on page 582

CONFigure:WCDMa:SIGN<i>:CELL:CPC:UDTX:LPLength <Length>

Defines the long preamble length that the UE uses during UL DTX cycle 2 to aid synchronization, see Continuous Packet Connectivity (CPC).

Parameters:

<Length>	Only the following values are allowed (in slots): 4 | 15 If you enter another value, the nearest allowed value is set instead. Range: 4 slots to 15 slots *RST: 4 slots
Example:	See Configuring CPC Settings
Firmware/Software:	V3.0.30
Options:	R&S CMW-KS413
Manual operation:	See "UE DTX Long Preamble Length" on page 582

6.6.13.3 Downlink DRX

The following commands configure the discontinuous reception in the downlink.

CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:CYCLe:APATtern <Pattern>

Reception pattern, to inform UE how often to monitor HS-SCCH, see Continuous Packet Connectivity (CPC).

Parameters:

<Pattern> Only the following values are allowed (in subframes):
4 | 5 | 8 | 10 | 16 | 20
If you enter another value, the nearest allowed value is set instead.

Range: 4 Subframe to 20 Subframe
*RST: 10 Subframe

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DRX Cycle > Activity Pattern" on page 584

CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:CYCLe:ITHReshold <Threshold>

Number of subframes after downlink activity where UE has to continuously monitor HS-SCCH, see Continuous Packet Connectivity (CPC).

Parameters:

<Threshold> Only the following values are allowed (in subframes):
0 | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512
If you enter another value, the nearest allowed value is set instead.

Range: 0 Subframe to 512 Subframe
*RST: 0 Subframe

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DRX Cycle > Inactivity Threshold" on page 584

CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:ENABle <Enable>

Defines the settings for the discontinuous reception in the downlink, see Continuous Packet Connectivity (CPC).

Parameters:

<Enable> OFF | ON

enables/disables UE DRX

*RST: OFF

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "Enable" on page 583

CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:GMONitoring:ENABle <Enable>

Defines the settings for the discontinuous reception in the downlink, see Continuous Packet Connectivity (CPC).

Parameters:

<Enable> OFF | ON

enables/disables UE monitoring of E-AGCH/E-RGCH when they overlap with the start of a UE DRX HS-SCCH reception

*RST: OFF

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DRX Cycle > UE Grant Monitoring: Enable, Inactivity Threshold" on page 584

CONFigure:WCDMa:SIGN<i>:CELL:CPC:DDRX:GMONitoring:ITHReshold <Threshold>

Number of subframes after uplink activity when UE has to monitor E-AGCH/E-RGCH, see Continuous Packet Connectivity (CPC).

Parameters:

<Threshold> Only the following values are allowed (in E-DCH TTIs):
1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256
If you enter another value, the nearest allowed value is set instead.

Range: 1 E-DCH TTI to 256 E-DCH TTI
*RST: 1 E-DCH TTI

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "UE DRX Cycle > UE Grant Monitoring: Enable, Inactivity Threshold" on page 584

6.6.13.4 E-DCH TX Start Time Restriction

The following commands set parameters for the transmission restrictions on the UL E-DCH.

CONFigure:WCDMa:SIGN<i>:CELL:CPC:MAC:CYCLe:ITHReshold <Threshold>

Restricts the starting points of the uplink transmission on E-DCH for a particular UE.

E-DCH inactivity time after which the UE can start E-DCH transmission only at given times, see Continuous Packet Connectivity (CPC).

Parameters:

<Threshold> Only the following values are allowed (in E-DCH TTIs):
1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512
If you enter another value, the nearest allowed value is set instead.

Range: 1 E-DCH TTI to 512 E-DCH TTI
*RST: 8 E-DCH TTI

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "E-DCH TX Start Time Restriction > MAC Inactivity Threshold" on page 584

CONFigure:WCDMa:SIGN<i>:CELL:CPC:MAC:CYCLe:TTI<ms> <Pattern>

Pattern where the start of uplink E-DCH transmission after inactivity is allowed, see Continuous Packet Connectivity (CPC).

Suffix:

<ms> 2,10

Parameters:

<Pattern> Only the following values are allowed (in subframes):
5 | 10 | 20 for 10 ms TTI
1 | 4 | 5 | 8 | 10 | 16 | 20 for 2 ms TTI
If you enter another value, the nearest allowed value is set instead.

Range: 1 Subframe to 20 Subframe
*RST: 10 Subframe

Example: See Configuring CPC Settings

Firmware/Software: V3.0.30

Options: R&S CMW-KS413

Manual operation: See "E-DCH TX Start Time Restriction > MAC DTX Cycle" on page 584

6.6.14 UE Measurement Report Settings

The following commands configure the UE measurement reports. This section is not relevant in reduced signaling mode.

CONFigure:WCDMa:SIGN<i>:UEReport:ENABle <Enable>

Enables or disables the UE measurement report completely.

Parameters:

<Enable> OFF | ON

*RST: ON

Example: See Configuring UE Measurement Report Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Report" on page 585

CONFigure:WCDMa:SIGN<i>:UEReport:RINTerval <Interval>

Sets the interval between two consecutive measurement report messages.

Parameters:

<Interval> Range: 0.25 s to 64 s

*RST: 1 s

Default unit: s

Example: See Configuring UE Measurement Report Settings

Firmware/Software: V1.0.15.20

Manual operation: See "Reporting Interval" on page 585

CONFigure:WCDMa:SIGN<i>:UEReport:CCELl:ENABle <CPICHRSCP>, <CPICHEcIo>, <TChBLER>, <TxPower>, <RxTxTimeDiff>, <Pathloss>

Enables or disables the evaluation and display of the individual information elements included in the UE measurement report message for the current cell.

Parameters:

<CPICHRSCP> OFF | ON

*RST: ON

<CPICHEcIo> OFF | ON

*RST: ON

<TChBLER> OFF | ON

*RST: ON

<TxPower> OFF | ON

*RST: ON

<RxTxTimeDiff> OFF | ON

*RST: ON

<Pathloss> OFF | ON

*RST: ON

Example: See Configuring UE Measurement Report Settings

Firmware/Software: V1.0.15.20

Manual operation: See "UTRA FDD" on page 585

CONFigure:WCDMa:SIGN<i>:UEReport:NCELl:ENABle <CPICHRSCP>, <CPICHEcIo>, <RSSI>, <SFNCFNTimeDiff>, <Pathloss>

Enables or disables the evaluation and display of the individual information elements included in the UE measurement report message for carrier 2.

Parameters:

<CPICHRSCP> OFF | ON
*RST: OFF

<CPICHEcIo> OFF | ON
*RST: OFF

<RSSI> OFF | ON
*RST: OFF

<SFNCFNTimeDiff> OFF | ON
*RST: OFF

<Pathloss> OFF | ON
*RST: OFF

Example: See Configuring UE Measurement Report Settings

Firmware/Software: V2.1.30

Manual operation: See "UTRA FDD" on page 585

6.6.15 Messaging (SMS)

The following commands configure parameters of the Short Message Service (SMS) and return information about received short messages. This section is not relevant in reduced signaling mode.

CONFigure:WCDMa:SIGN<i>:SMS:KTLoop <Enable>

Specifies whether the test loop is kept closed for an established RMC connection with test loop, when an SMS message is sent to the UE.

Parameters:

<Enable>	OFF | ON	
	*RST:	ON

Example: See Sending / Receiving a Short Message (Signaling)

Firmware/Software: V3.0.10

Manual operation: See "Keep Test Loop during SMS" on page 586

CONFigure:WCDMa:SIGN<i>:SMS:OUTGoing:RMCDelay <Delay>

Defines the time between sending of an SMS message and re-establishment of the RMC connection.

Parameters:

<Delay>
Range: 1 s to 5 s
*RST: OFF (2 s)
Additional parameters: OFF | ON (disables the delay | enables the delay using the previous/default value)

Example: See Sending / Receiving a Short Message (Signaling)

Firmware/Software: V2.1.20

Manual operation: See "Outgoing > RMC Reestablish Delay" on page 586

CONFigure:WCDMa:SIGN<i>:SMS:OUTGoing:INTernal <SMSInternal>

Defines the message text for SMS messages to be sent to the UE. It is encoded as 7-bit ASCII text.

Parameters:

<SMSInternal>
String with up to 160 characters
RST: "R&S Short Message Service Text. The quick brown fox jumps over the lazy dog. THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG. 0123456789 !"#%+-/()<>?=;@$,"

Example: See Sending / Receiving a Short Message (Signaling)

Firmware/Software: V2.0.10

Manual operation: See "Outgoing > Internal > Outgoing SMS" on page 587

SENSe:WCDMa:SIGN<i>:SMS:INComing:INFO:MTEXt?

Returns the text of the last SMS message received from the UE. Only 7-bit ASCII text is supported.

Return values:

<MessageText> Message text as string

Example: See Sending / Receiving a Short Message (Signaling)

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Incoming > Message Text / Message Length" on page 587

SENSe:WCDMa:SIGN<i>:SMS:INComing:INFO:MLENgth?

Returns the length of the last SMS message received from the UE.

Return values:

<MessageLength> Number of characters of the message

Range: 0 to 160

Example: See Sending / Receiving a Short Message (Signaling)

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Incoming > Message Text / Message Length" on page 587

CLEan:WCDMa:SIGN<i>:SMS:INComing:INFO:MTEXt

Resets all parameters related to a received SMS message. The message text and the information about the message length are deleted. The "message read" flag is set to true.

Example: See Sending / Receiving a Short Message (Signaling)

Usage: Event

Firmware/Software: V2.0.10

Manual operation: See "Incoming > Clear Message Text" on page 587

SENSe:WCDMa:SIGN<i>:SMS:INFO:LRMessage:RFLag?

Queries the "message read" flag for the last received message.

The flag is true (ON) in the following cases:

- No SMS message has been received.
- The last received SMS message has been read, see `SENSe:WCDMa:SIGN<i>:SMS:INComing:INFO:MTEXt?` on page 774.
- The last received SMS message has been deleted, see `CLEan:WCDMa:SIGN<i>:SMS:INComing:INFO:MTEXt` on page 775.

Return values:

<LastRecMessRead> OFF | ON

OFF: unread message available
ON: no unread message available

*RST: ON

Example: See Sending / Receiving a Short Message (Signaling)

Usage: Query only

Firmware/Software: V2.0.10

Manual operation: See "Incoming > Clear Message Text" on page 587

6.6.16 Message Monitoring Settings

The following commands configure message monitoring for WCDMA.

CONFigure:WCDMa:SIGN<i>:MMONitor:ENABle <Enable>

Enables or disables message monitoring for the WCDMA signaling application.

Parameters:

<Enable> OFF | ON

*RST: OFF

Example: See Configuring Message Monitoring

Firmware/Software: V2.1.30
V3.0.10: *RST value changed

Manual operation: See "Add WCDMA Signaling to logging" on page 588

CONFigure:WCDMa:SIGN<i>:MMONitor:IPADdress <Index>

Selects the IP address to which signaling messages shall be sent for message monitoring. The address pool is configured globally via `CONFigure:BASE:MMONitor:IPADdress<n>`.

A query returns both the current index and the resulting IP address.

Parameters:

<Index> IP1 | IP2 | IP3

Address pool index

Return values:

<IPAddress> Used IP address as string

Example: See Configuring Message Monitoring

Firmware/Software: V3.0.10

Manual operation: See "Logging PC IPv4 Address" on page 588

6.6.17 Using the WCDMA Wizard

The following commands configure and execute the WCDMA wizard.

CONFigure:WCDMa:SIGN<i>:PSETtings:HUMP <Subtest>

Selects a subtest for the HSUPA maximum output power wizard.

Parameters:

<Subtest> S1 | S2 | S3 | S4 | S5

Subtest 1 to subtest 5

*RST: S1

Firmware/Software: V3.0.30

Options: R&S CMW-KS411

Manual operation: See "WCDMA Wizards" on page 512

CONFigure:WCDMa:SIGN<i>:PSETtings <Selection>

Executes the wizard to apply the selected predefined set of WCDMA settings.

The following selections can be further configured before executing the wizard:

- HUMP: see `CONFigure:WCDMa:SIGN<i>:PSETtings:HUMP`

Setting parameters:

<Selection> HDMT | HUMT | HSMT | HUMP

HDMT: HSDPA maximum throughput
HUMT: HSUPA maximum throughput
HSMT: HSPA maximum throughput
HUMP: HSUPA maximum output power

Usage: Event

Firmware/Software: V3.0.10
V3.0.20: added HUMT and HSMT
V3.0.30: added HUMP

Options: R&S CMW-KS411

Manual operation: See "WCDMA Wizards" on page 512

6.6.18 BER Measurement

The following sections describe the commands related to the signaling BER measurement.

6.6.18.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:SIGN<i>:BER
STOP:WCDMa:SIGN<i>:BER
ABORt:WCDMa:SIGN<i>:BER

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.
- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See Performing a BER Measurement

Usage: Event

Firmware/Software: V1.0.15.0

Manual operation: See "BER (Softkey)" on page 589

FETCh:WCDMa:SIGN<i>:BER:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

Example: See Performing a BER Measurement

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "BER (Softkey)" on page 589

FETCh:WCDMa:SIGN<i>:BER:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

<RessourceState>	QUE | ACT | INV **QUE:** measurement without resources, no results available ("queued") **ACT:** resources allocated, acquisition of results in progress but not complete ("active") **INV:** not applicable because <main_state>: OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V1.0.15.0

Manual operation: See "BER (Softkey)" on page 589

6.6.18.2 Measurement Settings

The following commands configure the measurement.

CONFigure:WCDMa:SIGN<i>:BER:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY` and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout>	*RST: 0 s Default unit: s

Firmware/Software: V2.0.10

CONFigure:WCDMa:SIGN<i>:BER:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:WCDMa:SIGN<i>:BER:TBLocks` to determine the number of transport blocks per single shot.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Performing a BER Measurement

Firmware/Software: V2.1.20

Manual operation: See "Repetition" on page 591

CONFigure:WCDMa:SIGN<i>:BER:SCONdition <StopCondition>

Qualifies whether the measurement is stopped after a failed limit check or continued. `SLFail` means that the measurement is stopped and reaches the `RDY` state as soon as one of the results exceeds the limits.

Parameters:

<StopCondition> NONE | SLFail

NONE: Continue measurement irrespective of the limit check
SLFail: Stop measurement on limit failure

*RST: NONE

Example: See Configuring the BER Measurement

Firmware/Software: V1.0.15.0

Manual operation: See "Stop Condition" on page 591

CONFigure:WCDMa:SIGN<i>:BER:TBLocks <TransportBlocks>

Defines the number of transport blocks to be measured per measurement cycle (statistics cycle).

Parameters:

<TransportBlocks> Range: 1 to 50E+3
*RST: 100

Example: See Configuring the BER Measurement

Firmware/Software: V1.0.15.0

Manual operation: See "Transport Blocks" on page 591

CONFigure:WCDMa:SIGN<i>:BER:PNResync <Enable>

Activates or deactivates a correction (reordering) mechanism for transports blocks looped back in wrong order.

Parameters:

<Enable> OFF | ON

ON: Correction meachanism active, BER measurement result based on corrected block sequence, number of corrected blocks available as result "PN Discontinuity"
OFF: Correction meachanism inactive, no "PN Discontinuity" result

*RST: ON

Example: See Configuring the BER Measurement

Firmware/Software: V1.0.15.0

Manual operation: See "PN Resync" on page 592

CONFigure:WCDMa:SIGN<i>:BER:LIMit <BER>, <BLER>, <DBLER>, <LostTransBlocks>, <ULTFCIFaults>, <FDR>, <PNDiscontinuity>

Specifies upper limits for the results of the "BER" measurement.

Parameters:

<BER> Range: 0 % to 100 %
*RST: 0.1 %
Default unit: %
Additional parameters: OFF | ON (disables the limit | enables the limit using the previous/default level)

<BLER> Range: 0 % to 100 %
*RST: 1 %
Default unit: %
Additional parameters: OFF | ON (disables the limit | enables the limit using the previous/default level)

<DBLER> Range: 0 % to 100 %
*RST: 1 %
Default unit: %
Additional parameters: OFF | ON (disables the limit | enables the limit using the previous/default level)

<LostTransBlocks> Range: 1 to 50000
*RST: 1
Additional parameters: OFF | ON (disables the limit | enables the limit using the previous/default level)

<ULTFCIFaults>	Range: 0 % to 100 % *RST: 1 % Default unit: % Additional parameters: OFF | ON (disables the limit | enables the limit using the previous/default level)
<FDR>	Range: 0 % to 100 % *RST: 1 % Default unit: % Additional parameters: OFF | ON (disables the limit | enables the limit using the previous/default level)
<PNDiscontinuity>	Range: 1 to 50000 *RST: 1 Additional parameters: OFF | ON (disables the limit | enables the limit using the previous/default level)

Example: See Configuring the BER Measurement

Firmware/Software: V1.0.15.0

Manual operation: See "Limit" on page 592

6.6.18.3 Measurement Results

The following commands return the measurement results.

FETCh:WCDMa:SIGN<i>:BER?
READ:WCDMa:SIGN<i>:BER?
CALCulate:WCDMa:SIGN<i>:BER?

Returns all results of the signaling BER measurement.

The values described below are returned by `FETCh` and `READ` commands. `CALCulate` commands return limit check results instead, one value for each result listed below.

The number to the left of each result parameter is provided for easy identification of the parameter position within the result array.

Return values:

<1_Reliability>	see Reliability Indicator
<2_BER>	Bit Error Rate Range: 0 % to 100 % Default unit: %
<3_BLER>	Block Error Ratio Range: 0 % to 100 % Default unit: %
<4_DBLER>	Data Block Error Rate Range: 0 % to 100 % Default unit: %

<5_LostBlocks> Difference between the number of blocks sent and the number of blocks received

Range: 0 to <total number of blocks sent>

<6_ULTFCIFaults> Percentage of transport blocks which the UE receiver detected with a wrong transport format, irrespective of the result of the CRC check(s)

Range: 0 % to 100 %
Default unit: %

<7_FDR> False transmit format Detection Ratio; the percentage of transport blocks which passed the UE receiver's CRC check(s) but were detected with a wrong transport format

Range: 0 % to 100 %
Default unit: %

<8_PNDiscontinuity> Number of transport blocks that the R&S CMW corrected (i.e. reordered) in the PN Resync procedure

Range: 0 to <total number of blocks sent>

Example: See Performing a BER Measurement

Usage: Query only

Firmware/Software: V1.0.15.0
V2.0.10: CALCulate command

Manual operation: See "Results" on page 590

6.6.19 HSDPA ACK Measurement

The following sections describe the commands related to the signaling HSDPA ACK measurement.

6.6.19.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:SIGN<i>:HACK
STOP:WCDMa:SIGN<i>:HACK
ABORt:WCDMa:SIGN<i>:HACK

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.
- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See Performing an HSDPA ACK Measurement

Usage: Event

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "HSDPA ACK (Softkey)" on page 593

FETCh:WCDMa:SIGN<i>:HACK:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "HSDPA ACK (Softkey)" on page 593

FETCh:WCDMa:SIGN<i>:HACK:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

<RessourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "HSDPA ACK (Softkey)" on page 593

6.6.19.2 Measurement Settings

The following commands configure the measurement.

CONFigure:WCDMa:SIGN<i>:HACK:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY` and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout> *RST: 0 s
Default unit: s

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

CONFigure:WCDMa:SIGN<i>:HACK:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:WCDMa:SIGN<i>:HACK:MSFRames` to determine the number of HSDPA subframes to be measured per single shot.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Configuring the HSDPA ACK Measurement

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "Repetition" on page 595

CONFigure:WCDMa:SIGN<i>:HACK:MSFRames <MeasSubframes>

Defines the number of HSDPA subframes to be measured per measurement cycle (statistics cycle).

Parameters:

<MeasSubframes>	Range:	100 to 1E+6
	Increment:	100
	*RST:	2000

Example: See Configuring the HSDPA ACK Measurement

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "Measure Subframes" on page 595

CONFigure:WCDMa:SIGN<i>:HACK:HARQ <MonitoredHARQ>

Selects either a single H-ARQ process (numbered 0 to 7) to be monitored or specifies that all processes are to be monitored.

Parameters:

<MonitoredHARQ> ALL | H0 | H1 | H2 | H3 | H4 | H5 | H6 | H7

*RST: ALL

Example: See Configuring the HSDPA ACK Measurement

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

Manual operation: See "Monitored H-ARQ" on page 595

6.6.19.3 Measurement Results

The following commands return the measurement results.

FETCh:WCDMa:SIGN<i>:HACK:TRACe:MCQI:CARRier<carrier>:CURRent?
READ:WCDMa:SIGN<i>:HACK:TRACe:MCQI:CARRier<carrier>:CURRent?

Returns the current median CQI trace results.

The number of results depends on the configured number of subframes to be measured per measurement cycle, see `CONFigure:WCDMa:SIGN<i>:HACK:MSFRames` on page 787. For each 100 subframes one result is returned.

Suffix:

<carrier> 1..2
Selects the carrier for which the results shall be retrieved - only relevant for dual carrier scenario

Return values:

<Reliability> see Reliability Indicator

<Current> n median CQI values, from first to last measured subframe, one value per 100 measured subframes
Range: 0 to 31

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

FETCh:WCDMa:SIGN<i>:HACK:TRACe:THRoughput:CARRier<carrier>:CURRent?
READ:WCDMa:SIGN<i>:HACK:TRACe:THRoughput:CARRier<carrier>:CURRent?

Returns the current throughput trace results per carrier.

The number of results depends on the configured number of subframes to be measured per measurement cycle, see `CONFigure:WCDMa:SIGN<i>:HACK:MSFRames` on page 787. For each 100 subframes one result is returned.

Suffix:

<carrier> 1..2
Selects the carrier for which the results shall be retrieved - only relevant for dual carrier scenario

Return values:

<Reliability> see Reliability Indicator

<Current> n throughput values, from first to last (most recent) measured subframe, one value per 100 measured subframes
Range: 0 bit/s to 100E+6 bit/s
Default unit: bit/s

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

---

FETCh:WCDMa:SIGN<i>:HACK:TRACe:THRoughput:TOTal:CURRent?
READ:WCDMa:SIGN<i>:HACK:TRACe:THRoughput:TOTal:CURRent?

Returns the current overall throughput trace results (sum of both carriers in a dual carrier scenario).

The number of results depends on the configured number of subframes to be measured per measurement cycle, see `CONFigure:WCDMa:SIGN<i>:HACK:MSFRames` on page 787. For each 100 subframes one result is returned.

Return values:

<Reliability> see Reliability Indicator

<Current> n throughput values, from first to last (most recent) measured subframe, one value per 100 measured subframes

Range: 0 bit/s to 100E+6 bit/s
Default unit: bit/s

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

---

FETCh:WCDMa:SIGN<i>:HACK:THRoughput:CARRier<carrier>:ABSolute?
READ:WCDMa:SIGN<i>:HACK:THRoughput:CARRier<carrier>:ABSolute?

Return the throughput results as absolute values. The current, maximum, minimum and scheduled values are returned, see "Throughput" on page 462.

In addition to the measured values, the theoretical maximum possible throughput is returned, see "Max. possible Throughput" on page 461.

Suffix:

<carrier> 1..2
Selects the carrier for which the results shall be retrieved - only relevant for dual carrier scenario

Return values:

<Reliability> see Reliability Indicator

<AbsCurrent>	Current throughput Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<AbsMaximum>	Maximum throughput Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<AbsMinimum>	Minimum throughput Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<AbsScheduled>	Scheduled throughput Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<MaxPossible>	Maximum possible throughput Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<AbsTotalCurrent>	Current throughput - sum of both carriers Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<TotalMaxPos>	Maximum possible throughput - sum of both carriers Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

---

FETCh:WCDMa:SIGN<i>:HACK:THRoughput:CARRier<carrier>:RELative?
READ:WCDMa:SIGN<i>:HACK:THRoughput:CARRier<carrier>:RELative?

Return the throughput results as percentage of the Max. possible Throughput. The current, maximum, minimum and scheduled values are returned, see "Throughput" on page 462.

Suffix:

<carrier>	1..2 Selects the carrier for which the results shall be retrieved - only relevant for dual carrier scenario

Return values:

<Reliability>	see Reliability Indicator

<RelCurrent>	Range: 0 % to 100 % Default unit: %
<RelMaximum>	Range: 0 % to 100 % Default unit: %
<RelMinimum>	Range: 0 % to 100 % Default unit: %
<RelScheduled>	Range: 0 % to 100 % Default unit: %
Example:	See Performing an HSDPA ACK Measurement
Usage:	Query only
Firmware/Software:	V2.1.30
Options:	R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

---

FETCh:WCDMa:SIGN<i>:HACK:TRANsmission:CARRier<carrier>?
READ:WCDMa:SIGN<i>:HACK:TRANsmission:CARRier<carrier>?

Return all results of the "Transmissions" table row by row, see "Transmissions" on page 462.

Suffix:

<carrier>	1..2 Selects the carrier for which the results shall be retrieved - only relevant for dual carrier scenario

Return values:

<Reliability>	see Reliability Indicator
<Transmission1> <Transmission2> <Transmission3> <Transmission4>	For each transmission four values are returned: <Transmission...> = <Sent>, <ACK>, <NACK>, <DTX> Range: 0 % to 100 % Default unit: %
Example:	See Performing an HSDPA ACK Measurement
Usage:	Query only
Firmware/Software:	V2.1.30
Options:	R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

---

FETCh:WCDMa:SIGN<i>:HACK:BLER:CARRier<carrier>?
READ:WCDMa:SIGN<i>:HACK:BLER:CARRier<carrier>?

Return the BLER result, see "DL BLER" on page 462.

Suffix:

<carrier> 1..2
Selects the carrier for which the results shall be retrieved - only relevant for dual carrier scenario

Return values:

<Reliability> see Reliability Indicator

<BLER> Range: 0 % to 100 %
Default unit: %

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

---

FETCh:WCDMa:SIGN<i>:HACK:MSFRames?
READ:WCDMa:SIGN<i>:HACK:MSFRames?

Return the total number of already measured HSDPA subframes.

Return values:

<Reliability> see Reliability Indicator

<MeasSubframes> Range: 0 to 2E+9

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.20

Options: R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

---

FETCh:WCDMa:SIGN<i>:HACK:MCQI:CARRier<carrier>?
READ:WCDMa:SIGN<i>:HACK:MCQI:CARRier<carrier>?

Return the median CQI result, see "Median CQI" on page 463.

Suffix:

<carrier> 1..2
Selects the carrier for which the results shall be retrieved - only relevant for dual carrier scenario

Return values:

<Reliability> see Reliability Indicator

<MedianCQI> Range: 0 to 31

Example: See Performing an HSDPA ACK Measurement

Usage: Query only

Firmware/Software: V2.1.30

Options: R&S CMW-KS401

For additional information concerning syntax elements and returned values refer to Conventions and General Information

6.6.20 RLC Throughput Measurement

The following sections describe the commands related to the signaling "RLC Throughput" measurement.

6.6.20.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:SIGN<i>:THRoughput
STOP:WCDMa:SIGN<i>:THRoughput
ABORt:WCDMa:SIGN<i>:THRoughput

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.
- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See Performing an RLC Throughput Measurement

Usage: Event

Firmware/Software: V3.0.20

Manual operation: See "RLC Throughput (Softkey)" on page 596

FETCh:WCDMa:SIGN<i>:THRoughput:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

Example: See Performing an RLC Throughput Measurement

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "RLC Throughput (Softkey)" on page 596

FETCh:WCDMa:SIGN<i>:THRoughput:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

<RessourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V3.0.20

Manual operation: See "RLC Throughput (Softkey)" on page 596

6.6.20.2 Measurement Settings

The following commands configure the measurement.

CONFigure:WCDMa:SIGN<i>:THRoughput:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY` and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout> *RST: 0 s
Default unit: s

Firmware/Software: V3.0.20

CONFigure:WCDMa:SIGN<i>:THRoughput:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:WCDMa:SIGN<i>:THRoughput:WINDow` on page 797 to configure the duration of a single shot.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Configuring the RLC Throughput Measurement

Firmware/Software: V3.0.20

Manual operation: See "Repetition" on page 598

CONFigure:WCDMa:SIGN<i>:THRoughput:UPDate <Interval>

Configures the time interval used to derive a single throughput result.

Parameters:

<Interval> Range: 0.24 s to 2.4 s
Increment: 0.08 s
*RST: 0.24 s
Default unit: s

Example: See Configuring the RLC Throughput Measurement

Firmware/Software: V3.0.20

Manual operation: See "Result Interval" on page 598

CONFigure:WCDMa:SIGN<i>:THRoughput:WINDow <Size>

Specifies the duration of a single-shot measurement, i.e. the time interval covered by a throughput result trace.

The value is internally rounded up to the next integer multiple of the time interval used to calculate a single result (see `CONFigure:WCDMa:SIGN<i>:THRoughput:UPDate`).

Parameters:

<Size> Range: 10 s to 240 s
*RST: 120 s
Default unit: s

Example: See Configuring the RLC Throughput Measurement

Firmware/Software: V3.0.20

Manual operation: See "Window Size" on page 598

6.6.20.3 Measurement Results

The following commands return the measurement results.

FETCh:WCDMa:SIGN<i>:THRoughput?
READ:WCDMa:SIGN<i>:THRoughput?

Returns all single value throughput results.

Return values:

<1_Reliability>	see Reliability Indicator
<2_CurrDlPDU> <3_AvgDlPDU> <4_MaxDlPDU> <5_MinDlPDU>	Current, average, maximum and minimum DL PDU results Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<6_CurrDlSDU> <7_AvgDlSDU> <8_MaxDlSDU> <9_MinDlSDU>	Current, average, maximum and minimum DL SDU results Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<10_BlocksDlPDU>	Number of transmitted RLC PDUs Range: 0 to 4E+9
<11_CurrUlPDU> <12_AvgUlPDU> <13_MaxUlPDU> <14_MinUlPDU>	Current, average, maximum and minimum UL PDU results Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<15_CurrUlSDU> <16_AvgUlSDU> <17_MaxUlSDU> <18_MinUlSDU>	Current, average, maximum and minimum UL SDU results Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s

<19_BlocksUlPDU>	Number of received RLC PDUs Range: 0 to 4E+9
Example:	See Performing an RLC Throughput Measurement
Usage:	Query only
Firmware/Software:	V3.0.20

For additional information concerning syntax elements and returned values refer to Conventions and General Information

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FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?
FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?
FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:DL:SDU:CURRent?
FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:DL:SDU:AVERage?
READ:WCDMa:SIGN<i>:THRoughput:TRACe:DL:PDU:CURRent?
READ:WCDMa:SIGN<i>:THRoughput:TRACe:DL:PDU:AVERage?
READ:WCDMa:SIGN<i>:THRoughput:TRACe:DL:SDU:CURRent?
READ:WCDMa:SIGN<i>:THRoughput:TRACe:DL:SDU:AVERage?

Return the values of the downlink PDU and SDU throughput traces. The results of the current and average traces can be retrieved.

The number of trace values n depends on the configured <result interval> and <window size>:

n = integer (<window size> / <result interval>)

Return values:

<Reliability>	see Reliability Indicator
<Throughput>	Comma separated list of n throughput trace values Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
Example:	See Performing an RLC Throughput Measurement
Usage:	Query only
Firmware/Software:	V3.0.20

For additional information concerning syntax elements and returned values refer to Conventions and General Information

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FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?
FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?
FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:UL:SDU:CURRent?
FETCh:WCDMa:SIGN<i>:THRoughput:TRACe:UL:SDU:AVERage?
READ:WCDMa:SIGN<i>:THRoughput:TRACe:UL:PDU:CURRent?
READ:WCDMa:SIGN<i>:THRoughput:TRACe:UL:PDU:AVERage?

READ:WCDMa:SIGN<i>:THRoughput:TRACe:UL:SDU:CURRent?
READ:WCDMa:SIGN<i>:THRoughput:TRACe:UL:SDU:AVERage?

Return the values of the uplink PDU and SDU throughput traces. The results of the current and average traces can be retrieved.

The number of trace values n depends on the configured <result interval> and <window size>:

n = integer (<window size> / <result interval>)

Return values:

<Reliability>	see Reliability Indicator
<Throughput>	Comma separated list of n throughput trace values Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s

Example: See Performing an RLC Throughput Measurement

Usage: Query only

Firmware/Software: V3.0.20

For additional information concerning syntax elements and returned values refer to Conventions and General Information

6.6.21 E-HICH Measurement

The following sections describe the commands related to the signaling E-HICH measurement.

6.6.21.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:SIGN<i>:EHICh
STOP:WCDMa:SIGN<i>:EHICh
ABORt:WCDMa:SIGN<i>:EHICh

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.

- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See Performing an E-HICH Measurement

Usage: Event

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSUPA E-HICH (Softkey)" on page 599

FETCh:WCDMa:SIGN<i>:EHICh:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

Example: See Performing an E-HICH Measurement

Usage: Query only

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSUPA E-HICH (Softkey)" on page 599

FETCh:WCDMa:SIGN<i>:EHICh:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate...`, `READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

<RessourceState> QUE | ACT | INV

QUE: measurement without resources, no results available ("queued")
ACT: resources allocated, acquisition of results in progress but not complete ("active")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "HSUPA E-HICH (Softkey)" on page 599

6.6.21.2 Measurement Settings

The following commands configure the measurement.

CONFigure:WCDMa:SIGN<i>:EHICh:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY` and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout> *RST: 0 s
Default unit: s

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

CONFigure:WCDMa:SIGN<i>:EHICh:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:WCDMa:SIGN<i>:EHICh:MFRames` to define the number of subframes to be measured per single shot.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See Configuring the E-HICH Measurement

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Repetition" on page 600

CONFigure:WCDMa:SIGN<i>:EHICh:MFRames <MeasFrames>

Defines the number of subframes to be measured per measurement cycle (statistics cycle).

Parameters:

<MeasFrames>	Range: 1 to 1E+6 *RST: 1000

Example: See Configuring the E-HICH Measurement

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Measure Frames" on page 600

CONFigure:WCDMa:SIGN<i>:EHICh:LIMit <FalseRatio>

Specifies limits for the results of the E-HICH measurement.

Parameters:

<FalseRatio>	Upper limit for E-HICH reception "False Ratio" result Range: 0 % to 100 % *RST: 1 % Default unit: %

Example: See Configuring the E-HICH Measurement

Firmware/Software: V3.0.20

Options: R&S CMW-KS401

Manual operation: See "Limit" on page 600

6.6.21.3 Measurement Results

The following commands return the measurement results.

FETCh:WCDMa:SIGN<i>:EHICh?
READ:WCDMa:SIGN<i>:EHICh?

Return all single value results of the E-HICH measurement.

Return values:

<1_Reliability>	see Reliability Indicator
<2_MeasFrames>	Number of already measured HSUPA subframes Range: 0 to 1E+6
<3_FalseRX>	Number of transmissions that the UE received incorrectly Range: 0 to 1E+6
<4_CorrectRX>	Number of transmissions that the UE received correctly Range: 0 to 1E+6

<5_AllValidRX>	Number of transmissions that the UE received correctly or incorrectly For all three "RX" results the first new data block after a complete retransmission cycle is not counted as a test sample. Range: 0 to 1E+6
<6_FalseRatio>	Ratio of <3_FalseRX> to <5_AllValidRX> Range: 0 % to 100 % Default unit: %
<7_CorrectCRC>	Number of transmissions with correct CRC Range: 0 to 1E+6
<8_ErrorCRC>	Number of transmissions with incorrect CRC Range: 0 to 1E+6
<9_BLER>	Block error rate resulting from CRC results Range: 0 % to 100 % Default unit: %
<10_ThrptCurrent>	Current throughput Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<11_ThrptMaxPos>	Current throughput if there would be no CRC errors Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
<12_ThrptMaxExp>	Expected maximum reachable throughput Range: 0 bit/s to 100E+6 bit/s Default unit: bit/s
Example:	See Performing an E-HICH Measurement
Usage:	Query only
Firmware/Software:	V3.0.20
Options:	R&S CMW-KS401
Manual operation:	See "Results" on page 600

For additional information concerning syntax elements and returned values refer to Conventions and General Information

6.6.22 UL Logging Measurement

The following sections describe the commands related to the signaling "UL Logging" measurement.

6.6.22.1 Measurement Control and States

The following commands control the measurement and return the current measurement state.

INITiate:WCDMa:SIGN<i>:ULLogging
STOP:WCDMa:SIGN<i>:ULLogging
ABORt:WCDMa:SIGN<i>:ULLogging

Starts, stops, or aborts the measurement:

- `INITiate...` starts or restarts the measurement; the R&S CMW enters the "RUN" state.
- `STOP...` causes a running measurement to stop after the current evaluation period is terminated and valid results are available; the R&S CMW enters the "RDY" state.
- `ABORt...` causes a running measurement to stop immediately; the R&S CMW enters the "OFF" state.

Use `FETCh...STATe?` to query the current measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Example: See UL Logging Tests

Usage: Event

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

Manual operation: See "HSUPA UL logging (Softkey)" on page 601

FETCh:WCDMa:SIGN<i>:ULLogging:STATe?

Queries the main measurement state. Use `FETCh:...:STATe:ALL?` to query the measurement state including the substates. Use `INITiate...`, `STOP...`, `ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<State> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `ABORt...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate..., READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

Example: See UL Logging Tests

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

Manual operation: See "HSUPA UL logging (Softkey)" on page 601

FETCh:WCDMa:SIGN<i>:ULLogging:STATe:ALL?

Queries the main measurement state and the measurement substates. Both measurement substates are relevant for running measurements only. Use `FETCh:...:STATe?` to query the main measurement state only. Use `INITiate..., STOP..., ABORt...` to change the measurement state.

See also: "Measurement Control" in the R&S CMW user manual, chapter "Remote Control"

Return values:

<MainState> OFF | RDY | RUN

OFF: measurement switched off, no resources allocated, no results available (when entered after `STOP...`)
RDY: measurement has been terminated, valid results may be available
RUN: measurement running (after `INITiate..., READ...`), synchronization pending or adjusted, resources active or queued

*RST: OFF

<SyncState> PEND | ADJ | INV

PEND: waiting for resource allocation, adjustment, hardware switching ("pending")
ADJ: all necessary adjustments finished, measurement running ("adjusted")
INV: not applicable because <main_state>: OFF or RDY ("invalid")

<RessourceState>	QUE | ACT | INV **QUE:** measurement without resources, no results available ("queued") **ACT:** resources allocated, acquisition of results in progress but not complete ("active") **INV:** not applicable because <main_state>: OFF or RDY ("invalid")

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

Manual operation: See "HSUPA UL logging (Softkey)" on page 601

6.6.22.2 Measurement Settings

The following commands configure the measurement.

CONFigure:WCDMa:SIGN<i>:ULLogging:TOUT <Timeout>

Defines a timeout for the measurement. The timer is started when the measurement is initiated via a `READ` or `INIT` command. It is not started if the measurement is initiated manually (ON/OFF key or RESTART/STOP key).

When the measurement has completed the first measurement cycle (first single shot), the statistical depth is reached and the timer is reset.

If the first measurement cycle has not been completed when the timer expires, the measurement is stopped. The measurement state changes to `RDY` and the reliability indicator is set to 1, indicating that a measurement timeout occurred. Still running `READ`, `FETCh` or `CALCulate` commands are completed, returning the available results. At least for some results there are no values at all or the statistical depth has not been reached.

A timeout of 0 s corresponds to an infinite measurement timeout.

Parameters:

<Timeout>	*RST: 0 s Default unit: s

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

CONFigure:WCDMa:SIGN<i>:ULLogging:REPetition <Repetition>

Specifies the repetition mode of the measurement. The repetition mode specifies whether the measurement is stopped after a single-shot or repeated continuously. Use `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames` to define the number of subframes to be measured per single shot.

See also: "Statistical Settings" in the R&S CMW user manual, chapter "Remote Control"

Parameters:

<Repetition> SINGleshot | CONTinuous

SINGleshot: Single-shot measurement
CONTinuous: Continuous measurement

*RST: SING

Example: See UL Logging Tests

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

Manual operation: See "Repetition" on page 603

CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames <MeasSubframes>

Defines the number of subframes to be measured per measurement cycle (statistics cycle).

Parameters:

<MeasSubframes> Volume of measured consecutive UL HS-DPCCH/E-DPCCH/DPCCH subframes

Range: 15 to 10E+3
*RST: 100

Example: See UL Logging Tests

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

Manual operation: See "Measure Subframes" on page 603

CONFigure:WCDMa:SIGN<i>:ULLogging:SSFN <SFN>

Specifies the first system frame number for which the UL HS-DPCCH/E-DPCCH/DPCCH information is displayed.

System frame number corresponds to the subframe number of the UL HS-DPCCH/E-DPCCH/DPCCH.

Parameters:

<SFN> first system frame number set to modulo 4095

Range: 0 to 4095
*RST: 0

Example: See UL Logging Tests

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

Manual operation: See "Start SFN" on page 603

6.6.22.3 Measurement Results

The following commands return the measurement results.

FETCh:WCDMa:SIGN<i>:ULLogging:CARRier<carrier>:ANACk?
READ:WCDMa:SIGN<i>:ULLogging:CARRier<carrier>:ANACk?

Return results of the UL logging measurement on the UL HS-DPCCH. The results are returned per measured subframe:

<Reliability>, $\text{<ACKNACK>}_{\text{subframe1}}$, $\text{<ACKNACK>}_{\text{subframe2}}$, ..., $\text{<ACKNACK>}_{\text{subframe n}}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Suffix:
<carrier> 1..2

Return values:
<Reliability> see Reliability Indicator

<ACKNACK> ACK | NACK | DTX
HARQ-ACK:
ACK: successful CRC check of a received transmission packet
NACK: failed CRC check of a received transmission packet
DTX: no answer received from the UE

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:CARRier<carrier>:CQI?
READ:WCDMa:SIGN<i>:ULLogging:CARRier<carrier>:CQI?

Return results of the UL logging measurement on the HS-DPCCH. The results are returned per measured subframe:

<Reliability>, $\text{<CQI>}_{\text{subframe1}}$, $\text{<CQI>}_{\text{subframe2}}$, ..., $\text{<CQI>}_{\text{subframe n}}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Suffix:
<carrier> 1..2

Return values:

<Reliability> see Reliability Indicator

<CQI> DTX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30

DTX: no answer received from the UE
0 to 30: reported channel quality indicator, 30 means the best quality

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:DCARrier?
READ:WCDMa:SIGN<i>:ULLogging:DCARrier?

Return all results of the UL logging measurement on the E-DPCCH/DPCCH/HS-DPCCH. The results are returned as groups per measured subframe:

<Reliability>, {<SFN>, <Slot>, <ETFCI>, <RSN>, <HappyBit>, <DPCCH1>, <DPCCH2>, <DPCCH3>, <ACKNACK1>, <CQI1>, <ACKNACK2>, <CQI2>}$_{\text{subframe 1}}$, {...}$_{\text{subframe 2}}$, ..., {...}$_{\text{subframe n}}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Return values:

<1_Reliability> see Reliability Indicator

{<2_SFN> system frame number corresponds to the subframe number for which the UL HS-DPCCH/E-DPCCH/DPCCH information is displayed (set to modulo 4095)

Range: 0 to 4095
*RST: 0

<3_Slot> first slot number of the received UL HS-DPCCH/E-DPCCH/DPCCH subframe; see UL Logging Measurement

Range: 0 | 3 | 6 | 9 | 12
*RST: n/a

<4_ETFCI> DTX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127

see also 2ms TTI E-DCH transport block size

DTX: no answer received from the UE
0 to 127: indicates the transport block size on the E-DPDCH

*RST: n/a

<5_RSN> DTX | 0 | 1 | 2 | 3

retransmission sequence number
DTX: no answer received from the UE
0: new transmission
1: first retransmission
2: second retransmission
3: higher than second retransmission

*RST: n/a

<6_HappyBit> HAPPy | UNHappy | DTX

HAPPy: UE is satisfied with the granted data rate
UNHappy: UE is not transmitting at maximum power and cannot empty its transmit buffer with the current serving grant within a certain time period
DTX: no answer received from the UE

*RST: n/a

<7_DPCCH1> OFF | ON

queries the status of DPCCH read out from the first slot

*RST: n/a

<8_DPCCH2> OFF | ON

queries the status of DPCCH read out from the second slot

*RST: n/a

<9_DPCCH3> OFF | ON

queries the status of DPCCH read out from the third slot

*RST: n/a

<10_ACKNACK1> ACK | NACK | DTX

HARQ ACK: UE response (by dual carrier - carrier one)
ACK: successful CRC check of a received transmission packet
NACK: failed CRC check of a received transmission packet
DTX: no answer received from the UE

*RST: n/a

<11_CQI1> DTX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30

UE response (by dual carrier - carrier one); 30 means the best quality
DTX: no answer received from the UE
0 to 30: reported channel quality indicator

*RST: n/a

<12_ACKNACK2> ACK | NACK | DTX

HARQ ACK: UE response (by dual carrier - carrier two)
ACK: successful CRC check of a received transmission packet
NACK: failed CRC check of a received transmission packet
DTX: no answer received from the UE

*RST: n/a

<13_CQI2>} DTX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30

UE response (by dual carrier - carrier two); 30 means the best quality
DTX: no answer received from the UE
0 to 30: reported channel quality indicator

*RST: n/a

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:DPCCh?
READ:WCDMa:SIGN<i>:ULLogging:DPCCh?

Return results of the UL logging measurement on the DPCCH. The results are returned as groups per measured subframe:

<Reliability>, {<DPCCH1>, <DPCCH2>, <DPCCH3>}$_{\text{subframe1}}$, {...}$_{\text{subframe 2}}$, ..., {...}$_{\text{subframe n}}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Return values:

<Reliability> see Reliability Indicator

<DPCCH1> OFF | ON

queries the status of DPCCH read out from the first slot

*RST: n/a

<DPCCH2> OFF | ON

queries the status of DPCCH read out from the second slot

*RST: n/a

<DPCCH3> OFF | ON
queries the status of DPCCH read out from the third slot
*RST: n/a

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:ETFCi?
READ:WCDMa:SIGN<i>:ULLogging:ETFCi?

Return results of the UL loging measurement on the E-DPCCH. The results are returned per measured subframe:

<Reliability>, <ETFCI>$_{subframe1}$, <ETFCI>$_{subframe2}$, ..., <ETFCI>$_{subframe\ n}$

The number of subframes n is configured via CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames.

Return values:

<Reliability> see Reliability Indicator

<ETFCI> DTX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127
see also 2ms TTI E-DCH transport block size
DTX: no answer received from the UE
0 to 127: indicates the transport block size on the E-DPDCH
*RST: n/a

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:HBIT?
READ:WCDMa:SIGN<i>:ULLogging:HBIT?

Return results of the UL loging measurement on the E-DPCCH. The results are returned per measured subframe:

<Reliability>, <HappyBit>$_{subframe1}$, <HappyBit>$_{subframe2}$, ..., <HappyBit>$_{subframe\ n}$

The number of subframes n is configured via CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames.

Return values:

<Reliability> see Reliability Indicator

<HappyBit> HAPPy | UNHappy | DTX

HAPPy: UE is satisfied with the granted data rate
UNHappy: UE is not transmitting at maximum power and cannot empty its transmit buffer with the current serving grant within a certain time period
DTX: no answer received from the UE

*RST: n/a

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:RSN?
READ:WCDMa:SIGN<i>:ULLogging:RSN?

Return results of the UL loging measurement on the E-DPCCH. The results are returned per measured subframe:

<Reliability>, <RSN>$_{subframe1}$, <RSN>$_{subframe2}$, ..., <RSN>$_{subframe\ n}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Return values:

<Reliability> see Reliability Indicator

<RSN> DTX | 0 | 1 | 2 | 3

retransmission sequence number:
DTX: no answer received from the UE
0: new transmission
1: first retransmission
2: second retransmission
3: higher than second retransmission

*RST: n/a

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:SFN?
READ:WCDMa:SIGN<i>:ULLogging:SFN?

Return results of the UL logging measurement on the UL HS-DPCCH/E-DPCCH/DPCCH. The results are returned per measured subframe:

<Reliability>, <SFN>$_{subframe1}$, <SFN>$_{subframe2}$, ..., <SFN>$_{subframe\ n}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Return values:

<Reliability> see Reliability Indicator

<SFN> system frame number corresponds to the subframe number for which the UL logging information is displayed (set to modulo 4095)

Range: 0 to 4095
*RST: 0

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging:SLOT?
READ:WCDMa:SIGN<i>:ULLogging:SLOT?

Return results of the UL logging measurement on the E-DPCCH/DPCCH/HS-DPCCH. The results are returned per measured subframe:

<Reliability>, $\text{<Slot>}_{\text{subframe1}}$, $\text{<Slot>}_{\text{subframe2}}$, ..., $\text{<Slot>}_{\text{subframe n}}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Return values:

<Reliability> see Reliability Indicator

<Slot> first slot number of the received UL HS-DPCCH/E-DPCCH/DPCCH subframe; see UL Logging Measurement

Range: 0 | 3 | 6 | 9 | 12
*RST: 0

Usage: Query only

Firmware/Software: V3.0.30

Options: R&S CMW-KS401

FETCh:WCDMa:SIGN<i>:ULLogging[:SCELl]?
READ:WCDMa:SIGN<i>:ULLogging[:SCELl]?

Return all results of the UL logging measurement on the E-DPCCH/DPCCH/HS-DPCCH. The results are returned as groups per measured subframe:

<Reliability>, {<SFN>, <Slot>, <ETFCI>, <RSN>, <HappyBit>, <DPCCH1>, <DPCCH2>, <DPCCH3>, <ACKNACK>, <CQI>}$_{\text{subframe 1}}$, {...}$_{\text{subframe 2}}$, ..., {...}$_{\text{subframe n}}$

The number of subframes n is configured via `CONFigure:WCDMa:SIGN<i>:ULLogging:MSFRames`.

Return values:

<1_Reliability> see Reliability Indicator

<2_SFN> system frame number corresponds to the subframe number for which the UL HS-DPCCH/E-DPCCH/DPCCH information is displayed (set to modulo 4095)

Range: 0 to 4095
*RST: 0

<3_Slot> first slot number of the received UL HS-DPCCH/E-DPCCH/DPCCH subframe; see UL Logging Measurement

Range: 0 | 3 | 6 | 9 | 12
*RST: n/a

<4_ETFCI> DTX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127

see also 2ms TTI E-DCH transport block size
DTX: no answer received from the UE
0 to 127: indicates the transport block size on the E-DPDCH

*RST: n/a

<5_RSN>,... retransmission sequence number
DTX: no answer received from the UE
0: new transmission
1: first retransmission
2: second retransmission
3: higher than second retransmission

*RST: n/a

<6_HappyBit> HAPPy | UNHappy | DTX

HAPPy: UE is satisfied with the granted data rate
UNHappy: UE is not transmitting at maximum power and cannot empty its transmit buffer with the current serving grant within a certain time period
DTX: no answer received from the UE

*RST: n/a

<7_DPCCH1>,... OFF | ON

queries the status of DPCCH read out from the first slot

*RST: n/a

<8_DPCCH2>,... OFF | ON

queries the status of DPCCH read out from the second slot

*RST: n/a

<9_DPCCH3>,...	OFF | ON queries the status of DPCCH read out from the third slot *RST: n/a
<10_ACKNACK>,...	ACK | NACK | DTX HARQ ACK: UE response **ACK:** successful CRC check of a received transmission packet **NACK:** failed CRC check of a received transmission packet **DTX:** no answer received from the UE *RST: n/a
<11_CQI>,...	DTX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 UE response; 30 means the best quality **DTX:** no answer received from the UE **0 to 30:** reported channel quality indicator, 30 means the best quality *RST: n/a
Usage:	Query only
Firmware/Software:	V3.0.30
Options:	R&S CMW-KS401

6.7 List of Commands

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Symbols

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