ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Software Options

WCDMA Node B TX Tests (3GPP/FDD)

R&S® CMU-K75
1150.3200.02

Including the following supplementary software options:

WCDMA Downlink BER (3GPP/FDD)
R&S® CMU-K70, 1157.4602.02

RACH Testing (3GPP/FDD)
R&S® CMU-K71, 1157.4702.02

HSDPA Analyzer
R&S® CMU-K72, 1200.7603.02

HSDPA Stimulate
R&S® CMU-K73, 1200.7703.02

WCDMA Generator (3GPP/FDD, Release 99, Uplink)
R&S® CMU-K76, 1150.3300.02

AWGN and BER Simulation
R&S® CMU-K77, 1150.4107.02

BCH Synchronization and Monitor
R&S® CMU-K78, 1150.4802.02

HSDPA TX Measurements (DL)
R&S® CMU-K79, 1150.4407.02

Printed in Germany

Dear Customer,

throughout this manual, CMU-K70 to CMU-K79 is generally used as an abbreviation for the software options R&S® CMU-K70 and R&S® CMU-K75 to R&S® CMU-K79. The Universal Radio Communication Tester R&S® CMU 300 is abbreviated as CMU300.

Supplement to the Operating Manual for WCDMA Node B Software Options

New Features in Version V4.42 of Options R&S CMU-K70/…/-K79 (with Base System V4.42)

New Operating Bands Supported

Dear R&S CMU Customer,

With the new software version V4.42 of the R&S CMU 300 WCDMA SW (including options R&S CMUK70/…/-K79), the Universal Radio Communication Tester R&S CMU 300 provides the operating bands 7, 8, 9 and 10 and operating band S (3GPP/FDD). The downlink and uplink channels in the new operating bands are listed below.

- Operating Band VII comprises uplink frequencies between 2500 MHz and 2570 MHz, and downlink frequencies between 2620 MHz and 2690 MHz.
- Operating Band VIII comprises uplink frequencies between 880 MHz and 915 MHz, and downlink frequencies between 925 MHz and 960 MHz.
- Operating Band IX comprises uplink frequencies between 1749.9 MHz and 1784.9 MHz, and downlink frequencies between 1844.9 MHz and 1879.9 MHz.
- Operating Band X covers uplink frequencies between 1710 MHz and 1770 MHz, and downlink frequencies between 2110 MHz and 2170 MHz.
- Operating Band S covers uplink frequencies between 2000 MHz and 2020 MHz, and downlink frequencies between 2180 MHz and 2200 MHz. Operating Band S requires option R&S CMU-K74.

The assignment between channel numbers *N* and carrier frequencies *F* is defined in the 3GPP specification (TS 25.141).

$$N = 5 \cdot (F_{UL} / MHz - F_{UL,Offset} / MHz), \quad F_{UL,Low} \le F_{UL} \le F_{UL,High}$$

$$N = 5 \cdot (F_{DL} / MHz - F_{DL,Offset} / MHz), \quad F_{DL,Low} \le F_{DL} \le F_{DL,High}$$

The band-specific offset frequencies F_{offset} are listed in the tables below. The CMU accepts the entry of frequencies **or** channel numbers inside the selected operating bands.

Table 4-1 UTRA operating bands and channel numbers: Uplink

Operating Band	UARFCN formula offset $F_{UL,\ Offset}$ [MHz]	Assigned Channels	Assigned Center Frequencies $F_{UL,\ Low}$ [MHz] to $F_{UL,\ High}$ [MHz]
VII	2100 2030.1 (for additional channels)	2012 to 2338 2362, 2387, 2412, 2437, 2462, 2487, 2512, 2537, 2562, 2587, 2612, 2637, 2662, 2687	2502.4 to 2567.6 2502.5, 2507.5, 2512.5, 2517.5, 2522.5, 2527.5, 2532.5, 2537.5, 2542.5, 2547.5, 2552.5, 2557.5, 2562.5, 2567.5
VIII	340	2712 to 2863	882.4 to 912.6
IX	0	8762 to 8912	1752.4 to 1782.4
X	1135 1075.1 (for additional channels)	2887 to 3163 3187, 3212, 3237, 3262, 3287, 3312, 3337, 3362, 3387, 3412, 3437, 3462	1712.4 to 1767.6 1712.5, 1717.5, 1722.5, 1727.5, 1732.5, 1737.5, 1742.5, 1747.5, 1752.5, 1757.5, 1762.5, 1767.5
S	0 1000.1 (for additional channels)	10012 to 10088, 5012, 5037, 5062, 5087	2002.4 to 2017.6, 2002.5, 2007.5, 2012.5, 2017.5

Table 4-2 UTRA operating bands and channel numbers: Downlink

Operating Band	UARFCN formula offset $F_{DL, Offset}$ [MHz]	Assigned Channels	Assigned Center Frequencies $F_{DL, Low}$ [MHz] to $F_{DL, High}$ [MHz]
VII	2175 2105.1 (for additional channels)	2237 to 2563 2587, 2612, 2637, 2662, 2687, 2712, 2737, 2762, 2787, 2812, 2837, 2862, 2887, 2912	2622.4 to 2687.6 2622.5, 2627.5, 2632.5, 2637.5, 2642.5, 2647.5, 2652.5, 2657.5, 2662.5, 2667.5, 2672.5, 2677.5, 2682.5, 2687.5
VIII	340	2937 to 3088	927.4 to 957.6
IX	0	9237 to 9387	1847.4 to 1877.4
X	1490 1430.1 (for additional channels)	3112 to 3388 3412, 3437, 3462, 3487, 3512, 3537, 3562, 3587, 3612, 3637, 3662, 3687	2112.4 to 2167.6 2112.5, 2117.5, 2122.5, 2127.5, 2132.5, 2137.5, 2142.5, 2147.5, 2152.5, 2157.5, 2162.5, 2167.5
S	0 1000.1 (for additional channels)	10912 to 10988, 5912, 5937, 5962, 5987	2182.4 to 2197.6, 2182.5, 2187.5, 2192.5, 2197.5

In remote control (`CONFigure:SIGNalling:SELect:BAND`), the new bands are selected with the parameters `OB7, OB8, OB9, OB10, OBS`.

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Contents of Manuals for Universal Radio Communication Tester R&S CMU

The user documentation for the R&S CMU 200/300 is divided in a Quick Start Guide, the operating manual for the basic instrument (including options CMU-B41, CMU-B17) and separate manuals for individual software and hardware options. The complete documentation is available on CD-ROM, stock no. PD 0757.7746.2x.

TIP

For an overview and order information about printed manuals refer to the beginning of the Quick Start Guide. The latest revisions of the manuals are also posted on the CMU Customer Web on GLORIS.

Operating Manual R&S CMU-K70 …-K79

(Software Options for WCDMA Node B Tests (3GPP/FDD)

The present operating manual describes the application of the R&S CMU 300 for WCDMA Node B Tests. It gives comprehensive information about the installation of the required software options and about manual and remote control of the instrument. For introduction, some typical measurement tasks are explained in detail using the functions of the graphical user interface.

The manual is organized as follows:

Chapter 1	Describes the steps necessary for installing the software and putting the instrument into operation.
Chapter 2	Gives an introduction to the application of the CMU for WCDMA Node B tests and presents typical measurement examples.
Chapter 3	Gives an overview of the user interface and describes the concepts of measurement control and instrument configuration.
Chapter 4	Represents the reference chapter providing detailed information on all functions of the user interface and their application.
Chapter 5	Describes the basics of remote control of the instrument for WCDMA Node B tests.
Chapter 6	Lists all remote control commands for WCDMA Node B tests. At the end of the chapter the commands are grouped together according to their function (measurement groups or configurations) and sorted in alphabetical order.
Chapter 10	Contains an index for the operating manual.

What's new in this Revision...

This operating manual describes version V4.10 of the WCDMA Node B firmware package. The essential new features of this firmware version are listed below.

New Features	Description	Refer to...
UE-ID scan	Automatic detection of the UE-IDs in the cell.	Chapter 2 and Chapter 4, → HSDPA Analyzer, Measurement Configuration
Extended data logging	Code Domain Power log contains TCP values	Chapter 4, Connection Control (Signalling) → Data Logging
BCH Trigger Generator	New operating mode for *Non Signalling* tests enables the UL WCDMA generator without external trigger.	Chapter 4, → Time Synchronization and BCH Trigger Generator

Frequently Used Abbreviations

3GPP	*3rd Generation Partnership Project*
Abs.	*Absolute*
ACLR	*Adjacent Channel Leakage power Ratio*
ACP	*Adjacent Channel Power*
AICH	*Acquisition Indicator Channel*
AM	*Acknowledged Mode*
AMR	*Adaptive Multi Rate*
ARQ	*Automatic Repeat Request*
Avg.	*Average*
BCH	*Broadcast Control Channel*
BER	*Bit Error Rate*
BLER	*Block Error Rate*
BTFD	*Blind Transport Format Detection*
CCPCH	*Common Control Physical Channel*
CCTrCH	*Coded Composite Transport Channel*
CDE	*Code Domain Error*
CDMA	*Code Division Multiple Access*
CDP	*Code Domain Power*
CD-ρ	*Code Domain ρ-factor*
Chan.	*Channel*
Channel.	*Channelization*
CPICH	*Common Pilot Channel*
CQI	*Channel Quality Indicator (HSDPA)*
CRC	*Cyclic Redundancy Check*
CTFC	*Calculated Transport Format Combination*
Curr.	*Current*
DBLER	*Data Block Error Rate*
DCCH	*Dedicated Control Channel*
Disp.	*Display*
DL	*Downlink*
DPCCH	*Dedicated Physical Control Channel*
DPCH	*Dedicated Physical Channel*
DPDCH	*Dedicated Physical Data Channel*
DTCH	*Dedicated Traffic Channel*
Err.	*Error*
EVM	*Error Vector Magnitude*
Ext./Extern.	*External*
FBI	*Feedback information*
FDD	*Frequency Division Duplex*
FDR	*False transmit format Detection Ratio*
FFT	*Fast Fourier Transform*
Freq.	*Frequency*
GPIB	*General Purpose Interface Bus = IEEE488 Bus*
H-ARQ	*Hybrid ARQ*
HPSK	*Hybrid Phase Shift Keying*
HSDPA	*High Speed Downlink Packet Access*
HS-DPCCH	*High Speed Dedicated Physical Control Channel*
HS-DPDCH	*High Speed Dedicated Physical Data Channel*
HS-S(P)DSCH	*High Speed (Physical) Downlink Shared Channel*
HS-SCCH	*High Speed Shared Control Channel*
I	*In-phase*
IF	*Intermediate Frequency*
IMEI	*International Mobile station Equipment Identity*
Int.	*Internal*
IPDL	*Idle Periods in the DownLink*
LAC	*Location Area Code*
Lev.	*Level*
MAC	*Medium Access Control*
Magn.	*Magnitude*
Max.	*Maximum*
MCC	*Mobile Country Code*
ME	*Magnitude Error*
Meas.	*Measurement*
Min.	*Minimum*
MNC	*Mobile Network Code*
OBW	*Occupied Bandwidth*
OCNS	*Orthogonal Channel Noise Simulator*
OTDOA	*Observed Time Difference Of Arrival*
OVSC	*Orthogonal Variable Spreading Code*

P-CCPCH	Primary Common Control Physical Channel
PCDE	Peak Code Domain Error
PCPCH	Physical Common Packet Channel
P-CPICH	Primary Common Pilot Channel
PDCP	Packet Data Convergence Protocol
PDSCH	Physical Downlink Shared Channel
PE	Phase Error
PEP	Peak Envelope Power
PICH	Page Indicator Channel
Pk.	Peak
P-SCH	Primary Synchronization Channel
Q	Quadrature-phase
QPSK	Quadrature Phase Shift Keying
RAB	Radio Access Bearer
RAT	Radio Access Technology
RBW	Resolution Bandwidth
Ref.	Reference (marker)
Rel.	Relative
RF	Radio Frequency
RLC	Radio Link Control
RRC	Root-raised cosine (filter)
RSCP	Received Signal Code Power
RV	Redundancy and Constellation Version (Coding Sequence, HSDPA)
RX	Receiver
SCCPCH	Secondary Common Control Physical Channel
S-CCPCH	Secondary Common Control Physical Channel
SCH	Synchronization Channel
Scr.	Scrambling
SDU	Service Data Unit
SEM	Spectrum Emission Mask
SRB	Signalling Radio Bearer
S-SCH	Secondary Synchronization Channel
SW	Software
Sym.	Symbol
Sync./Synch.	Synchronization
TF	Transport Format
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TFI	Transport Format Indicator
TM	Transparent Mode
TPC	Transmit Power Control
TrCH	Transport Channel
Trg.	Trigger
TTI	Transmission Time Interval
TTI	Transmission Time Intervals
UARFCN	UTRA Absolute Radio Frequency Channel Number
UE	User equipment
UE-ID	User Equipment Identification
UICC	Universal Integrated Circuit Card
UL	Uplink
USIM	UMTS Subscriber Identity Module
UTRA(N)	Universal Terrestrial Radio Access (Network)
Vect.	Vector
WCDMA	Wideband CDMA

Glossary of Terms

The following list contains definitions of terms that are often used throughout this manual. For a comprehensive overview of WCDMA definitions and abbreviations please refer also to 3GPP TS 21.905 "Vocabulary for 3GPP Specifications" (Release 1999).

Adjacent channel power (ACP) Power emitted in the first and second adjacent channels, i.e. at ±5 MHz and ±10 MHz from the carrier frequency.

Adjacent channel leakage power ratio (ACLR) Ratio of the power measured in an adjacent channel (Adjacent Channel Power, ACP) to the transmitted carrier power, expressed in dB. This definition differs from the 3GPP specification by a minus sign but is in line with other systems like GSM and TDMA.

Carrier frequency error Deviation of the UE modulated carrier frequency from the frequency received from the base station (node B). In the CMU: deviation of the UE modulated carrier frequency from the nominal carrier frequency.

Carrier spacing Frequency offset between two adjacent carriers (5 MHz).

Channel raster Frequency offset between the allowed positions of WCDMA carriers (200 kHz).

Channelization code Orthogonal Variable Spreading Factor (OVSF) codes that preserve the orthogonality between a user's different physical channels. The channelization codes used in the uplink WCDMA signal are OVSF codes with a length (spreading factor) between 4 and 256. In the downlink, a spreading factor of 512 may be used in addition.

Chip rate Product of the symbol rate and the spreading factor. For the 3GPP WCDMA system a fixed chip rate of 3.84 Mcps is specified.

Code domain The entire set of channelization codes involved in a WCDMA signal configuration. Measuring a parameter in code domain means to determine its values as a function of the individual channelization codes.

For standard uplink WCDMA DPCH signals the assignment between the physical channel contributions and the channelization codes in the I and Q branch is fixed. Therefore, any code domain measurement result can be represented as a function of the physical channel contributions as well.

Code domain error Ratio of the RMS-averaged power of the error vector projected onto the code domain to the RMS-averaged power of the composite reference signal, expressed in dB.

Code domain power Power in the individual code channels normalized to the power of the composite signal, expressed in dB.

Code domain ρ factor Correlated power of an individual channel (ρ factor) divided by the total power of the composite WCDMA signal.

Crest factor Peak to average ratio: ratio of the peak transmit power in a slot (peak envelope power) to the average transmit power in a slot.

Downlink WCDMA signal Signal transmitted by a WCDMA base station (node B) to be received by the UE. With option CMU-K66, *WCDMA (3GPP/FDD, DL) Generator,* the CMU provides a downlink WCDMA signal consisting of a P-CPICH, P-CCPCH, P-SCH, S-SCH, and DPCH. The individual channels are spread, multiplexed and scrambled according to the rules defined in the standard.

Emission mask Tolerance template for the spectral emissions in a range between 2.5 MHz and 12.5 MHz away from the UE center carrier frequency. The spectrum emission mask is divided into several areas the power in these areas must be measured with Gaussian filters of different bandwidth.

Error vector Difference vector connecting the measured and the ideal modulated signal vector.

Error vector magnitude	RMS value of the error vector divided by the RMS value of the reference signal (ideal modulated signal vector), expressed in percent. The error vector magnitude (EVM) is the critical quantity to assess the modulation accuracy of the UE transmitter.
Inner Loop TPC	Transmit Power Control mode where the UE transmitter adjusts its output power in accordance with a series of TPC command received in the downlink.
I/Q imbalance	Difference between the estimated I and Q amplitudes of the measured signal, normalized and expressed in dB units.
I/Q origin offset	Ratio of the I/Q offset vector (i.e. the estimated DC offset of the measured signal) to the average offset-corrected signal vector.
Magnitude error	Difference in magnitude between the measured and the ideal modulated signal vector, normalized to the magnitude of the ideal vector.
Maximum power	Operating mode where the UE is set to its maximum power control level.
Minimum power	Operating mode where the UE is set to its minimum power control level.
Modulation accuracy	Ability of the UE transmitter to generate an ideal QPSK-modulated signal.
Occupied bandwidth	Width of a frequency range around the assigned channel frequency containing 99% of the total integrated power of the transmitted spectrum.
OFF power	Operating mode where the UE is set to is set to the transmit OFF power state where it does not transmit except during uplink compressed mode.
Peak code domain error	Maximum Code Domain Error for all codes in a considered code domain at a specific spreading factor. The Code Domain Error for every code corresponds to the projection of the EVM onto that code. The PCDE is expressed in dB.
Peak envelope power	Maximum power of the RF envelope.
Phase error	Difference in phase between the measured and the ideal modulated signal vector.
Power class	Determines the maximum output power of a WCDMA UE and its tolerances. The four power classes 1 to 4 specified correspond to maximum output powers of +33 dBm, +27 dBm, +24 dBm and +21 dBm.
Power step	Relative power difference between the average power of the target timeslot and the average power of the original timeslot in inner loop power control. The powers are averaged not including the transient duration.
RF channel number	Integer number assigned to an RF channel centered on an integer multiple of the 200 MHz channel raster. The assignment between channel numbers *N* and carrier frequencies *F* is $N = 5 \cdot (F / MHz), \quad 0.0\ MHz \le F \le 3276.6\ MHz$. The WCDMA UE is designed to operate in the uplink band between 1920 MHz and 1980 MHz, corresponding to channel numbers 9600 to 9900. The downlink band ranges from 2110 MHz to 2170 MHz, corresponding to channel numbers 10550 to 10850.
Spectrum emissions	Unwanted emissions immediately outside the nominal channel resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. An uplink WCDMA signal must conform to a specified spectrum *emission mask*.
Spreading factor	Length or maximum number of the channelization codes used to spread the WCDMA signal. The spreading factor is the ratio of the WCDMA chip rate of 3.84 Mcps and the symbol rate.
Symbol rate	WCDMA chip rate divided by the spreading factor. The WCDMA standard allows variable symbol rates of 7.5 ksps (downlink only), 15 ksps, 30 ksps, 60 ksps, 120 ksps, 240 ksps, 480 ksps and 960 ksps.

Transmit Power Control The process of adjusting the output power of the UE transmitter in order to optimize the transmission quality of the connection and the network capacity.

Uplink WCDMA signal Signal transmitted by a WCDMA UE to be received by the base station (node B). An uplink DPCH signal consists of one DPCCH plus up to 6 DPDCHs that are spread, multiplexed and scrambled according to fixed rules.

Waveform quality Normalized correlated power between the actual and the ideal waveform, sampled at the constellation points. The waveform quality (ρ factor) is a measure of the modulation accuracy. For an ideal transmitter (ideal correlation), it is equal to 1, otherwise it is a positive number smaller than 1.

References

3GPP TS 21.905 "Vocabulary for 3GPP Specifications" (Release 1999)
3GPP TS 25.141 "Base station conformance testing (FDD)" (Release 1999)
3GPP TS 25.143 "UTRA repeater; Conformance testing" (Release 1999)
3GPP TS 25.211 "Physical channels and mapping of transport channels onto physical channels" (Release 1999)
3GPP TS 25.213 "Spreading and modulation (FDD)" (Release 1999)
3GPP TS 25.214 "Physical layer procedures (FDD)" (Release 1999)
3GPP TS 25.402 "Synchronisation in UTRAN Stage 2" (Release 1999)

Application Note 1GP39_0E: "W-CDMA Signal Generator Solutions by Rohde & Schwarz"
Application Note 1EF44_0E: "Measurements on 3GPP Base Station Transmitter Signals"

For more application notes and information related to our instruments please refer to http://www.rsd.de/www/dev_center.nsf/appnotes?OpenFrameset

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1 Installation and First Steps

This chapter describes the installation and update of the WCDMA Node B software options for the Universal Radio Communication Tester R&S CMU300.

Installation Instructions

Before proceeding to perform any of the steps described in this manual, please make sure that the instrument is properly connected and put into operation according to the instructions given in chapter 1 of the R&S CMU 300 Quick Start Guide. The hardware and software options available are shown in the *Startup* menu. The status of the software option described in this manual is indicated in the line *UMTS Node B – WCDMA FDD*.

- If a version number is indicated, the R&S CMU is ready to use the software option. In this case you may skip this chapter, except if you wish to update the current software version or activate another version.
- If *disabled* is indicated, the software option must be enabled using a key code; see section *Enabling Software Options* on p. 1.6.
- If *not installed* is indicated, the software must be installed via the PCMCIA interface or the floppy disk drive, see below.

Software Installation or Update

The R&S CMU300 is always delivered with the latest software version available. New R&S CMU software versions are available for download on the R&S GLORIS Service board. To be loaded via the PCMCIA interface, the software must be copied to one or several flash disks/memory cards or PCMCIA hard disks. An appropriate memory card R&S CMU-Z1, order no. 1100.7490.02, can be obtained from Rohde & Schwarz.

Note: *If your R&S CMU is equipped with a floppy disk drive (option R&S CMU-U61), a set of installation floppy disks must be generated instead of a flash disk. All other steps do not depend on the storage medium.*

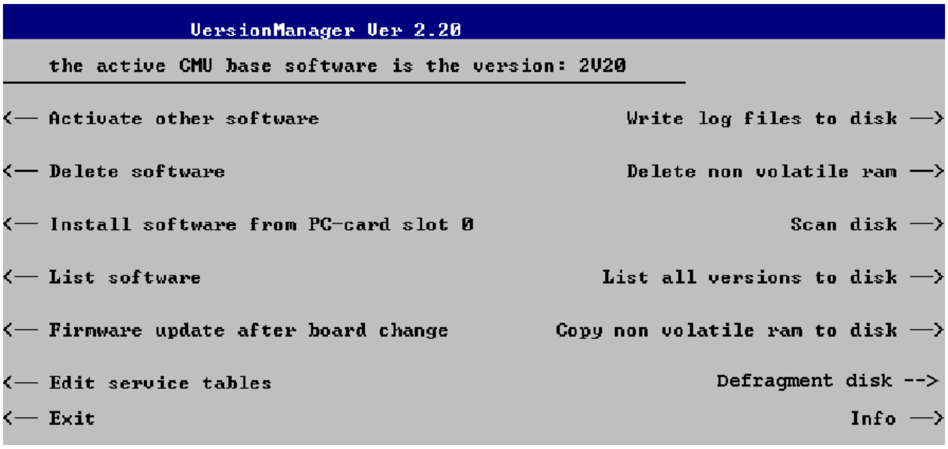
To install the WCDMA Node B software options proceed as follows:

➢ Switch off the R&S CMU.

➢ Insert the flash disk into one of the two slots of the PCMCIA interface.

➢ Switch on the R&S CMU.

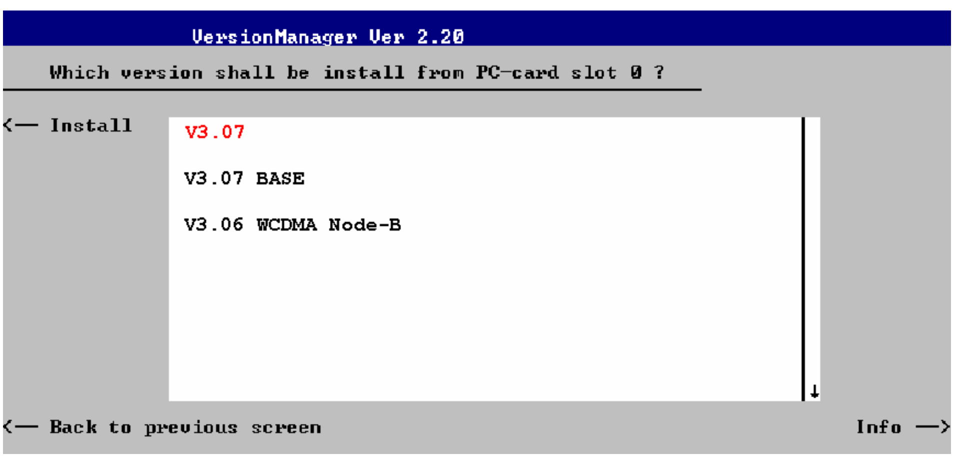
The installation is started automatically while the R&S CMU 300 performs its start-up procedure. To this end the *VersionManager* is called up (for a detailed description of the *VersionManager* refer to chapter 1 of the CMU operating manual or to the on-line help accessible via *Info):*



Softkey no. 5 on the left softkey bar, *Install software...,* is used to install new software from an external storage medium. The R&S CMU automatically recognizes the storage medium and indicates the corresponding slot number: Slot 0 or 1 denotes the left or right slot of the PCMCIA interface. If a floppy disk is used the menu option reads *Install software version <version> from floppy.*

➢ Press left softkey no. 5 *(Install software...)* to start the installation.

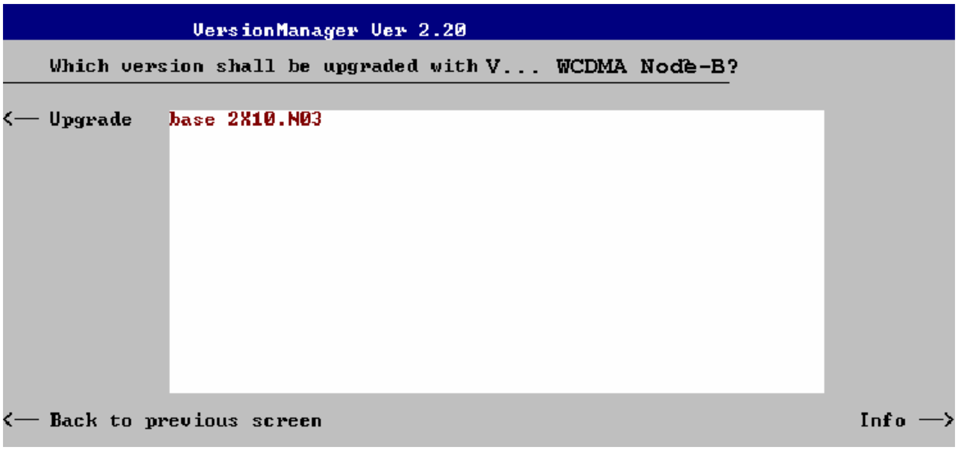
If your storage medium contains several installation versions, the software version selection dialog is opened:



➢ Use the rotary knob or the cursor keys to scroll the list and select the WCDMA software version you intend to install.

➢ Press *Install* to start the installation.

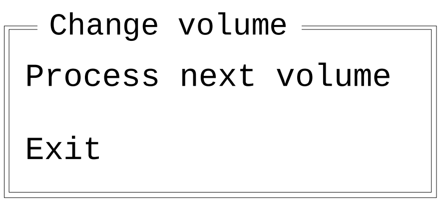
The installation is started. To be operable on your instrument, a network option must be combined with a compatible version of the R&S CMU base software. Any base software version installed on the R&S CMU hard disk can be combined with one or several network options to form an independent software configuration. If none of the configurations is compatible to the new *WCDMA Node B* option, the *VersionManager* displays an error message and takes you back to the software selection dialog; see section *Creating a new Software Configuration* on page 1.4. Otherwise, the following upgrade selection dialog is opened:



The upgrade selection dialog displays a list of base software versions that can be combined with the new *WCDMA Node B* software.

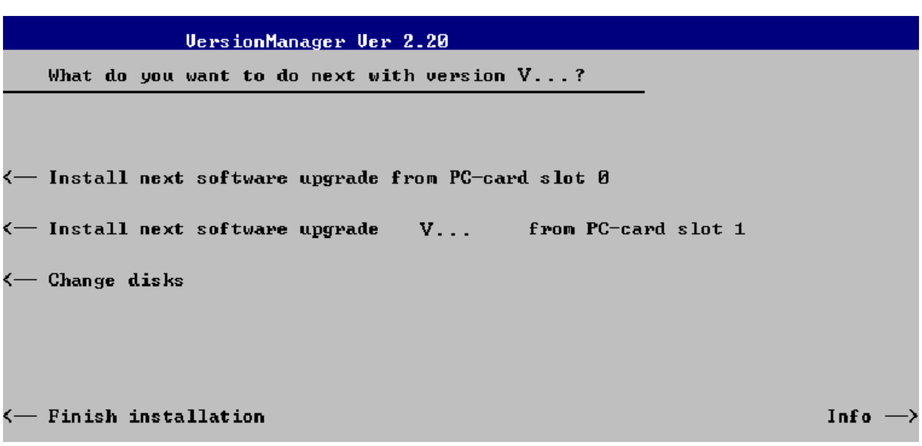
- Select the appropriate base version and press *Upgrade*.

The new *WCDMA Node B* option is added to the configuration or updates the previous *WCDMA Node B* version of the configuration. To indicate that the storage medium must be changed the R&S CMU issues the *Change volume* message:



- Replace the current disk with the disk requested.
- Use the cursor up/down keys to select “Process next volume” (default setting).
- Press *ENTER* to confirm that the new disk has been inserted and to continue the installation.

After processing the last disk the R&S CMU displays the following screen:



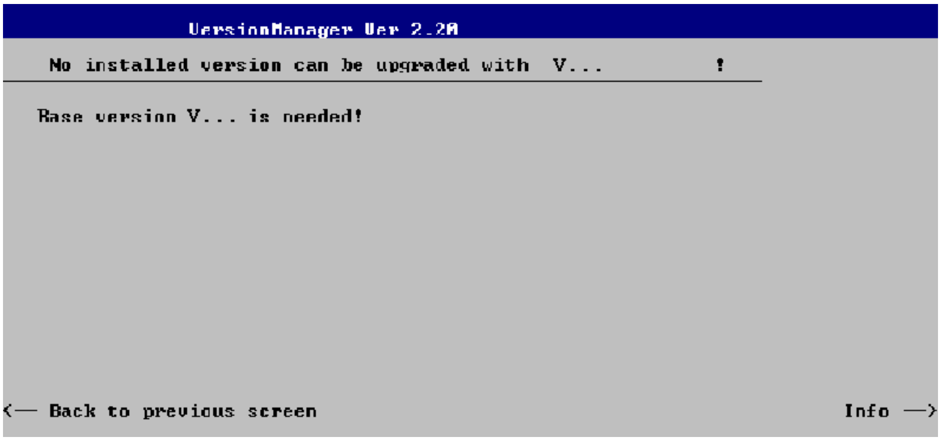
- If you wish to install or upgrade other software versions, press left softkey no 4 or 5 *(Install next software...)* or insert new storage medium into the PCMCIA slot or floppy disk drive and press *Change disks*.
- To finish the installation, remove all disks from the drive and press *Finish installation*.

The *VersionManager* is closed and the R&S CMU is rebooted. The new firmware options are now operational and listed in the *Menu Select* menu together with their version number. Besides, the last software configuration installed is automatically taken as the active one in the next measurement session.

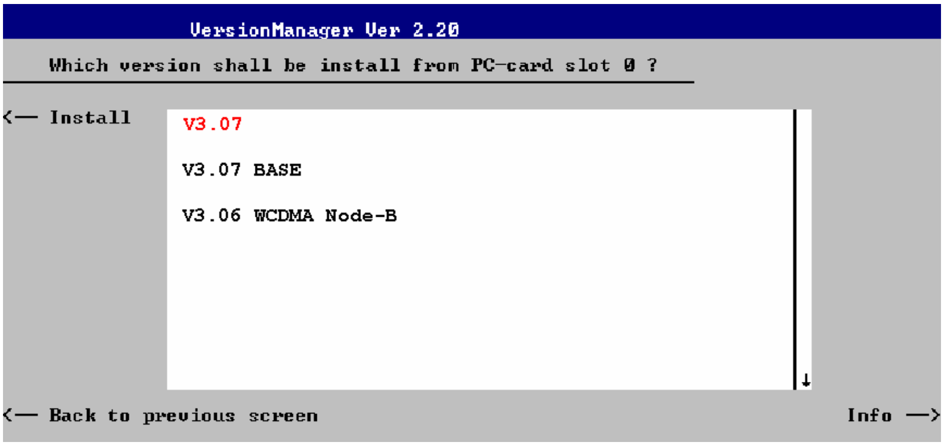
Creating a new Software Configuration

The R&S CMU handles base software versions and network options on a separate basis. Different versions of the base software can be combined with different options to create new firmware configurations. For example, it is possible to update the base software without affecting the associated network options or vice versa. Moreover, the same base software version can be installed several times and combined with different network options (and vice versa), so it may enter into several firmware configurations.

If no compatible base software version can be found on the hard disk, then the R&S CMU will refuse to install a new *WCDMA Node B* software option selected in the software selection dialog (see previous section). Instead, it displays the following error message:



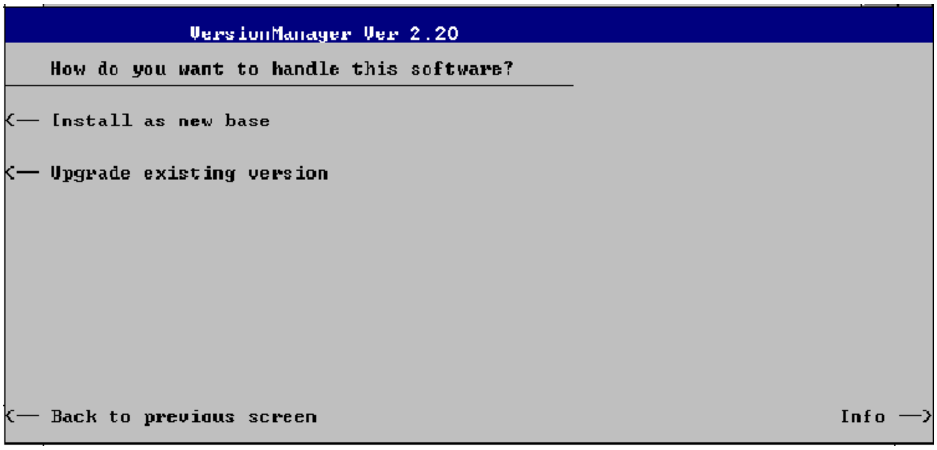
➢ Press *Back to installation* to return to the software version selection dialog.



➢ Select a base software version that is compatible to your *WCDMA Node B* software option and press *Install*.

Note: *In general the* WCDMA Node-B *firmware version number and the base software version number must be in the same range, i.e. they may differ in the last digit only. The VersionManager checks and detects all compatible versions.*

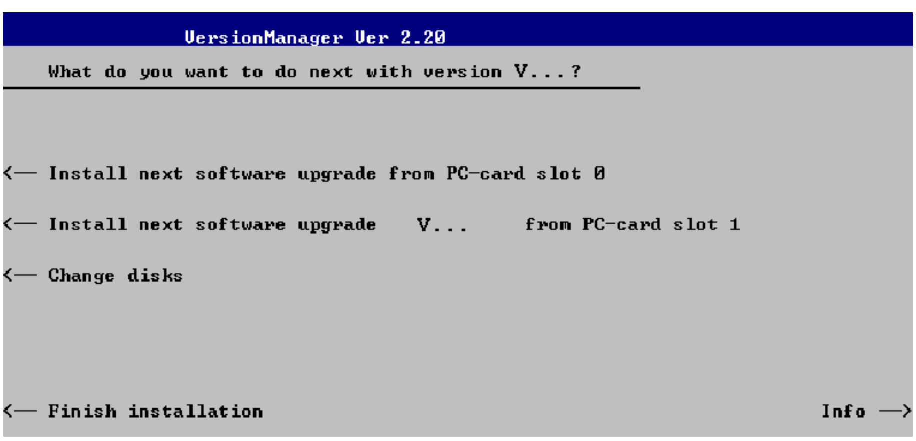
With a new base software version, it is possible to either update an existing configuration or create a new one. A dialog selecting between the two alternatives is opened:



Note: *This dialog is skipped if the new base software version is not compatible with any of the existing configurations. An incompatible new base software must be installed as a new base software.*

- ➢ If you wish to add a new configuration to your hard disk, press *Install as new base*.
- ➢ To upgrade an existing configuration with the selected base software version in order to make it compatible to the new *WCDMA Node B* software option, press *Upgrade existing version*. The existing version to be upgraded must be selected in an additional dialog.

The installation is performed as described in section *Software Installation or Update* on p. 1.1 ff. After adding the new base software as a new configuration or updating the existing configuration, the R&S CMU displays the following screen:



- ➢ Press left softkey no 4 or 5 *(Install next software...)* and proceed as described in section *Software Installation or Update* on p. 1.1 ff. to install the new *WCDMA Node B* version and assign it to the new configuration.

Enabling Software Options

A new R&S CMU software option purchased is ready to operate after it is enabled by means of a key code supplied with the option. This key code is to be entered into the *Option Enable* popup window which in turn can be opened via from the *Setup – Options* menu. For details refer to Chapter 4 of the R&S CMU200/300 operating manual.

Note: *The software options* R&S CMU-K70 …-K79 *are part of a single software package termed* WCDMA Node B*, so they must be installed or updated together. However, the options must be enabled and operated separately. Software installation and enabling of software options are completely independent from each other.*

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2 Getting Started

The following chapter presents a sample WCDMA Node B test session with the universal radio communication tester R&S CMU300. It is intended to give an introduction to the functionality of the instrument and to the tests that are commonly performed on WCDMA Node Bs.

Before starting any measurement with the CMU, please note the instructions given in chapter 1 of the operating manual for the R&S CMU basic unit for putting the instrument into operation. In chapters 2 to 4 of that manual you will also find information on customizing the instrument and the display according to your personal preferences. For installation instructions for the WCDMA Node B software (CMU-K75/-K76) refer to chapter 1 of the present manual.

The tests reported below include:

- Connection of the Node B and selection of the WCDMA Node B function group
- Example of a simple *Power* measurement
- Condensed operating instructions for *Power, Code Domain Power, Modulation* and *Spectrum* measurements.

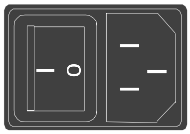
The steps to perform are explained on the left side of each double-page together with the results obtained on the CMU screen. On the right side, additional information is given. We also point out alternative settings and related measurements that could not be reported in detail.

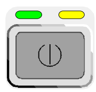
The principles of manual operation are discussed in chapter 3. For a systematic explanation of all menus, functions and parameters including WCDMA background information refer to the reference part in chapter 4.

Note: *The WCDMA UL generator (option CMU-K76, WCDMA Generator (3GPP/FDD, Release 1999, UL)) can be configured in the* Generator *tab of the* Connection Control *menu. The functionality and use of the option is described in Chapter 4, section* Generator Settings*.*

Preparing a WCDMA Node B Test

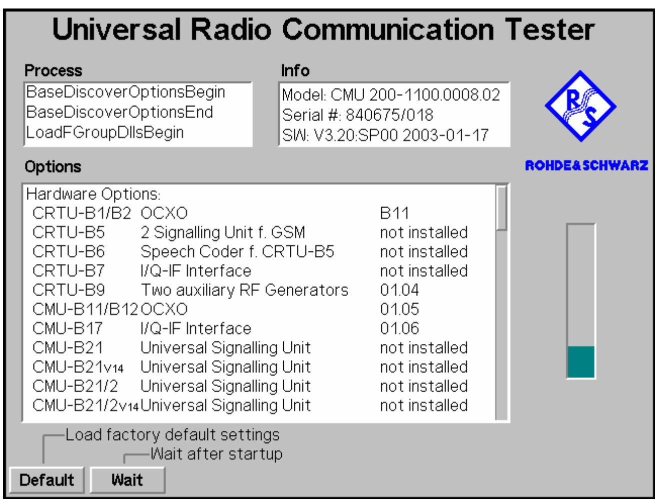
This chapter describes how to use the CMU for WCDMA node B tests. As a prerequisite for starting the session, the instrument must be correctly set up and connected to the AC power supply as described in chapter 1 of the operating manual for the R&S CMU basic unit. Furthermore, the WCDMA software must be properly installed following the instructions given in chapter 1 of the present manual.





Step 1

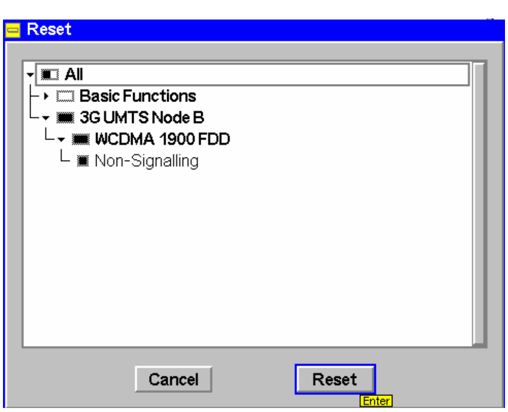
- Switch on the CMU using the mains switch at the rear. ①
- Check the operating mode of the instrument at the *ON/STANDBY* key on the front panel.② Press the *ON/STANDBY* key to switch on the CMU.



Step 2

The startup menu is displayed while the CMU performs a power-up test. ③

After a few seconds the CMU displays the last menu that was used in the previous session.



Step 3

- Press the *RESET* key to open the *Reset* popup menu.
- Proceed as described in Chapter 4 of the CMU200/300 operating manual, section *Reset of Instrument Settings*, to expand the tree of function groups.
- Select the function group *WCDMA 1900 FDD – Non Signalling* to be reset (the corresponding nodes must be black).
- Use the cursor keys to activate the *Reset* button and press *ENTER*. In the popup box opened *(Are you sure?),* select *Yes* to confirm the reset.

The CMU indicates that it performs a partial reset of the selected function group and is then ready to carry out the following steps. The *Reset* popup menu is closed automatically.

Additional Information...

... on Step 1

① **Mains switch on the rear panel**

When the mains switch at the rear is set to the *OFF* position, the complete instrument is disconnected from the power supply. When it is set to the *ON* position, the instrument is in standby mode or in operation, depending on the position of the *ON/STANDBY* key on the front panel.

② ***ON/STANDBY* key on the front panel**

The *ON/STANDBY* key at the front of the instrument determines whether the instrument is in standby mode or in operation.

Standby mode:
Only the reference frequency oscillator is supplied with operating voltage, and the orange LED (STANDBY) is illuminated.

Operation:
The green LED (ON) is illuminated and all modules of the instrument are supplied with operating voltage.

... on Step 2

③ **Startup menu (see p. 2.2)**

The startup menu displays the following information:

- The status of the startup test *(Process)*
- The device name, serial number and software version *(Info)*
- The options and equipment installed *(Options)*
- The progress of the startup test (*Startup* bar graph)

Alternative Settings and Measurements

☞ Chapter 1 of CMU manual

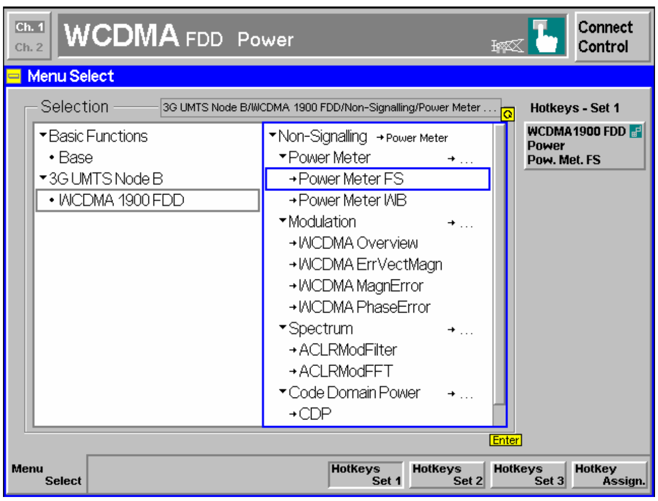
☞ Chapter 1 of CMU manual

☞ Chapter 4 of CMU manual

That chapter also contains information on customizing the CMU, e.g. by adjusting volume and contrast of the display, selecting the printer etc.

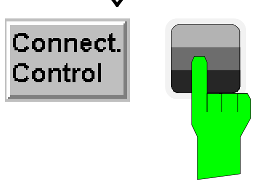
Step 4

- Press the *Menu Select* key to open the *Menu Select* menu.④



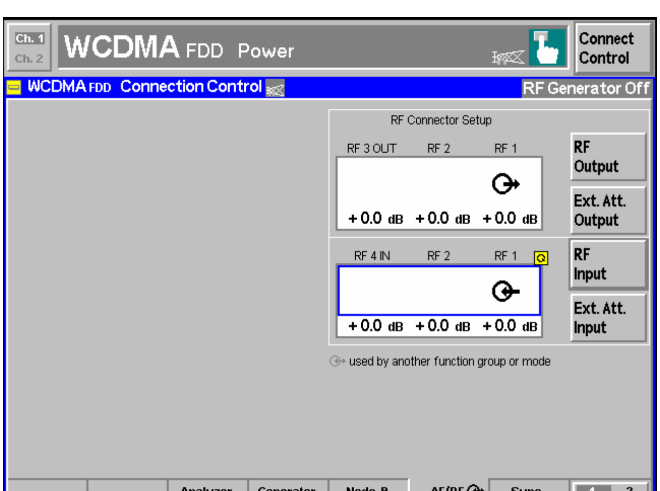
The *Menu Select* menu indicates the function groups available. If a function group is selected the corresponding modes and measurement menus are indicated.

- Select the *WCDMA 1900 FDD* function group.
- Select the *Non-Signalling* mode
- Select the *Power Meter FS* application in the *Power* menu.
- Press the *Enter* key to activate the selected measurement and open the *Power* menu.



Step 5

- Press the *Connect. Control* softkey.



The *Connection Control* menu is opened. ⑤

- Press the AF/*RF* hotkey to open the tab defining the signal connectors and external attenuation values.
- Select RF1 as output connector and as input connector. Do not define any external attenuation (all values equal to 0.0 dB).

Two yellow LEDs on the front panel indicate the input and output connectors selected (the output LED only lights if the generator is switched on).

- Press *Connect. Control* again to close the *Connection Control* menu and return to the *Power* measurement menu.

Additional Information...

... on Step 4

④ **Menu Select menu**

The *Menu Select* menu shows all function groups installed on your CMU. Function group *WCDMA1900 FDD* provides the *Non Signalling* test mode with a number of measurement menus.

... on Step 5

⑤ **RF connection of the node B**

The *AF/RF* ⊙→ tab of the *Connection Control* menu configures the input and output connectors in function group *WCDMA1900 FDD Non Signalling*. The CMU provides two bidirectional RF connectors RF1 and RF2 which differ in their specified input and output level ranges. RF1 is adapted to the RF output level range of a WCDMA node B; it is the recommended standard connector for WCDMA node B tests (see data sheet).

The unidirectional connectors RF4 IN and RF3 OUT are intended for the connection of modules which require high input levels or modules with low RF output levels. RF4 IN and RF3 OUT can also be used to connect WCDMA node Bs off the air via antennas.

The choice of the RF inputs and outputs may also depend on the connectors of your node B.

Alternative Settings and Measurements

☞ Chapter 3

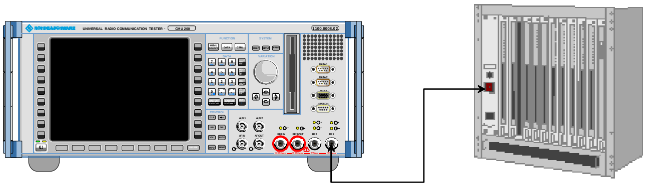
☞ Chapter 4

Frequently used measurement menus can be stored together with their function group and test mode and assigned to one of the eight hotkeys. When needed for the next time, they can be called up by a single keystroke.

☞ Chapter 4

The external attenuation factors for the RF inputs and outputs can be used to compensate for a known cable loss between the CMU and the BTS under test.

⇓



Step 6

- Connect the bi-directional RF connector RF 1 of the CMU to the RF input/output of the node B. ⑥
- Supply the node B with the correct operating voltage and switch on.

The CMU is now ready to perform transmitter tests on the node B.

Additional Information...

Alternative Settings and Measurements

... on Step 6

⑥ **RF connection of the node B**

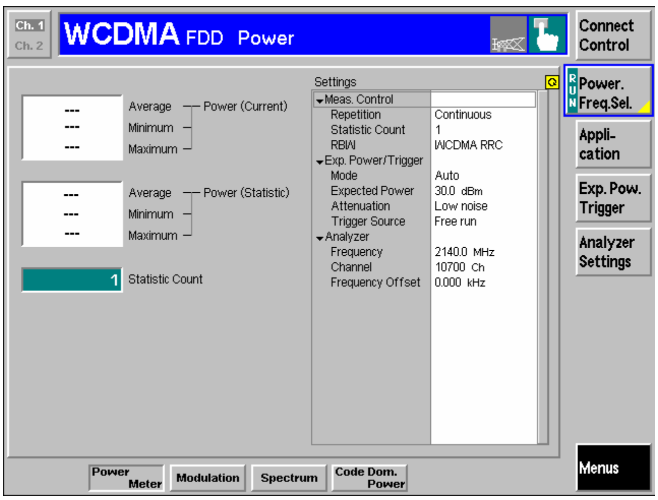
A high-quality cable should be used for this connection, ideally with an attenuation of less than 0.5 dB.

☞ Chapter 4

Example: Power Measurement

In the *Non Signalling* mode, the CMU can generate an uplink WCDMA signal and analyze a downlink RF signal with WCDMA characteristics. The measurements are not restricted to the specified channel range of the network.

The following *Power* measurement example shows the general structure of the measurement menus and the most important settings to be made. *Code Domain Power, Modulation* and *Spectrum* measurements can be done analogously; see section Condensed Measurement Examples on p. 2.11 ff.



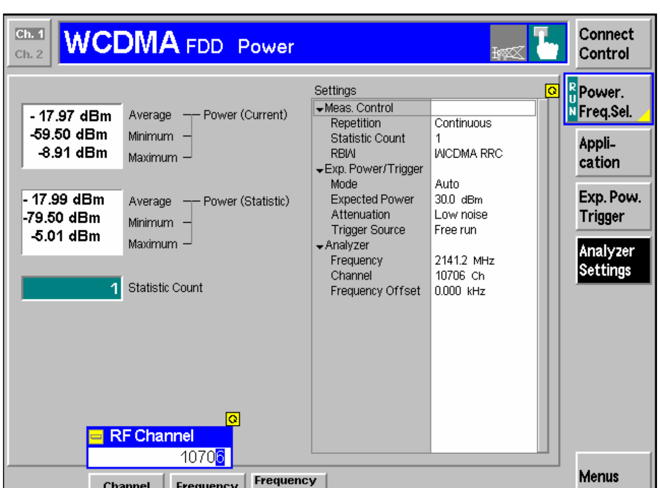
Step 1

The *Power* menu displays the power of the received signal. At present, the output fields most probably show invalid results ("---"). ①

In addition, the menu provides softkeys to set the *Trigger* and the RF *Analyzer*. ②

All parameters are set to default values. They can be changed by means of the softkey/hotkey combinations or in the *Connection Control* menu. User-defined parameters will be saved to the non-volatile RAM for later sessions when the CMU is switched off.

⇓



- Press the *Analyzer Settings* softkey to display a range of hotkeys related to the RF analyzer frequency settings.
- Press the *Channel* hotkey and set the analyzer frequency equal to the RF carrier frequency of the received WCDMA downlink signal.

In general, no explicit analyzer power setting is required, because the CMU adapts itself to the power of the RF input signal. ③

The CMU displays the power of the received signal and provides a statistical evaluation of the power in a configurable number of slots.

⇓

Additional Information...

Alternative Settings and Measurements

... on Step 1

① **Measurement and Generator State**

The state of the measurements is displayed in the measurement control softkeys (second softkey in each measurement menu, below *Connect. Control,* here labeled *Power Freq. Sel.)*. For ongoing measurements, the results in the output fields are constantly updated. The results in the *Power (Current)* section correspond to the average, minimum and maximum power in the current slot.

For various reasons, an output field may fail to show a valid measurement result (indication "---"):

- The analyzer settings do not match the properties of the input signal.
- The input signal is missing.
- The measurement is switched off *(OFF* is indicated above the output fields).

The options for the measurement status are *ON* (default) and *OFF*. A third state, *HLT*, occurs after a single-shot measurement is terminated (see below).

After selection of the measurement control softkey, each measurement can be switched off and on again by means of the toggle key *ON/OFF*.

The RF generators may also be switched on (state *ON)* or off (state *OFF).*

② **Analyzer Settings**

The *Analyzer Settings* softkey displays three hotkeys to define the center frequency of the analyzer.

The assignment between carrier frequency and channel number is according to WCDMA specifications. The analyzed signal is a WCDMA downlink signal from the node B under test, whereas the generated signal is an uplink signal.

The RF frequency can be set in multiples of 200 kHz. With an additional *Frequency Offset*, it is possible to generate and analyze an RF signal with an arbitrary frequency that is in the range supported by the tester.

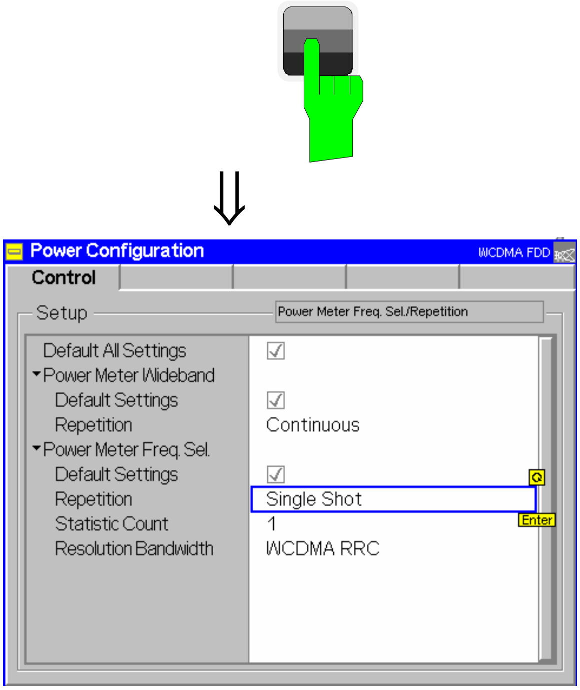
☞ Chapter 4

The settings of the *Exp. Pow. Trigger* and the *Analyzer Settings* softkeys are also accessible in the *Analyzer* and *Trigger* tabs of the *Connection Control* menu.

③ **Expected Power**

The *Expected Power* hotkey is associated to the *Exp. Pow. Trigger* softkey and is used to adjust the RF input path to the expected power of the measured signal. This is done automatically or by entering a definite maximum input power. The permissible range of *Expected Power* depends on the RF connector and the external attenuation used.

☞ Chapter 4



Step 2

- Press the *Power Freq. Sel.* softkey twice to call up the *Power Configuration* menu.

The *Power Configuration* menu defines the scope of the *Power* measurement. The statistical settings are discussed in section *General Settings* in chapter 3. We pick one example, limiting the measurement to one statistics cycle.①

- Press the *ON/OFF* key or the rotary knob to expand the table.
- Select *Single Shot* in the *Repetition* line.②
- Press the *ESCAPE* key or the *Power* softkey again to close the *Power Configuration* menu and return to the main menu.

The *Power* measurement is stopped after the number of slots forming a *Statistic Count*. The status indication in the *Power Freq. Sel.* softkey is set to *HLT*.③

Additional Information...

... on Step 2

① **Power Configuration menu**

The *Power Configuration* menu contains a single tab *(Control)* to define the scope (statistics) of the measurement and select the IF filter.

An analogous configuration menu is associated to each of the four measurement menus *(Power, Code Domain Power, Modulation, Spectrum)* in the function group. The configuration menus for the *Code Domain Power, Modulation* and *Spectrum* measurements also provide a tab to define tolerances for the measured values *(Limit Lines).*

② **Repetition mode and statistic count**

The *Repetition* mode determines whether the measurement is

- Continued until explicitly stopped by the operator *(Continuous)* or...
- Stopped after one statistic count *(Single Shot)*

A statistic count corresponds to an integer number of slots that are measured in succession.

③ **Measurement in the HLT state**

The state indication of the different measurements is included in the measurement control softkeys (2^{nd} softkey in the right softkey bar of each measurement menu). In the single shot mode (i.e. if the *Repetition* mode is set to *Single Shot)* the measurement is stopped after each statistics cycle and assumes the *HLT* state. The next single shot measurement can be initiated by pressing the toggle key *ON/OFF*.

Note that with remote control, the most common (and default) repetition mode is *Single Shot*, while manual measurements are generally performed in *Continuous* mode.

Alternative Settings and Measurements

☞ Chapter 3.

Settings made in the *Power Configuration* menu and the other configuration menus apply to power measurements only.

Settings made in the *Connect. Control* menus apply to the entire function group and mode *WCDMAxxx-BTS Non Signalling*.

☞ Chapter 3.

☞ CMU manual

See the sections on measurement control in chapter 3 and 5.

Error sources for power measurements

If the measured signal power is off the expected value, please first ensure that the attenuation of any cables and/or antenna couplers used is being taken into account by the CMU.

External attenuation values for each input may be entered in the *RF* ⊙→ tab of the *Connect. Control* menu.

Condensed Measurement Examples

TX measurements are performed with the WCDMA signal from the Node B fed to RF connector 1 of the CMU. The analyzer frequency of the CMU must be set to the frequency of the RF input signal. For some measurements, the CMU must additionally synchronize to the Node B signal and know the test model configuration.

Power

The *Power* measurement (see section *Power Measurements* in Chapter 4) provides the power of the Node B signal. The CMU analyzer settings must be compatible with the Node B signal.

To perform a Power measurement...

1. Provide the Node B signal at RF connector RF 1 (recommended connector for the output power range of a WCDMA Node B).
2. Press the *Connect. Control* softkey and the *AF/RF* hotkey to change the RF connector assignments: Press *RF Output* and use the roll-key to select RF 1 as output connector. Press *RF Input* and use the roll-key to select RF 1 as input connector.
3. Press *Connect. Control* again to close the *Connection Control* menu.
4. Press *Menus – Power* to open the *Power* menu.
5. Press *Application – Pow. Meter Wideband* to select the wideband power measurement and check whether the CMU can measure the input signal (the *Power* output field must indicate a result).

The RF input signal path is automatically adjusted to the input signal power. *Exp. Power/Trigger – Mode: Auto* is indicated in the *Settings* table.

6. Press *Analyzer Settings – Frequency* to set the analyzer frequency to the frequency of your Node B signal.
7. Press *Application – Pow. Meter Freq. Sel.* to select the frequency selective power meter.

The CMU displays a statistical evaluation of the RF power measured with the IF bandwidth *(RBW)* indicated in the *Settings* table.

8. If desired, press the measurement control softkey *Pow. Meter Freq. Sel.* twice to open the *Power Configuration* menu and change the resolution bandwidth.

Code Domain Power

To make a *Code Domain Power* measurement (see section *Code Domain Power Measurements* in Chapter 4) the CMU analyzer settings must be compatible with the Node B signal and the CMU must be able to synchronize to the Node B signal. Furthermore the CMU must be set according to the test model configuration of the Node B signal.

Note: *The CMU uses the P-CPICH of the Node B signal for synchronization. Synchronization fails unless the downlink (Node B) signal contains a P-CPICH and the CMU knows the primary and secondary scrambling codes.*

To perform a Code Domain Power measurement...

1. Configure the Node B signal according to test model 3, feed it to the RF 1 connector and adjust the RF input/output connector assignment as described for the *Power* measurement.
2. Press the *Connect. Control* softkey and the *Node B* hotkey to set the primary and secondary scrambling code in accordance with the scrambling codes of your Node B signal.
3. Press *Connect. Control* again to close the *Connection Control* menu.
4. Press *Menus – Code Domain Power* to open the *Code Domain Power* menu.
5. Press *Analyzer Settings – Frequency* to set the analyzer frequency to the frequency of your Node B signal.
6. Press *Analyzer Settings – Test Model* to set the test model according to your Node B signal.

The CMU alternatively displays the code domain power in all code domain channels and slots or the peak code domain error.

Modulation

The *Modulation* measurement (see section *Modulation Measurements* in Chapter 4) provides the modulation accuracy of the Node B signal. The CMU analyzer settings must be compatible with the Node B signal and the CMU must be able to synchronize to this signal. Furthermore the CMU must be set according to the test model configuration of the Node B signal.

Note: *The CMU uses the P-CPICH of the Node B signal for synchronization. Synchronization fails unless the downlink (Node B) signal contains a P-CPICH and the CMU knows the primary and secondary scrambling codes.*

To perform a Modulation measurement...

1. Configure the Node B signal according to test model 4, feed it to the RF 1 connector and adjust the RF input/output connector assignment as described for the Power measurement.
2. Press the *Connect. Control* softkey and the Node B hotkey to set the primary and secondary scrambling code in accordance with the scrambling codes of your Node B signal.
3. Press *Connect. Control* again to close the *Connection Control* menu.
4. Press *Menus – Modulation* to open the *Modulation* menu.
5. Press *Analyzer Settings – Frequency* to set the analyzer frequency to the frequency of your Node B signal.
6. Press *Analyzer Settings – Test Model* to set the test model according to your Node B signal.
7. Press *Application – Overview WCDMA* to display a tabular *Overview* of modulation parameters with statistical evaluation.
8. Press *Application – EVM WCDMA* to display a diagram showing the Error Vector Magnitude (EVM) as a function of time.

With the remaining two applications, the CMU displays the *Phase Error* or *Magnitude Error* as a function of time.

Spectrum

To make a *Spectrum* measurement (see section *Spectrum Measurements* in Chapter 4) the CMU analyzer settings must be compatible with the Node B signal.

To perform a Spectrum measurement...

1. Provide the Node B signal at RF connector RF 1 and adjust the RF input/output connector assignment as described for the *Power* measurement.
2. Press the *Connect. Control* softkey and the *Node B* hotkey to obtain an overview of the different test models specified for Node B tests.

Using a Node B signal configured according to test model 1 as specified for the *Spectrum (ACLR)* measurement is recommended but not necessary.

3. Press *Connect. Control* again to close the *Connection Control* menu.
4. Press *Menus – Spectrum* to open the *Spectrum* menu.
5. Press *Analyzer Settings – Frequency* to set the analyzer frequency to the frequency of your Node B signal.

The CMU displays the ACLR in a 25 MHz wide frequency range around the nominal carrier frequency.

Tests in Signalling Mode

With option R&S CMU-K78, *BCH Synchronization and Monitor,* the R&S CMU can perform TX Tests and DL BER tests in synchronized mode. To synchronize to the Node B signal, the tester must know its basic properties, in particular the frequency and scrambling codes.

A procedure for synchronizing the R&S CMU to the Node B signal is reported in Chapter 4, section *Connection Control (Signalling).* Chapter 4 also provides condensed measurement examples for various signalling measurements.

UE-ID Scan

The UE-ID scan is a special operating mode where the R&S CMU 300 can detect up to 128 active UE-IDs in the cell in order to perform HSDPA measurements on these cells. The scan requires option R&S CMU-K72, *DL HSDPA Analyzer*.

Measurement task

The Node B under test transmits a DL HSDPA signal carrying data for 4 different UEs. The UE-IDs are in the range between 50000 and 60000.

Determine the UE-IDs scheduled by the Node B and measure the net HS-PDSCH data rate and throughput for all UE-IDs using a minimum number of settings at the R&S CMU 300.

Solution

The HS-PDSCH data rate and the throughput is displayed in the *HS-PDSCH Throughput* application of the *HSDPA* measurement. In a UE-ID scan, the R&S CMU can determine the scheduled UE-IDs automatically before proceeding to the measurement.

Procedure

The R&S CMU must be prepared for a HSDPA Test as described in Chapter 4, section *HSDPA Analyzer.* In particular the R&S CMU 300 must be BCH/SFN synchronized, and the Node B settings must be in accordance with the DL WCDMA signal.

1. Preparatives

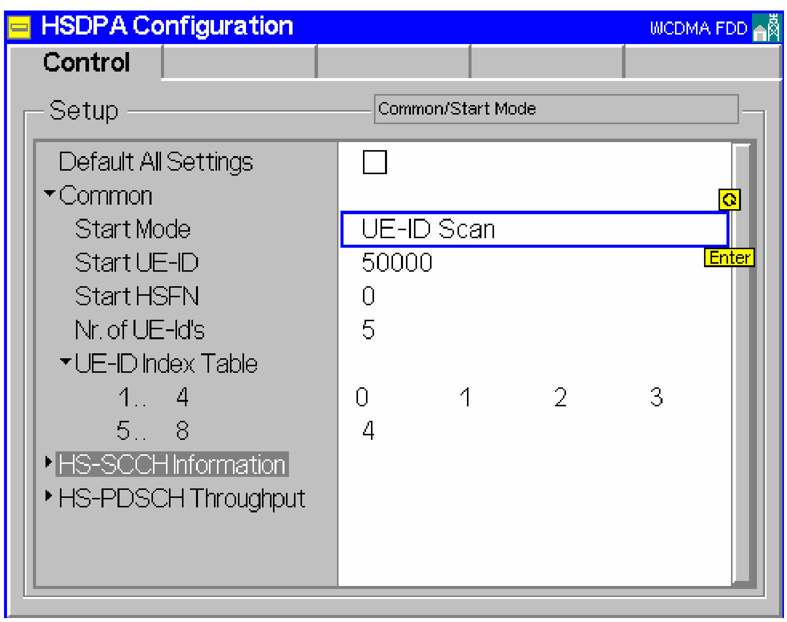
To prepare a HSDPA test proceed as follows:

1. Establish BCH/SFN synchronization; see Chapter 4, section *Connection Control (Signalling)*.
2. In the *Network* tab of the *Connection Control* menu, select *Node B Settings: – DL Operation Mode: HSDPA.*
3. In the *HSDPA Channels* section of the same tab, adjust the expected channelization codes of the HS-SCCHs to your DL signal configuration.
4. Close the *Connection Control* menu and press the *Menus* softkey twice to select the *HSDPA* menu group.

2. UE-ID scan

The UE-ID scan is configured in the *Control* tab of the *HSDPA Configuration* menu.

5. Close the *Connection Control* menu and press the *Menus* softkey twice to select the *HSDPA* menu group.
6. Press *Application – HS-PDSCH Throughput* to activate the measurement application.
7. Press the measurement softkey *HS-PDSCH Thr.put* twice to open the *HSDPA Configuration* menu.
8. In the *Common* section of the *Control* tab, set *Start UE-ID: 50000, Nr. of UE-IDs: 5, Start Mode: UE-ID Scan.*



The R&S CMU 300 checks the received HS-SCCHs for matching UE-IDs, starting at UE-ID 500000. The scan is stopped automatically after the 4 UE-IDs have been found. The UE-IDs are entered in the *UE-ID Index Table* (entries no. 2 to 5); the *Start Mode* is switched to *Immediate,* and the *HS-PDSCH Throughput* measurement is started.

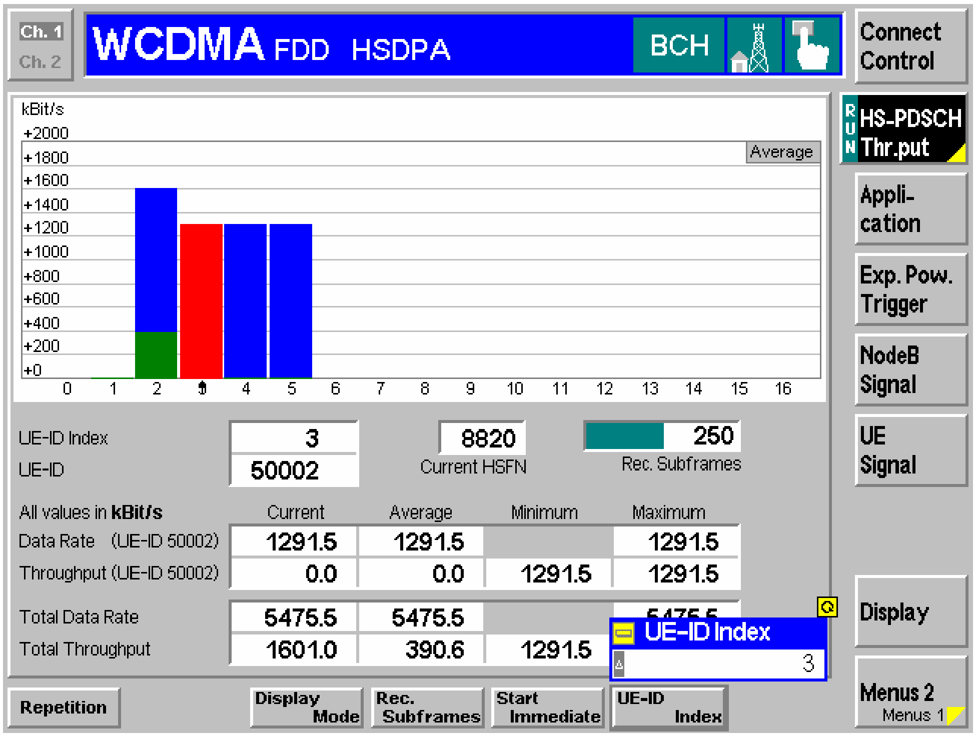
NOTE

The Nr. of UE-IDs *must be set to the number of UE-IDs to be detected plus 1. The first entry in the UE-ID index table (main UE-ID) is not overwritten during the scan.*

3. HS-PDSCH throughput

9. Press *Escape* to close the *HSDPA Configuration* menu.

The *HSDPA* measurement menu shows the results for all detected UE-IDs:



Troubleshooting The UE-ID scan can fail if the R&S CMU settings do not match the DL WCDMA signal configuration.

Table 1 Possible problems during the UE-ID scan and solutions

Symptom	Problem	Solution
UE-ID scan won't start	After starting the UE-ID scan the R&S CMU 300 immediately switches to *Start Mode: Immediate.* No measurement results are displayed.	The *Nr. of UE-IDs* must be set to a value larger than 1 (UE-ID no. 1 is the main UE-ID; it does not belong to the scan)
UE-ID scan won't stop	The UE-ID scan runs continuously; the measurement is not started.	The R&S CMU fails to detect the specified *Nr. of UE-IDs,* e.g. because it is larger than the no. of UE-IDs scheduled. Select a smaller *Nr. of UE-IDs,* or select *Start Mode: Immediate* to stop the scan manually.
Missed UE-IDs	Some or all of the scheduled UE-IDs are not detected.	To be detected for sure, the UE-IDs must be scheduled continuously for the maximum duration of the scan, i.e. for approx. 2 minutes.
Missing throughput results	One or several bars in the *HS-PDSCH Throughput* measurement are empty.	Empty bars indicate multiple entries of the same UE-ID. The scan never generates multiple entries, so the table must have been edited manually.

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3 Manual Control

This chapter gives a brief survey of the operating concept and structure of the user interface for WCDMA Node B tests. The CMU was designed for maximum operating convenience and flexibility. All instrument functions are grouped together in menus; each of them provides a number of related configuration settings or displays a group of measured quantities. All menus show a similar structure so that many settings, once defined, can be used in several menu groups. Switchover between the different menu groups is possible at any time.

In the following, the different measurement modes and measured quantities are discussed. Settings and measurement parameters frequently encountered are explained from a general point of view.

The formal aspects of measurement control are discussed in more detail in chapter 5 *(Remote Control – Basics)* and in chapter 5 of the CMU200/300 operating manual.

Menu Structure

The menus used to control WCDMA Node B measurements can be arranged in different ways. From a functional point of view, they form the following groups:

- The two test modes *Non Signalling* and *Signalling* (with option R&S CMU-K78)
- General configurations *(Connection Control),* including control of the WCDMA uplink generator (option R&S CMU-K76)
- Measurement groups *(Power, Modulation, Spectrum, Code Domain Power, DL BER Test)* and configurations specific to these measurement groups *(Power Configuration, Modulation Configuration, Spectrum Configuration, Code Domain Power Configuration, DL BER Test Configuration)*

In a formal sense, the CMU uses main menus, popup menus, graphical measurement menus and dialog windows of various size. This aspect is discussed in chapter 3 of the operating manual for the CMU basic unit.

Test Mode

WCDMA Node B measurements are performed in one of the two modes *Signalling* or *Non Signalling* mode. In both modes the CMU receives and analyzes the modulated downlink WCDMA signal transmitted by the WCDMA Node B under test. With option R&S CMU-K76, *WCMDA Generator*, the CMU can also generate a WCDMA uplink signal to be received by the Node B. The WCDMA generator signal can be used to transfer data to the Node B, e.g. to test its downlink power control. In *Signalling* mode it can be used to perform receiver quality tests in loopback mode.

Definition

The term signalling denotes all actions that are necessary to establish, control and terminate a communication between the base station (CMU) and the mobile phone. The signalling messages conveyed allow the mobile station and the network to discuss the management of issues either related to the user or concerning technical aspects of the communication.

Non Signalling TX Test Mode

In *Non Signalling* mode, the CMU analyzes the downlink WCDMA signal transmitted by the device under test. The purpose of the Node B TX tests is to verify that the overall power, code domain power, modulation and out-of-band transmission characteristics of the Node B transmitter conform to 3GPP WCDMA specifications. No signalling parameters are transferred, and no call connection is set up, so that test times are reduced considerably.

To perform TX tests, the CMU analyzer frequency must be set to the frequency of the received WCDMA signal. For some measurements, the CMU must also synchronize to the DL WCDMA signal (know its scrambling code) and know the test model configuration.

The TX tests provided in this test mode are listed in section *Measurement Groups* on p. 3.3.

The *WCDMA Generator* (option CMU-K76) provides a configurable uplink WCDMA signal for test purposes. The R&S CMU needs additional information to ensure that the timing of this signal is in accordance with the timing that the Node B expects. Two alternative methods are available for synchronization:

- Use of an external trigger signal from the Node B *(Wired Sync. trigger)*
- *BCH Trigger,* i.e. synchronization to the P-CPICH or BCH in the downlink WCDMA signal

Signalling Mode

In the *Signalling* mode, the R&S CMU can synchronize to the DL signal from the Node B and is able to transmit and receive signalling information and data.

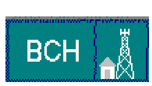
In addition to the TX measurements *(Modulation, Code Domain Power)* provided in *Non Signalling* mode, the *Signalling* mode offers a *DL BER Test* using a test loop from the R&S CMU to the Node B and back. Moreover the R&S CMU can decode and display the System Information Blocks received from the Node B.

Symbols for TX Test Mode

The *test mode* and *signalling state* is indicated to the left of the operating mode in each main menu and graphical measurement menu (see chapter 3 of CMU200/300 operating manual). The following symbols are used in the WCDMA Node B function group:


Non signalling mode, TX tests

Signalling mode, Unsynchronized



Signalling mode, Synchronized (with CPICH or BCH substate)

Configurations

The CMU offers a wide range of settings for the RF signal generators and analyzers, the signal inputs and outputs, reference frequency, RF input path, trigger, and the individual measurements. Configurations may apply to the whole function group *(Connection Control)* or to a particular measurement.

Connection Control

The *Connect. Control* softkey is located to the right of the title bar in each measurement menu. It opens a popup menu with several tabs defining

- The RF analyzer settings *(Analyzer* in *Non Signalling*, *Analyzer* and *Node B Signal* in *Signalling* mode) and the properties of the downlink WCDMA signal that can be analyzed
- The properties of the generator signal *(Generator* in *Non Signalling* mode, *UE Signal* in *Signalling* mode, with option R&S CMU-K76, *WCDMA Generator (3GPP/FDD, Release 99, Uplink)* only)
- The RF connectors to be used and the external attenuation *(AF/RF Input/Output)*
- The reference signal and the system clock *(Sync.)*

- The trigger settings *(Trigger)*
- In *Signalling* mode, the *BCH Monitor* and the *Logging* tab to display and store layer 3 information.
- In *Signalling* mode, parameters to control the display *(Misc.)*

All settings made in the *Connect. Control* menu are valid for the whole function group. The essential ones are also accessible through the softkeys and hotkeys in the measurement menus.

Configuration of measurements

A popup menu offering specific settings is assigned to each measurement group *(Power, Modulation, Spectrum, Code Domain Power, DL BER Test).* The following general parameters can be defined in separate tabs:

- The repetition mode, stop condition, statistic count and display mode for the measurement *(Control)*
- Tolerances for the measured quantities *(Limits)*

These settings are explained in more detail below (see section *General Settings* on page 3.4). For measurement-specific settings provided in the measurement configuration menus refer to Chapter 4.

Configuration via hotkeys

The softkeys and associated hotkeys in the measurement menus provide the most important configurations for the current measurement; see chapter 4 and chapter 3 of the CMU200/300 operating manual. Settings may via hotkeys supersede the corresponding settings made in the configuration menus.

Measurement Groups

Measurement results are indicated in two different ways:

- Discrete values and parameters are displayed in output fields, lists and tables. In remote control, these results are referred to as scalars.
- Traces are displayed in a Cartesian coordinate system, the time or frequency forming the x-axis scale. Relatively small sets of test points are generally viewed in a bar graph. In remote control, results of this type are referred to as arrays.

While the measurement is running in repetition mode *Continuous* (see page 3.4), the results are constantly updated. An overview of the measurements is given in the table below.

Table 3-1 Measurement Groups

Measurement Group	Functionality
Power (Non Signalling/Signalling)	Measurement of the peak power of the Node B transmitter signal using a wideband filter and measurement of the average, minimum and maximum power over a slot plus a statistical evaluation over several slots using filters with variable bandwidth.
Code Domain Power (Non Signalling/Signalling)	Measurement of the power in the code domain channels and of the peak code domain error for a particular spreading factor. Scalar modulation quantities such as the carrier frequency error, average and RMS phase error, I/Q imbalance, I/Q origin offset, as well as statistical results (peak and RMS values) and the results of the limit check are indicated in addition.
Modulation (Non Signalling/Signalling)	Measurement of the error vector magnitude, magnitude error or phase error derived from the modulation vector as a function of time. Scalar modulation quantities such as the carrier frequency error, average and RMS phase error, I/Q imbalance, I/Q origin offset, waveform quality, as well as statistical results (peak and RMS values) and the results of the limit check are indicated in addition.

Measurement Group	Functionality
Spectrum (Non Signalling/Signalling)	Measurement of the adjacent channel leakage power ratio (ACLR) at definite off-carrier frequencies (application ACLR), or as a continuous function of the frequency (application OBW). From the measurement curve in the OBW application, the occupied bandwidth (OBW) is derived. Statistical evaluations and a limit check are performed in addition.
DL BER Test (Signalling)	Bit Error Rate and Block Error Rate tests on a WCDMA DL signal, in particular for Node B receiver quality tests in loopback mode.
PRACH Preamble Test (Signalling, R&S CMU-K71)	Configuration of a sequence of RACH preambles and analysis all received AICHs with regard to correct timing and signature.
HSDPA Analyzer (Signalling, R&S CMU-K72)	Decoding of the DL HS-SCCH channels, evaluation of the decoded information, and calculation of the data throughput of the associated HS-PDSCHs. With option R&S CMU-K73, *HSDPA Stimulate,* the R&S CMU is able to transmit an UL High Speed Dedicated Physical Control Channel (HS-DPCCH) carrying ACK/NACK messages and CQI values in order to check the response of the Node B under test.

In addition the measurements in Table 3-1, the following results are available in *Signalling* mode:

- Node B signal parameters during synchronization *(Connection Control – Connection)*
- System Information Blocks transmitted on the BCH *(Connection Control – BCH Monitor)*
- *BCH Monitor, Code Domain Power,* and *Transport Channel* information to be recorded during the test session *(Connection Control – Logging)*

General Settings

A number of settings can be made in several of the configuration menus assigned to the measurement groups. In combination, these settings define the scope of the measurement, i.e. the number of slots/evaluation periods measured and the results displayed. The following brief overview is intended to avoid confusion of terms.

Application

Applications are different measurements belonging to the same measurement group. They effectively split up a measurement group into various related subgroups which can be configured separately.

They are selected via the *Application* softkey in the measurement menus.

Statistic Count

The term *statistic count* denotes the integer number of slots/evaluation periods which form one measurement cycle. Together with the *repetition mode* and the *stop condition,* the statistic count determines when exactly the measurement is stopped.

The *statistic count* is set in the *Control* tab of the configuration popup-menus assigned to the four measurement groups *Power, Modulation*, *Spectrum,* and *Code Domain Power.*

Repetition Mode

The *repetition mode* defines when a measurement that is not stopped by a limit failure (see stop condition *On Limit Failure* below) will be terminated. Two modes are available for all measurements:

Single Shot The measurement is stopped after one *statistic count*.

Continuous The measurement is continued until explicitly terminated by the user; the results are periodically updated.

A third repetition mode is available in remote control mode:

Counting Repeated single shot measurement with a fixed number of statistic counts. The calculation of average, minimum and maximum curves (see *Display Mode* below) starts again from the beginning after each measurement cycle.

The *repetition mode* is set in the *Control* tab of the configuration popup-menus assigned to the four measurement groups *Power*, *Modulation, Spectrum* and *Code Domain Power.*

Note: *In contrast to other measurement settings, the repetition modes in manual and remote control are independent and do not overwrite each other. In most measurements, the default repetition mode in manual control is* Continuous *(observe results over an extended period of time), the default mode in remote control is* Single Shot *(perform one measurement and retrieve results).*

Stop Condition

A *stop condition* can be set for most measurements:

None The measurement is performed according to its repetition mode, irrespective of the measurement results and the limits set.

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 performed according to its repetition mode.

The *stop condition* is set in the *Control* tab of the configuration popup-menus assigned to the measurement groups.

Display Mode

In graphical measurement diagrams, the *display mode* defines which of the measured and calculated curves is displayed if the measurement extends over several slots/evaluation periods. In general, curves are evaluated at a set of fixed, equidistant test points (samples). After n slots/evaluation periods, n measurement results per test point have been taken.

Current The current slot, i.e. the last result for all test points, is displayed.

Minimum At each test point, the minimum value of all slots/evaluation periods measured is displayed.

Maximum At each test point, the maximum value of all slots/evaluation periods measured is displayed.

Max./Min. At each test point, the extreme value of all slots/evaluation periods measured is displayed, i.e. the maximum or minimum, whichever has a larger absolute value.

Average At each test point, a suitably defined average over all slots/evaluation periods measured is displayed; see section *Averaging and Statistical Evaluation* below.

The *display mode* is set in the *Control* tab of the configuration popup-menus assigned to the measurement groups *Modulation, Spectrum,* and *Code Domain Power.*

Averaging and Statistical Evaluation

In WCDMA TX tests, the test parameters are typically evaluated with a basic evaluation period (measurement length) of one transmit slot comprising 2560 chip periods. Continuous measurements may extend over many consecutive slots/evaluation periods; the wealth of information obtained in such a measurement is further processed and output as average and statistical quantities.

Calculation of average quantities

The *Average* traces in the *Modulation, Code Domain Power* and *Spectrum* menus are obtained as follows:

Let c be the number of evaluation periods forming one statistics cycle (one *Statistic Count)* and assume that n periods have been measured since the start of the measurement. In calculating the *Average* trace, the following two situations are distinguished:

n ≤ c Single shot measurement or continuous measurement during the first statistics cycle: At each test point, *Average* trace no. n is calculated from *Average* trace no. n – 1 and *Current* trace no. n according to the following recurrence:

$$Avg(n) = \frac{n-1}{n} Avg(n-1) + \frac{1}{n} Curr(n) \qquad (n = 1, \ldots, c)$$

The *Average* trace represents the arithmetic mean value over all n periods measured.

n > c Continuous measurement after the first statistics cycle: At each test point, *Average* trace no. n is calculated from *Average* trace no. n – 1 and *Current* trace no. n according to:

$$Avg(n) = \frac{c-1}{c} Avg(n-1) + \frac{1}{c} Curr(n) \qquad (n > c)$$

Scalar quantities are averaged in analogy to *Average* traces. The formulas hold for n = 1 where the average trace becomes equal to the current trace (statistics off).

Calculation of statistical quantities

In most TX measurements the statistical functions *Average, Minimum, Maximum* and *Minimum/Maximum* are applied to a set of test points depending on two independent parameters:

- The time, i.e. the abscissa values t_i, i ranging from 1 to the total number of test points in the trace.
- The current number of the evaluation period ranging from 1 to the number n of the current period.

The result of the statistical operations depends on the parameter range considered and – in the case of statistics functions evaluated over several parameters – on the order of evaluations. This is why the definition of statistical quantities deserves some attention and is explained in the relevant sections in chapter 4. Some particular examples are:

1. In the *Power* menu, the *Average Power (Current)* denotes the average power of the current slot, i.e. the RMS value of all test points t_i in one slot. *Average Power (Statistical)* is the average of all *Average Power (Current)* results in the current measurement, averaged according to the formulas described above.
2. In the *Code Domain Power* and *Modulation* menus, quantities such as the *Carrier Frequency Error*, *I/Q Imbalance* etc. are first calculated for the current slot and entered in the *Current* column of the output table. The results in

the *Average* column correspond to the average of the *Current* results calculated according to the formulas described above. The results in the *Max./Min.* column correspond to the extreme value of the *Current* results of all measured slots.

NOTE *The averaging rules for the* HSDPA Analyzer *differ from the general scheme described above; see description in Chapter 4.*

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4 Functions and their Application

This chapter describes the user interface for the WCDMA Node B FDD test options and provides detailed information about the instrument settings and their application. It is organized as follows:

- Measurement menus which are available in *Non Signalling* and in *Signalling* mode *(Power, Code Domain Power, Modulation, Spectrum, HSDPA Tests):* purpose and principle of the measurements and relation to conformance test specifications, description of measurement results, specific measurement configurations
- Global configurations in *Non Signalling* mode *(Connection Control)*
- Measurement menus which are available in *Signalling* mode *(DL BER Test, PRACH Preamble Test, HSDPA Analyzer):* purpose and principle of the measurements and relation to conformance test specifications, description of measurement results, specific measurement configurations
- Global configurations and additional measurement tools in *Signalling* mode *(Connection Control)*

The description of each softkey, select or input field is complemented by the corresponding remote-control commands. Conversely, the description of the commands in Chapter 6 also contains the corresponding menus of the user interface.

Each menu and each panel is briefly described first and then illustrated together with its call button. The menu functions are explained in the following way:

Softkey	Short function definition
Designation of select/input field	Definition of field function. Further description of the field: purpose, interaction with other settings, notes... *Parameter 1* Description of parameter 1 *Parameter 2* Description of parameter 2 ... Further description of the parameters: purpose, interaction with other settings, notes...
Remote control	`Remote-control command (long form)  Parameter1 | Parameter2 ...`

For all numerical values, including their ranges and default settings, please refer to the description of the remote-control commands in Chapter 6.

The description of the operating concept is to be found in Chapter 3 of the operating manual for the R&S CMU200/CMU300 basic instrument. Besides, a description of measurement control and the essential settings is given at the end of Chapter 3 in the present WCDMA manual. A comprehensive index listing important keywords and the proper names of all menus, dialog elements and softkeys is appended to the end of this manual.

Power Measurements

The menu group *Power* comprises the functions for measuring the power of the received RF carrier signal. The results are displayed in the measurement menu *Power,* the popup menu *Power Configuration* is used for configuration of the measurements.

- The measurement control softkey *Pow. Meter Wideband* changes to *Power Meter Freq. Sel.,* depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Power Configuration*. The hotkeys associated with the measurement control softkey define the scope of the *Power* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *Channel, Frequency,* and *Frequency Offset* belong to the softkey *Analyzer Settings).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

The *WCDMA Node B FDD* function groups provide different types of power measurements. All power measurements are performed at fixed frequency. They differ in their measurement principle and filter settings, in the statistical evaluation and the display of results.

Power Wideband	*Pow. Meter Wideband* is an application in the *Power* menu. The measurement is performed at the RF Frontend of the CMU and yields the peak power of the input signal inside a wide frequency range. The main purpose of the measurement is to indicate whether an input signal is available and whether it is advisable to change the *Expected Power* settings.
Power Meter Freq. Sel.	*Power Meter Freq. Sel.* is the second application in the *Power* menu. The measurement yields the average, minimum and maximum power of an RF input signal over a slot plus a statistical evaluation over several slots; see section *Measurement Results* on p. 4.6. Bandpass measurement filters with different bandwidths and the 3.84 MHz RRC filter specified for WCDMA conformance tests are available. The measurement is always frequency selective; no wideband filter is provided.

Types of settings

The purpose of the *Power* menu is to present the power results at a glance. The two measurement applications *Pow. Meter Wideband* or *Power Meter Freq. Sel.* can be selected with the *Application* softkey. The remaining softkeys/hotkey combinations provide two different types of settings:

- General settings are valid for the entire function groups WCDMA Node B FDD *Non Signalling* or WCDMA Node B FDD *Signalling.* Changing general settings in any application will have an impact on all measurements and applications of the function group. All general settings are also provided in the *Connection Control* menu (see p. 4.52). Examples of general settings are the *Expected Power* and the trigger settings (softkey *Exp. Power Trigger)* and the configuration of the RF generator (softkey *Generator)*.
- Specific settings are relevant for one application only, or they can be set independently for several applications. Changing specific settings in an application will not affect the other measurements and applications of the function group. No specific settings are provided in the *Connection Control* menu (see p. 4.52). Examples of specific settings are the *Repetition* mode (to be set independently for all applications) and *Statistic Count* (not relevant for the *Pow. Meter Wideband* application).

Measurement results

The output fields in the left half of the *Power* menu show the current measurement results. The results depend on the selected application. They are described in detail in section *Measurement Results* on p. 4.6.

The results displayed in the *Power* menu represent only a small fraction of the power results that the CMU is able to acquire. More results are displayed in the *Spectrum* and *Code Domain Power* measurement menus; see sections *Spectrum*

Measurements on p. 4.36 and *Code Domain Power Measurements* on p. 4.9. In particular, the *Spectrum* menus show the results as a function of frequency and code channels.

Note: *A Power measurement example is reported in Chapter 2.*

The main menu *Power* is opened from the main menu *Menu Select* (with associated key at front of instrument). It can also be accessed from the other measurement menus via the *Power* hotkey.

Menu Select

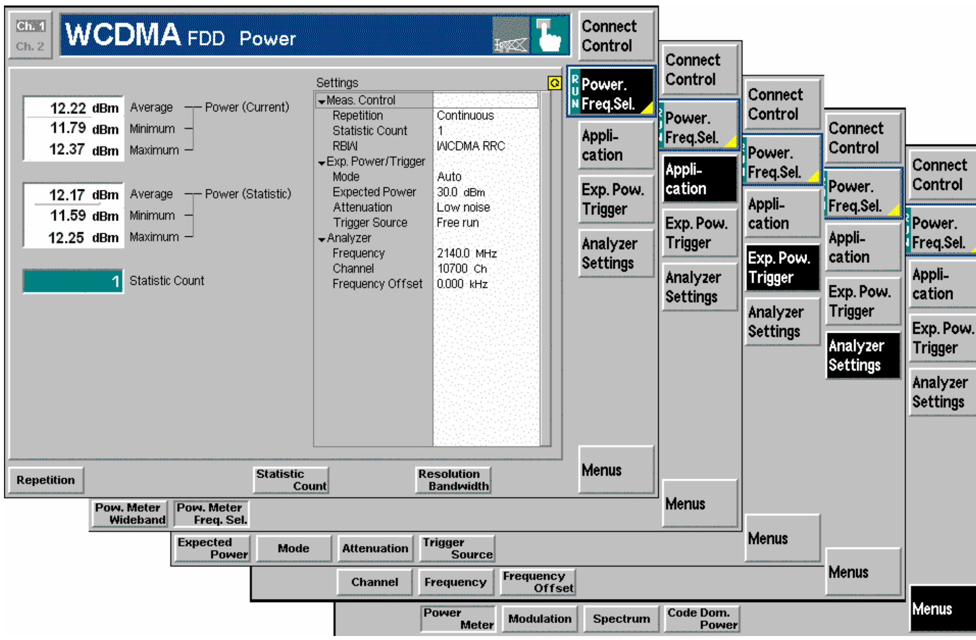


Fig. 4-1 Measurement menu Power

Test Settings

The basic settings for the *Power* measurement are directly accessible from the measurement menu via softkey/hotkey combinations. If a softkey is selected and an associated hotkey is pressed, a popup window will appear which indicates the current setting and enables an entry.

Example:

Analyzer Settings The *Analyzer Settings* softkey displays a hotkey bar including the hotkey *RF Channel*.

Channel The *Channel* hotkey defines the WCDMA channel number of the analyzed RF signal.

RF Channel 9612

Input windows indicate the current parameter value (in this case: the WCDMA channel number of the analyzed RF signal) or a list of possible settings. Parameters are changed by one of the following:

- Overwriting/incrementing numerical values (for numeric parameters)

- Selecting from the list of parameters (for select parameters)

Many of the basic settings are also accessible from the *Power Configuration* popup menu. They are explained in more detail in section *Power Configuration* on p. 4.7.

Each *Power* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys.

Pow. Meter Wideband

The *Pow. Meter Wideband* softkey (which changes to *Power Meter Freq. Sel.,* depending on the application selected) controls the measurement application and indicates its status *(RUN | HLT | OFF)*. This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The status can be set independently for all three applications.

Remote control

```
INITiate:POWer:<Application>
ABORt:POWer:<Application>
STOP:POWer:<Application>
CONTinue:POWer:<Application>
FETCh:POWer:<Application>:STATus?
FETCh[:SCALar]:POWer:<Application>:POWer[:RESult]? etc.
```

Measurement configuration

Pressing the *Pow. Meter Wideband* softkey twice opens the popup menu *Power Configuration* (see page 4.7).

Besides a number of hotkeys defining the scope of the measurement and the resolution bandwidth are associated with the *Pow. Meter Wideband* softkey. The corresponding settings are specific to the *Power* menu and also provided in the *Control* tab of the *Power Configuration* menu; see section *Power Configuration* on p. 4.7.

Appli-cation

The *Application* softkey selects the measurement application. The measurement control softkey (second softkey below *Connect. Control)* indicates the current application. Some of the hotkeys associated with the different softkeys, the *Settings* table, and the results in the *Power* menu also vary as a function of the application. Details about the measurements and the results are explained in section *Measurement Results* on p. 4.6.

Pow. Meter Wideband

The *Pow. Meter Wideband* hotkey selects the measurement of the peak power using a wideband filter. In this application no statistical evaluation of the results is provided.

Remote control
The *Pow. Meter Wideband* application corresponds to the `POWer:PMWB` subsystem.

Pow. Meter Freq. Sel.

The *Pow. Meter Freq. Sel.* hotkey selects the measurement of the peak and average power using frequency-selective bandpass or RRC filters. In this application a statistical evaluation of the results is provided.

Remote control
The *Pow. Meter Freq. Sel.* application corresponds to the `POWer:PMFS` subsystem.

Exp. Pow. Trigger

The *Exp. Pow. Trigger* softkey controls the level in the RF input signal path and provides the trigger settings for the measurements.

The expected power and trigger settings are general settings and therefore also provided in the *Connection Control* menu. They are described in more detail in sections *Analyzer Settings – Table-Oriented Version* on page 4.55 and *Trigger (Group Configuration – Trigger)* on p. 4.78.

Analyzer Settings

The *Analyzer Settings* softkey determines the center frequency of the RF analyzer. The frequency settings are general settings and also provided in the *Connection Control* menu; see section *Analyzer Settings (Connection Control – Analyzer)* on p. 4.54.

Settings table

The *Settings* table in the right half of the *Power* menu gives an overview of the measurement settings belonging to the current application. It changes when a different application is selected. The roll-key scrolls and expands the *Settings* table.

Measurement Results

The results displayed in the *Power* menu depend on the selected application. All results are obtained at a definite frequency; see *Analyzer Settings* softkey on p. 4.5.

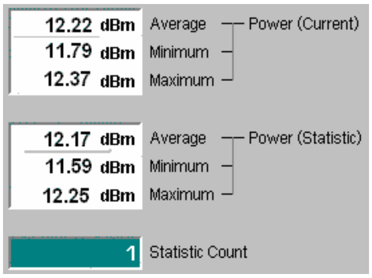
Pow. Meter Wideband:

The result for the *Pow. Meter Wideband* application appears in a single output field.

The measurement is performed at the RF Frontend of the CMU and yields the peak power of the input signal inside a wide frequency range. *Power* is generally slightly higher than the power measured with frequency selective filters. The main purpose of the measurement is to indicate whether an input signal is available and whether it is advisable to change the *Expected Power* settings.

Remote control
```
READ[:SCALar]:POWer:PMWB?
FETCh[:SCALar]:POWer:PMWB?
SAMPle[:SCALar]:POWer:PMWB?
```

Pow. Meter Freq. Sel.:



The results for the frequency selective power meter *(Pow. Meter Freq. Sel.)* application are displayed in several groups of output fields. All results are obtained at the selected frequency and resolution bandwidth of the IF filter. The statistical evaluation is based on a basic evaluation period of 1 WCDMA slot and on the statistics cycle *(Statistic Count)* defined in the configuration menu (see section *Power Configuration* on p. 4.7; for a general description of statistical evaluations in the CMU refer to Chapter 3 of the CMU manual, section *General Settings)*.

Power (Curr.) Average, minimum and maximum power of the RF input signal in the current slot

Power (Avg.) Average, minimum and maximum of the *Power (Curr.)* values: The *Maximum (Minimum)* value is the largest (smallest) power ever measured in the current measurement. *Average* is the average over all *Average – Power (Curr.)* values in the current measurement, obtained according to the averaging rules described in Chapter 3 of the CMU manual, section *General Settings.*

Statistic Count Number of slots per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle

Remote control
```
READ[:SCALar]:POWer:PMFS?
FETCh[:SCALar]:POWer:PMFS?
SAMPle[:SCALar]:POWer:PMFS?
```

Power Configuration

The popup menu *Power Configuration* configures the power measurements. It is opened by pressing the measurement control softkey in the Power menu twice.

In the *Control* tab of the *Power Configuration* menu both power measurement applications of the *Power* menu can be configured independently. The tab defines:

- The center *Frequency* of the RF analyzer
- The Repetition mode
- The *Statistic Count* for the measurement (for the *Power Meter Freq. Sel.* measurement only)
- The *Resolution Bandwidth* of the measurement filter

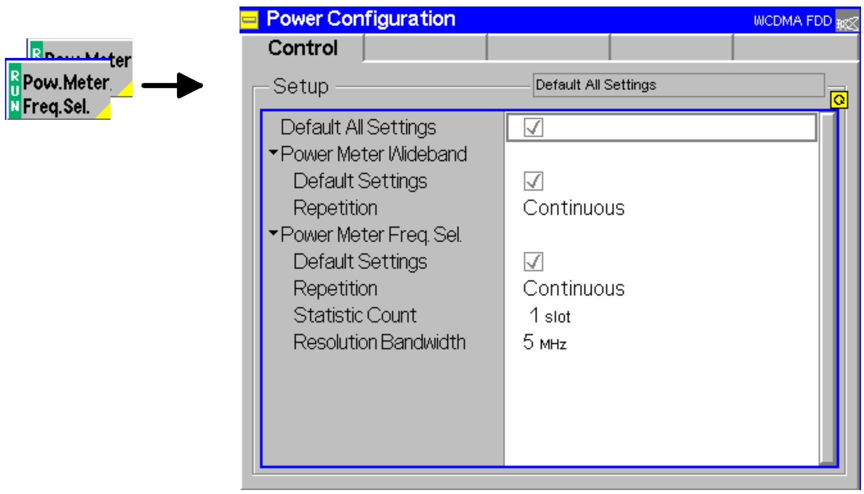


Fig. 4-2 Power Configuration – Control

Default Settings

The *Default All Settings* switch assigns default values to all settings in the *Control* tab. In addition, default switches for the individual applications are provided.

Remote control
`DEFault:POWer:<Application>:CONTrol`

Repetition

Repetition determines the repetition mode. Repetition modes for the applications *Pow. Meter Wideband* and *Power Meter Freq. Sel.* can be set independently.

Single Shot Single shot measurement: the measurement is stopped after a statistics cycle (or after a stop condition is met, see below). A stopped measurement is indicated by the status display *HLT* in the *Power* softkey.

Continuous Continuous measurement: The CMU measures continuously until the measurement is explicitly stopped via the measurement control softkey in the graphical measurement menu (see *Pow. Meter Wideband* softkey on p. 4.4). The measurement results are valid after one slot; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the *Power* softkey.

Single shot should always be selected if only a single measurement result is required under fixed conditions. The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example for adjustments.

Note: *In remote mode, the counting measurement (counting mode) is available as a further repetition mode with a defined number of measurement cycles to be performed.*

Remote control

```
CONFigure:POWer:&lt;Application&gt;:CONTrol:REPetition
     CONTinuous | SINGleshot | 1 ... 10000,NONE,<Stepmode>
```

Statistic Count The input field *Statistic Count* defines the number of slots that form a statistics cycle. The settings *1* and *OFF* (press *ON/OFF* key) are equivalent. A statistics cycle is equal to the duration of single shot measurements; see *Repetition Mode* above. This setting is available for the *Power Meter Freq. Sel.* application; for *Pow. Meter Wideband* measurements the *Statistic Count* is always equal to one.

Remote control

```
CONFigure:POWer:PMFS:CONTrol:STATistics  1 ... 1000 | NONE
```

Resolution Bandwidth *Resolution Bandwidth* defines the resolution bandwidth of the analyzer in the *Power Meter Freq. Sel.* application. Bandpass filters with bandwidths of 5 MHz or 7 MHz are available. Moreover, a root-raised cosine (RRC) filter with a roll-off α = 0.22 and a bandwidth equal to the chip rate (3.84 MHz) is provided. The RRC filter is stipulated for many WCDMA conformance tests.

Remote control

```
[SENSe:]POWer:PMFS:CONTrol:BWIDth[:RESolution]
```

Code Domain Power Measurements

The menu group *Code Domain Power* measures the power and the modulation accuracy of a downlink WCDMA signal and of its individual code channels. The *Code Domain Power* measurement complements the *Modulation* measurement, where the accuracy of the modulation vector can be analyzed as a function of time. The measurement results are displayed in the graphical measurement menu *Code Domain Power,* the popup menu *Code Domain Power Configuration* is used for configuration of the measurements.

Definition of measured quantities:

According to standard TS 25.141, the quality of the modulated downlink WCDMA signal is primarily assessed by its *Error Vector Magnitude (EVM)* and *Peak Code Domain Error (PCDE).* The EVM quantifies the modulation quality of the composite signal, the PCDE quantifies the modulation quality of the individual code channels. The combination of both parameters ensures that the entire WCDMA signal as well as all code channels satisfy the requirements of the conformance specification.

The measurement of both parameters is based on a comparison between the modulation vector Z in the I/Q-plane, measured over a complete P-CPICH slot, and an ideal, calculated reference signal R'; see section *Measurement of CDP Parameters* on p. 4.10.

Error Vector Magnitude (EVM) RMS value of the error vector E = R' – Z divided by the RMS value of the reference signal R', expressed in percent.

PCDE Maximum Code Domain Error for all code channels at a specific spreading factor. The Code Domain Error for every code corresponds to the projection of the EVM onto that code. The PCDE is expressed in dB.

The power and frequency accuracy is assessed by means of the following parameters:

Code Domain Power (CDP) Ratio of the power in an individual code channel to a reference value (e.g. the power of the composite WCDMA downlink signal), expressed in dB.

Carrier Freq. Error Difference of the measured Node B modulated carrier frequency from the expected (nominal) frequency.

In addition to the previous parameters, specified in standard TS 25.141, the CMU provides the following results:

I/Q Origin Offset Origin offset in the I/Q constellation diagram reflecting a DC offset in the baseband signal (see *Fig. 4-4* on page 4.11 and *Equation 4-1*). The origin offset corresponds to a RF carrier feedthrough in spectral representation.

I/Q Imbalance Amplitude difference between the in-phase (I) to the quadrature (Q) components of the measured signal, normalized and logarithmized (see *Fig. 4-4* on page 4.11 and *Equation 4-2*). The I/Q imbalance corresponds to an unwanted signal in the opposite sideband in spectral representation.

A limit check is provided for all measured parameters; see section *Tolerance Values (Code Domain Power Configuration – Limits)* on p. 4.24.

Measurement of CDP Parameters

In annex E of standard TS 25.141, the different steps to obtain the parameters of the *Code Domain Power* are outlined as follows:

1. Acquire the signal Z and calculate the reference signal R

The actual modulation vector of the output signal of the Node B under test is measured over a complete P-CPICH slot and stored as Z, using a matched filter (an RRC filter with a roll-off α = 0.22 and a bandwidth equal to the chip rate). A reference signal R, depending on the RF frequency f_{Carr} and the Code Domain Power CDP, is constructed mathematically and filtered by the same matched filter.

2. Determine the *Code Domain Power* and *Frequency Error*

The reference signal R is varied with respect to the parameters mentioned in TS 25.141 in order to achieve best fit with the measured signal Z, i.e. to minimize the RMS value of the difference Z – R. This yields the measured values of the *Frequency Error,* the *Code Domain Power* and the varied reference signal R'.

3. Calculate the EVM and PCDE

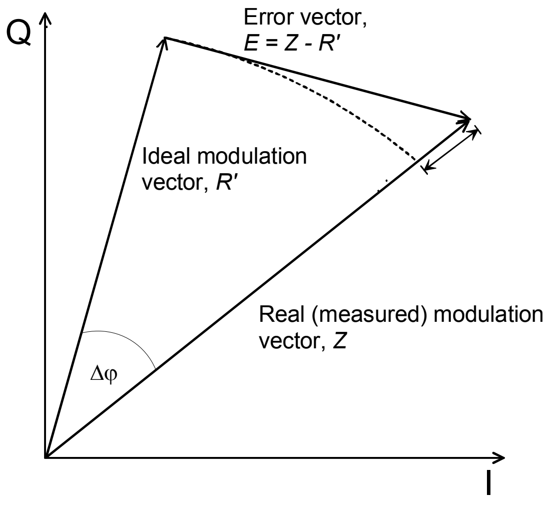


Fig. 4-3 Modulation errors in the I/Q vector diagram

The error vector *E = Z – R'* is calculated as an array at each sample in the measurement interval. From E and Z the following arrays can be calculated:

| *E* | = | *Z – R'* |	Magnitude of the error vector, calculated at each sample in the measurement interval.
$\Delta\varphi$	Phase error
| *Z* | - | *R'* |	Magnitude error

The *Modulation* measurement diagrams show the relative magnitude error and the relative EVM, i.e. the quantities defined above divided by the magnitude of the ideal modulation vector **|** *R'* **|**.

The Error Vector Magnitude (EVM) displayed in the tables of the *Code Domain Power* and of the *Modulation* menu is calculated as the ratio of the RMS value of E to the RMS value of R' in percent, i.e.

$$EVM = RMS(E) / RMS(R') * 100\%$$

The Peak Code Domain Error (PCDE) is calculated as follows:

The error vector *E = Z – R'* is descrambled and projected onto all code channels of a specific spreading factor SF. For each of the resulting projected error vectors E_k (k = 0 to SF – 1), the RMS value is calculated. The PCDE is calculated as the ratio of the maximum of the RMS values of E_k to the RMS value of R' in dB:

$$PCDE = 20 * \log [\max_k RMS(E_k) / RMS(R')] \text{ dB}$$

In addition to the previous parameters, CMU provides the Origin Offset and the I/Q Imbalance:

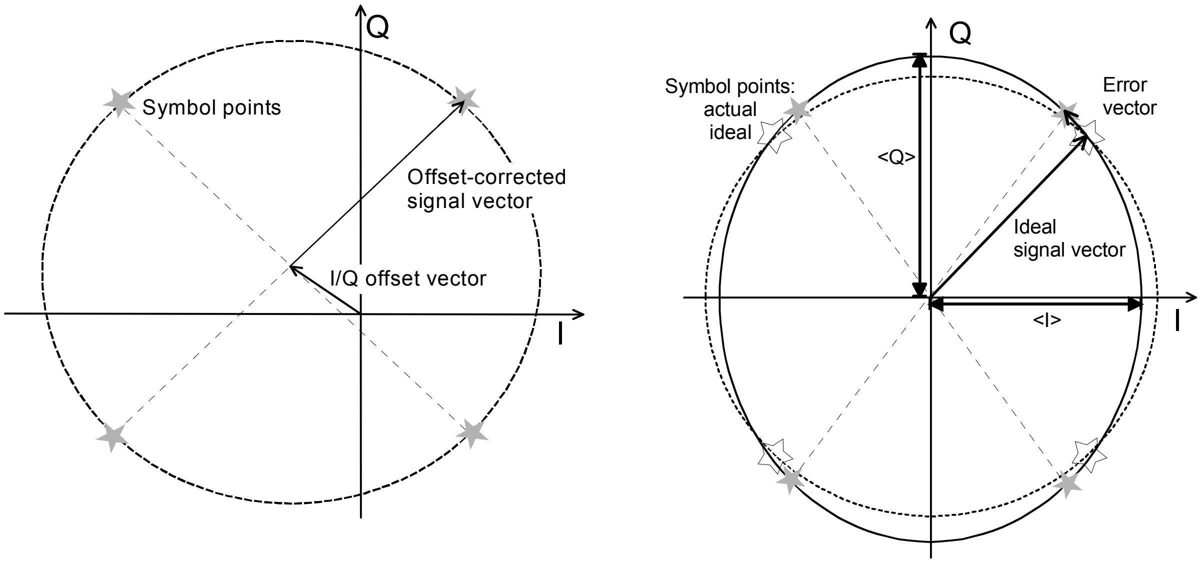


Fig. 4-4 Modulation errors in the I/Q constellation diagram

Origin offset *Fig. 4-4* is an idealized representation of the modulation errors where the effects of a pure origin offset (left diagram) and of a pure I/Q imbalance (right diagram) are completely disentangled. The I/Q offset in dB is the logarithmic ratio of the I/Q offset vector (i.e. the estimated DC-offset of the measured signal) to the RMS value of the varied reference signal R'.

$$\text{Origin Offset} = 20 * \log \frac{|\text{I/Q offset vector}|}{\text{RMS(R')}} \qquad \text{(Equation 4-1).}$$

I/Q imbalance The I/Q imbalance in dB is equal to the difference between the estimated I and Q amplitudes of the measured signal, which are normalized and logarithmized as follows:

$$\text{I/Q Imbalance} = 20 \log \frac{|<\text{I}> - <\text{Q}>|}{|<\text{I}> + <\text{Q}>|} \qquad \text{(Equation 4-2).}$$

Note: *To perform Code Domain Error measurements the transmitter test model set at the CMU must correspond to the Node B signal configuration and the CMU must be able to synchronize to the P-CPICH of the downlink signal. A short Code Domain Power measurement example is reported in Chapter 2, section* Condensed Measurement Examples.

Measurement Menu (Code Domain Power)

The graphical measurement menu *Code Domain Power* displays the results of the code domain power and modulation accuracy measurement.

- The measurement control softkey *Code Dom. Power* (which changes to *Peak Code Dom. Error*, if that application is selected) controls the measurement, indicates its status (RUN | HLT | OFF) and opens the configuration menu Code Domain Power Configuration. The hotkeys associated with the measurement control softkey define the scope of the Code Domain Power measurement.
- The softkeys *Application, Exp. Pow. Trigger, Analyzer Settings, Marker* and *Menus* to the right of

the test diagram are combined with various hotkeys. The softkey/hotkey combinations provide test settings and switch over between different measurements. The entry of values is described in section *Test Settings* on page 4.3.

The measurement menu *Code Domain Power* can be accessed from any other measurement menu of function group WCDMA Node B FDD using the *Code Dom. Power* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).

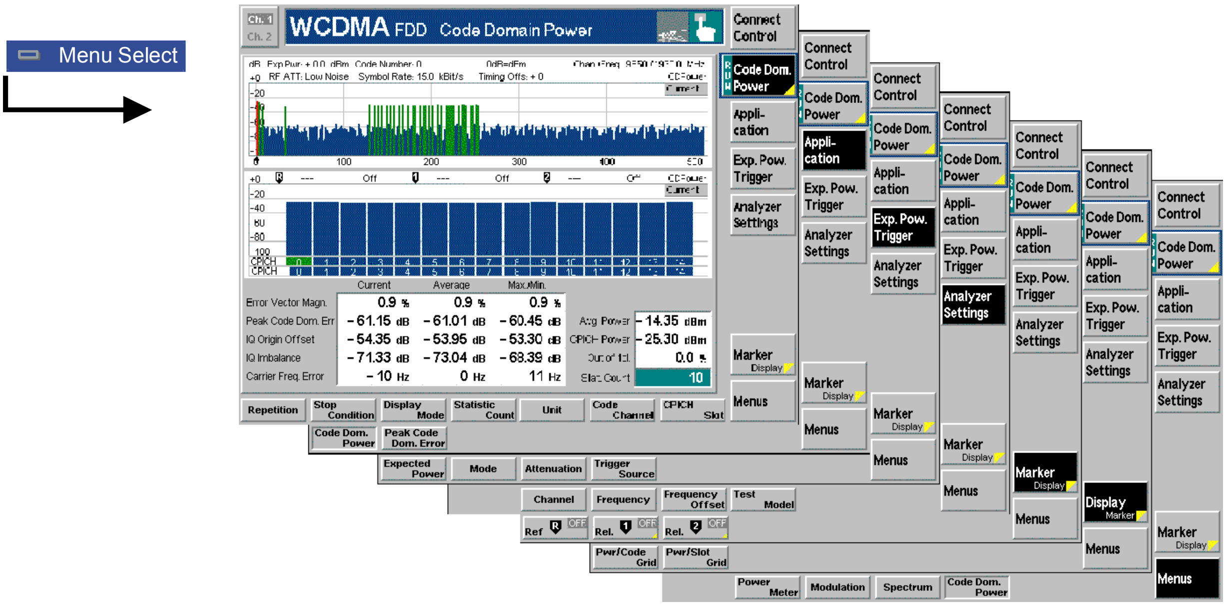


Fig. 4-5 Measurement menu Code Domain Power

Test Settings

The *Exp. Pow. Trigger* test settings and most of the *Analyzer Settings* are identical with those in the *Power* menu (see section *Test Settings* on page 4.3). The same holds for the *Marker* functions and the *Menus* softkey.

The following softkeys and hotkeys differ from the other measurements:

Code Dom. Power

The *Code Dom. Power* softkey controls the measurement and indicates its status *(RUN | HLT | OFF)*.

This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The status of the measurement is unaffected upon switchover to other menus controlling a *Code Domain Power* measurement; however, a running measurement is restarted.

Remote control
`INITiate:CDPower:CDPower`
`ABORt:CDPower:CDPower`
`STOP:CDPower:CDPower`
`CONTinue:CDPower:CDPower` etc.
`FETCh:CDPower:CDPower:STATus?`

Measurement configuration

Pressing the *Code Dom. Power* softkey twice opens the popup menu *Code Domain Power Configuration* (see page 4.47). Besides, the hotkeys *Repetition, Stop Condition,* and *Statistic Count* defining the scope of the measurement are associated with the *Code Dom. Power* softkey. The function of these hotkeys is explained in the *Power* menu section (see section *Test Settings* on page 4.3); they are identical with the parameters set in the *Control* tab of the *Code Domain Power Configuration* menu (see section *Measurement Control (Code Domain Power Configuration – Control)* on page 4.47). The *Display Mode* hotkey is also provided in the *Control* tab.

The *Unit, Code Channel, CPICH Slot,* and *Display Spreading Factor* hotkeys are also provided in the configuration menu and described in section *Measurement Control (Code Domain Power Configuration – Control)* on page 4.47.

Application

The *Application* softkey selects the main measurement parameter displayed in the bar graphs. For a detailed description see background information in section *Code Domain Power Measurements* on p. 4.9.

The alternative applications call up different measurement menus containing bar graphs and various output fields; see section *Measurement Results* on p. 4.13. The configuration settings for all *Code Domain Power* applications, however, are listed in a common popup menu (see section *Measurement Configurations (Code Domain Power)* on p. 4.22).

Code Dom. Power

The *Code Dom. Power* hotkey selects the measurement of the Code Domain Power (CDP). The result is displayed in all code channels but at fixed CPICH slot number and in all CPICH slots but at fixed channelization code number.

Remote control
The *Code Dom. Power* application is selected by the keywords
`:CDPower:CDPower` in the 2nd and 3rd level of the *Code Domain Power* commands, e.g. `CONFigure:CDPower:CDPower...`

Peak Code Dom. Error

The *Peak Code Dom. Error* hotkey selects the measurement of the Peak Code Domain Error (PCDE) for a particular spreading factor. The application provides two diagrams to display the CDE at fixed CPICH slot number in all code channels and the PCDE in all CPICH slots.

Remote control
The *Peak Code Dom. Error* application is selected by the keywords
`:CDPower:PCDE` in the 2nd and 3rd level of the *Code Domain Power* commands, e.g. `CONFigure:CDPower:PCDerror...`

Analyzer Settings

The *Analyzer Settings* softkey determines the center frequency of the RF analyzer and selects the transmitter test model of the Node B signal.

- The frequency settings are general settings and also provided in the *Connection Control* menu; see section *Analyzer Settings (Connection Control – Analyzer)* on p. 4.54.
- The test model must be selected in accordance with the *Node B* configuration. See description of test model hotkeys below.

Remote control
`[SENSe:]RFANalyzer…`

Select Test Model

Activates either one of the *Fixed Test Models* specified in standard TS 25.141 or one of the *User Test Models* UM1 or UM2.

In the *Auto Detection Mode* the R&S CMU analyzes the DL signal and determines the channel types with their parameters; see section *Automatic Channel Detection* on p. 4.14.

Different test models can be selected for the *Code Domain Power* and *Modulation* measurements. In the *Power* and *Spectrum* measurements the test model settings are not used: The R&S CMU measures the received signal irrespective of its configuration.

Remote control:
`CONFigure:CDPower:TMODel`
`M116 | M132 | M164 | M2 | M316 | M332 | M4 M5308 | M5144 | M562 | USR1 | USR2 | ACD`

User Test Models

Opens a popup menu to vary one of the fixed test models and define a new test model; see section *User Test Models* on p. 4.15.

Remote control:
`CONFigure:U1TM:CLEar; CONFigure:U2TM:CLEar`
`CONFigure:U1TM:LINE<nr>; CONFigure:U2TM:LINE<nr>`
Where `<nr> = 1 to 134`

Fixed Test Models

Opens a popup menu with an overview of the parameters for all test models (test models 1 to 5) specified in standard 3GPP TS 25.141. The fixed test models are described in section *Fixed Test Models* on p. 4.16.

Remote control: No equivalent command

Automatic Channel Detection

If automatic channel detection is active, the R&S CMU analyzes the DL signal and determines the channels with their type and parameters. There is no need to select a fixed test model or to set the parameters of a user test model according to the DL signal configuration.

Fast Channel Detection

The analysis of the DL signal and automatic channel detection takes a short while. To avoid this delay if the same DL signal is measured repeatedly, store the detected signal configuration as a user test model:

In the *Code Domain Power* or *Modulation* menu, click *Analyzer Settings – Select Test Model*, select *Auto Channel Detection* and wait until the R&S CMU has determined the DL channels.

Click Analyzer Settings – User Test Models.

In the Test Model Configuration dialog opened, perform the following settings: Model Name: User Model 1 (or 2), Based On: Auto Channel Detection.

Click Analyzer Settings – Select Test Model again and select UM1: User Model1 (or UM2: User Model 2).

Remote control:
`CALCulate:<Measurement>:FCHDetection USR1 | USR2`
where `<Measurement> = CDPower | MODulation`

Unspecified Channels

The channel types are identified by means of their parameters. The detection of the P-CPICH, PICH, C-CCPCH, and HS-PDSCH is unambiguous. The parameters of the S-CCPCH, DPCH, HS-SCCH, and PDSCH are not unique, so the type of these channels can not be detected. In addition, ambiguities can occur for some HSDPA configurations.

After an auto-detected signal configuration has been stored as a user test model, the *Test Model Configuration* dialog lists the ambiguous channel types with their parameters as *Unspec. Channel(s).* In the *Power vs. Slot* bar graph, ambiguous channels are marked *U-CHAN.* The presence of unspecified channels in general does not impair the TX measurements.

User Test Models

User test models can be defined in a popup menu which is opened on pressing *Analyzer Settings – User Test Models* in either the *Modulation* or the *Code Domain Power* menu. The R&S CMU provides two independent user test models with the following properties:

- The test models can be defined by varying one of the fixed test models defined in standard TS 25.141.
- Channel types that are always present and fixed parameters appear on a gray background, which means that they cannot be changed.
- Incompatible parameter settings are auto-corrected.
- User test models remain unchanged after a reset of the instrument.

User Test Models

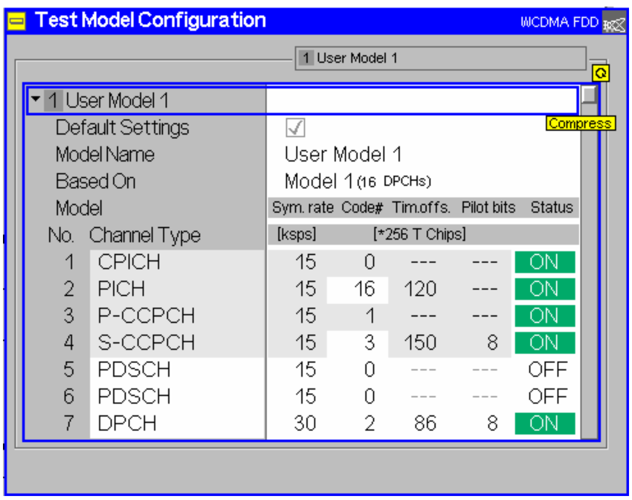


Fig. 4-6 User Test Models

Default Settings Resets all parameters of the user test models to those of the fixed test model 1 (16 DPCHs).

Remote control: No equivalent command.

`CONFigure:<Measurement>:TMODel M116`
Selects the default test model but doesn't change the user test models.

`CONFigure:U1TM:CLEar; CONFigure:U2TM:CLEar`
Disables all channels (no. 1 to 134) in the user test models.

Model Name Defines a name for the user test mode. The name must fit into the line and appears in the selection box opened by the *Select Test Model* hotkey.

Remote control: No equivalent command.

Based On

Selects one of the fixed test models from the conformance test specification TS 25.141 that the user test model is based on. This parameter allows to define user test models with a minimum effort by varying the parameters of a pre-defined model.

User test model 2 can also be based on user test model 1 and vice versa. Moreover a user model can be based on a DL signal configuration detected by the R&S CMU *(Auto Channel Detection).*

Remote control: No equivalent command.

Model

Overview of the physical and code channel contributions of the user test models. User-defined channels may contain up to 134 channels. The parameters are described on p. 4.66/67 of the WCDMA Node B operating manual.

The parameter ranges are restricted, if this is necessary to avoid incompatible settings. Moreover the R&S® CMU avoids code channel conflicts by auto-correcting incompatible settings as far as possible:

- The channelization code must be smaller than the spreading factor SF = 3.84 kbps / symbol rate. If the symbol rate is increased so that the channelization code is no longer valid, the maximum allowed code, corresponding to SF – 1, is set.
- The timing offset for the lowest symbol rate of 7.5 kbps must be an even value. If an attempt is made to enter an odd value while a 7.5 kbps symbol rate is set, or if the symbol rate is set to 7.5 kbps while the timing offset value is odd, then a notice box appears and the timing offset is increased by one.

For the HSDPA channels (HS-SCCH and HS-PDSCH), timing offset and pilot bits are not relevant and therefore disabled.

Note: ***Conflicting channel settings***

If a user test model with conflicting code channel settings is selected (Analyzer Settings – Select Test Model), an error message "Code Channel Conflict" is displayed. In the Test Model Configuration *dialog, a red square behind the channel number marks a channel with incompatible settings:*

Remote control:
`CONFigure:U1TM:LINE<nr>; CONFigure:U2TM:LINE<nr>`
Where `<nr> = 1 to 134`

Fixed Test Models

The *Fixed Test Models* popup dialog provides an overview of the transmitter test models specified in standard TS 25.141 and their physical and code channel contributions.

Fixed Test Models

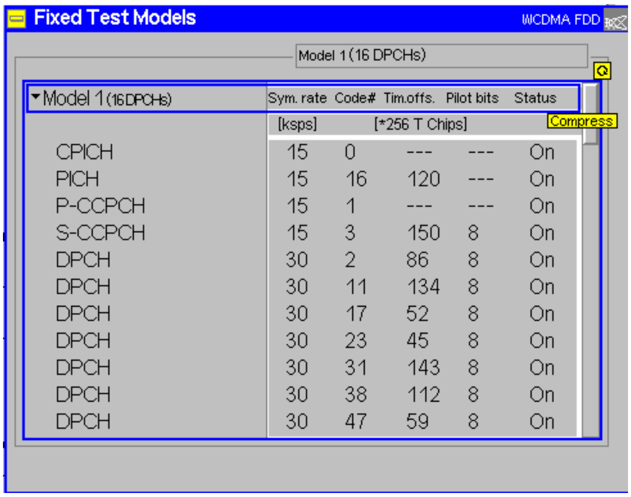


Fig. 4-7 Fixed Test Models

Test models 1 to 4 do not contain HSDPA channels; test model 5 is intended for EVM tests for base stations supporting HS-PDSCH transmission using 16QAM modulation. Considering that the base stations support different numbers of DPCHs and HS PDCHs, three different variants of test model 5 have been specified. The three test models 5 are available with option R&S CMU-K79 only.

The test models define Node B signal configurations with different common physical channel contributions and a variable number of Dedicated Physical Channels. The individual channels have the following properties:

Sym. rate Symbol rate of the physical channel, $3.84 \cdot 10^6$/SF ksps where SF is the spreading factor. The common physical channels PICH, P-CPICH, and P-CCPCH have fixed symbol rates of 15 ksps; the S-CCPCH and DPCH symbol rates can vary between 7.5 ksps and 960 ksps and between 15 ksps and 960 ksps, respectively.

Code # Channelization code number of the physical channel. The common physical channels P-CPICH and P-CCPCH have fixed code numbers of $C_{256,0}$ and $C_{256,1}$, abbreviated as 0 and 1, respectively. The PICH can have code numbers between 2 and 255, the S-CCPCH and DPCH are assigned one of the remaining code numbers $C_{SF,m}$ where $m \le SF - 1$.

Timing Offset Timing offset in multiples of 256 chip periods, equivalent to 1/10 WCDMA slot or 1/150 frame. The P-CPICH timing is always zero and provides the timing reference. The timing of the other channels can be distributed randomly across the WCDMA frame.

Pilot bits Number of pilot bits in the physical channel. The PICH, P-CPICH and P-CCPCH don't carry any pilot bits; the pilot bits of the S-CCPCH and DPCH is given in terms of the slot format number; see standard TS 25.211.

Status The overview only indicates channels that are present *(On)* in the Node B signal.

Remote control
–

The basic test models contain 64 DPCHs, distributed randomly across the code space. Considering that not every base station supports 64 DPCHs, variants of the test models with 32 and 16 DPCHs are also specified.
The conformance test specification TS 25.143 stipulates a particular test model for each test case; see Table 4-1 below. The CMU allows each test model to be used for each measurement. However, *Modulation* and *Code Domain Power* measurements generally fail if the Node B signal configuration does not correspond to the test model set at the CMU.

Table 4-1 Uplink DPDCH slot formats and symbol rate

Measured Quantity	Test Model	CMU Measurement Menu
Node B output power	Test Model 1	Power
Out of band emission, ACLR	Test Model 1	Spectrum
CPICH power accuracy	Test Model 2	Power
Peak Code Domain Error (PCDE)	Test Model 3	Code Domain Power
Error Vector Magnitude (EVM)	Test Model 4	Modulation, (Code Domain Power)
Carrier Frequency Error	Test Model 4	Modulation, (Code Domain Power)

Measurement Results

The *Code Domain Power* menu group contains two separate measurement menus corresponding to the two applications *Code Dom. Power* and *Peak Code Dom. Error*. Both menus are largely analogous.

Code Domain Power

In the *Code Domain Power* application, the transmit power in all code channels of the Node B signal is displayed. The results and the corresponding measurement settings are indicated in two parameter lines, two test diagrams (one for power vs. channel and one for power vs. slot) and several output fields:

Parameter lines

Power vs. code channel bar graph

Power vs. slot bar graph

Output fields

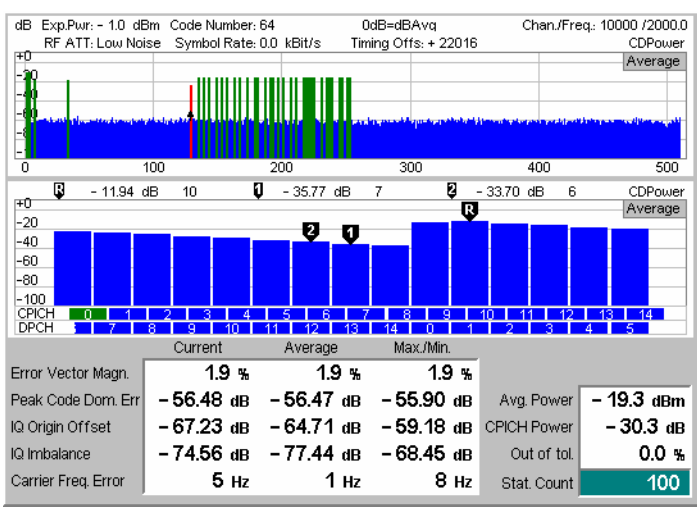


Fig. 4-8 Display of results (Code Domain Power)

Parameter lines The essential analyzer settings (as set by means of the *Exp. Pow. Trigger* softkey described on p. 4.5 and the *Analyzer Settings* softkey described on p. 4.5) are indicated in the parameter lines across the top of the measurement menu:

Exp. Power Expected input power in dBm

RF Attenuation Setting for the internal attenuation of the input signal *(Normal, Low Noise, Low Distortion)*

Freq. Offset Frequency offset with respect to the nominal WCDMA channel frequency

Chan./Freq. RF channel measured and associated nominal carrier frequency

0 dB =... 0 dB reference power *(Unit)* selected in the *CDP Configuration* menu

The remaining results apply to the selected channel (red bar in the upper graph):

Code Number Channelization code

Symbol Rate Symbol rate according to the spreading factor

Timing Offset Measured timing offset relative to the P-CPICH timing, also visualized in the lower bar graph (in chip periods; 0 to 38400 chips or 1 frame)

Parameter line, lower bar graph

The parameter line above the lower bar graph contains the following marker values and results:

R Code domain power and slot number of reference marker

1 Code domain power and slot number of delta marker 1 (setting *absolute*) or difference from reference marker (setting *relative*)

2 Code domain power and slot number of delta marker 2 (setting *absolute*) or difference from reference marker (setting *relative*)

Remote control
The settings are read out using the query corresponding to the setting command (setting command with appended question mark). In addition:

```
FETCh[:SCALar]:CDPower:CDPower:SRATe?
FETCh[:SCALar]:CDPower:CDPower:TOFFset?
```

Upper bar graph

The upper bar graph in the *Code Domain Power* (CDP) measurement menu shows the WCDMA transmit power in a specific P-CPICH slot, projected to the individual code channels of the downlink WCDMA signal. All code channels no. 0 to 511 are indicated.

The CMU expects the channels of the *Test Model* selected via *Analyzer Settings – Test Model* to be active (the test model channels are displayed in the *Node B Signal* tab of the *Connection Control* menu; see section *Node B Signal (Connection Control – Node B)* on p. 4.72). Active channels are green, the channel currently selected for the analysis in the lower bar graph is red, and the noise floor of the inactive channels is blue. Blue bars with powers significantly above the noise floor and exceeded limits in the output fields are likely to indicate that the selected *Test Model* is not in accordance with the Node B signal configuration.

The *P-CPICH Slot* can be selected in the configuration menu, and the CDP may or may not include the contribution of the SCH; see section *Measurement Control (Code Domain Power Configuration – Control)* on page 4.47.

The y-axis scale of the diagram can be scaled in absolute units, relative to the average power of the composite WCDMA signal, or relative to the CPICH power *(Unit* function in the configuration menu). The reference powers are displayed in the output fields below the diagram. Changing the *Unit* shifts the power bars in vertical direction and changes the 0 dB reference power indication in the first parameter line.

The *Display Mode* (statistical evaluation of the results; to be set in the *Control* tab of the configuration menu) is indicated in the upper right corner of the diagram. No limit check is performed.

Lower bar graph

The lower bar graph in the *Code Domain Power* measurement menu shows the WCDMA transmit power of a specific code channel (the current channel, highlighted with red color in the upper diagram), measured in all 15 slots of the

WCDMA frame. The two slot symbol bars across the bottom of the diagram show the relative timing of the P-CPICH and the current channel (see *Timing Offset* in the second parameter line). The current P-CPICH slot for the upper bar graph is highlighted with green color.

The *Code Channel* can be selected in the configuration menu; see section *Measurement Control (Code Domain Power Configuration – Control)* on page 4.47.

The power in consecutive slots is typically constant unless the Node B is commanded to change its transmit power. The y-axis scale and *Display Mode* of the diagram is identical to the upper bar graph. No limit check is performed.

Remote control
`READ:ARRay:CDPower:CDPower:CHANnels:CURRent?` etc.

Output fields

The modulation parameters displayed in the output fields on the left side below the diagram are explained in section *Code Domain Power Measurements* on p. 4.9. They are displayed and monitored here to show a possible relation between the modulation accuracy and the code domain parameters (e.g. poor modulation accuracy may result in noise or non-orthogonal components that are detected as fictitious channels). A limit check is made for the modulation parameters.

On the right side, the following additional results are displayed:

Avg. Power	Average power of the total composite WCDMA signal in the current frame, measured with an RRC filter at the chip instants. The *Avg. Power* is used as a reference for the code domain powers if it is selected with the *Unit* function (see section *Measurement Control (Code Domain Power Configuration – Control)* on page 4.47)
CPICH Power	Average power of the P-CPICH in the current frame, measured with an RRC filter. The *CPICH Power* is used as a reference for the code domain powers if it is selected with the *Unit* function (see section *Measurement Control (Code Domain Power Configuration – Control)* on page 4.47)
Out of Tolerance	Percentage of evaluation periods (frames) where any of the *Current* results exceeded the limits.
Statistic Count	Number of evaluation periods (frames) per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle.

Remote control
`READ[:SCALar]:CDPower:CDPower?` etc.

Limit Check

A red output field indicates that the measurement result exceeds the upper limit set in the *Limits* tab of the *Code Domain Power Configuration* menu, see p. 4.24.

Remote control
`CALCulate[:SCALar]:CDPower:CDPower:MATChing:LIMit?`

Peak Code Domain Error

In the *Peak Code Domain Error* measurement, the PCDE is displayed. The results and the corresponding measurement settings are indicated in two parameter lines, two test diagrams (one for power vs. channel and one for power vs. slot) and several output fields:

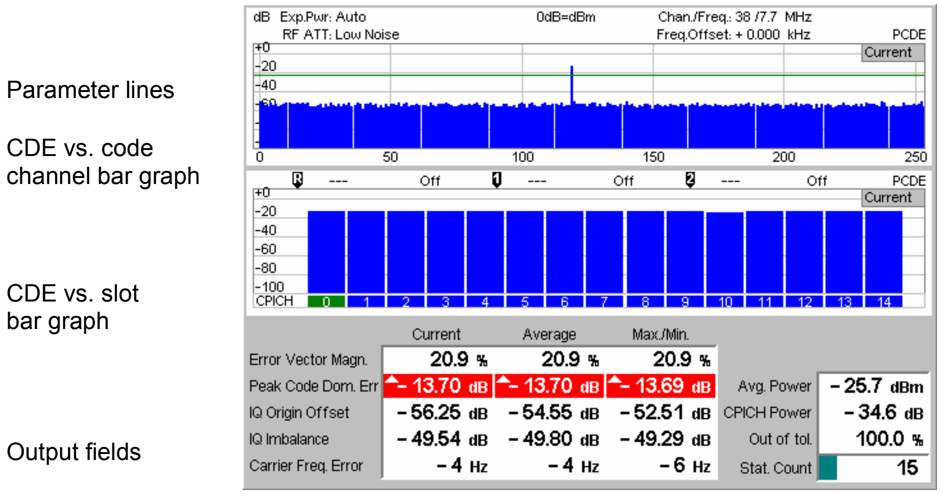


Fig. 4-9 Display of results (Peak Code Domain Error)

Parameter lines The settings and results indicated in the parameter lines are also shown in the *Code Domain Power* menu; see p. 4.18.

Upper bar graph The upper bar graph in the *Peak Code Domain Error* measurement menu shows the code domain error in a specific CPICH slot and in all code channels considered for the PCDE calculation. The *P-CPICH Slot* can be selected in the configuration menu. The number of evaluated code channels and thus the width of the individual bars and the x-axis scale can vary between 4 and 512 (in powers of 2), depending on the *Spreading Factor* selected in the *Control* tab of the configuration menu (see section *Measurement Control (Code Domain Power Configuration – Control)* on p. 4.22. The y-axis scale of the diagram is fixed.

The *Display Mode* (statistical evaluation of the results; to be set in the *Control* tab of the configuration menu) is indicated in the upper right corner of the diagram. In contrast to the *Code Domain Power* application, no *Minimum* display mode is available. A red, horizontal line indicates the upper limit for the PCDE set in the *Limits* tab of the configuration menu.

Lower bar graph The lower bar graph in the *Peak Code Domain Error* measurement menu shows the peak code domain error measured in all 15 slots of the WCDMA frame. The current P-CPICH slot for the upper bar graph is highlighted with green color.

The y-axis scale and *Display Mode* of the diagram is identical to the upper bar graph.

Remote control
`READ:ARRay:CDPower:PCDerror:CHANnels:CURRent?`
`READ:ARRay:CDPower:PCDerror:SLOTs:CURRent?` etc.

Output fields The output fields below the diagram are also provided in the *Code Domain Power* application; see p. 4.20.

Remote control
`READ[:SCALar]:CDPower:PCDerror?` etc.
`CALCulate[:SCALar]:CDPower:PCDerror:MATChing:LIMit?`

Measurement Configurations (Code Domain Power)

The popup menu *Code Domain Power Configuration* contains two tabs that define the parameters of the CDP measurement including the error tolerances.

The popup menu *Code Domain Power Configuration* is called up by pressing the measurement control softkey in the top right of the graphical measurement menu *Code Domain Power* twice (this softkey reads *Code Dom. Power* etc., depending on the selected application). By pressing the associated hotkeys, it is possible to change between the tabs.

Measurement Control (Code Domain Power Configuration – Control)

The *Control* tab controls the *Code Domain Power* measurement by defining

- The inclusion of the SCHs in the CDP results
- The *Repetition* mode
- The statistics applied for the displayed results *(Display Mode)*
- The *Stop Condition* and the number of frames forming a statistics cycle *(Statistic Count)*
- The Code Channel for the Code Domain Power diagram
- The CPICH Slot for the Code Domain Power and Peak Code Domain Error diagrams
- The *Unit* for the CDP results
- The number of code channels displayed *(Spreading Factor,* for *Peak Code Dom. Err.* only)

Besides, it influences the graphical measurement menus by adding or removing the *Grid* lines in the diagrams.

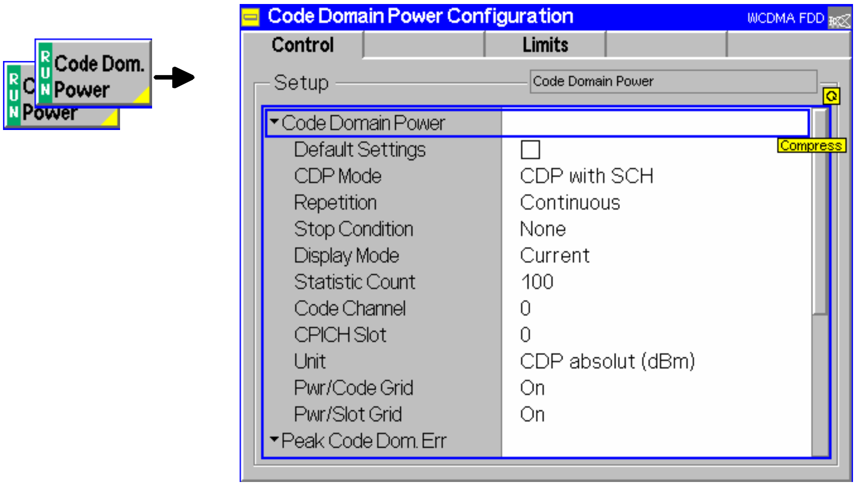


Fig. 4-10 Code Domain Power Configuration – Control

The settings can be defined separately for the different applications of the *Code Domain Power* measurement group. Most functions comply with those of the *Control* tab of the *Power Configuration* menu (see page 4.7). In the remote-control commands, the keywords POWer:<Pow_Application> are to be replaced by CDPower:<CDP_Application>. The following parameters are specific to the *Code Domain Power* measurement:

Default Settings The *Default Settings* switches assign default values to all settings of the individual applications in the *Control* tab (the default values are quoted in the command description).

Remote control
`DEFault:CDPower:<CDP_Application>:CONTrol ON | OFF`

CDP Mode *CDP Mode* qualifies whether or not the Code Domain Power is measured with the SCH contributions.

CDP with SCH CDP is measured across the entire slot, including the SCH contribution

CDP without SCH CDP is measured across 9/10 of the slot, excluding the SCH contribution

The Synchronization Channels in the downlink signal are not code-multiplexed with the other physical channels. As a consequence, orthogonality of the codes can not be exploited for SCH channel separation. The setting *CDP with SCH* can impair the CDP measurement and increase the noise level in the inactive channels.

Remote control
`CONFigure:CDPower:CDPower:CONTrol:CDPMode  WSCH | NSCH`

Code Channel *Code Channel* selects the code channel number for the lower diagram in the *Code Dom. Power* application. An arrow in the upper diagram and a red bar indicates the selected channel in the code domain.

Remote control
`CONFigure:CDPower:CDPower:CONTrol:CCHannel 0 to 511`

CPICH Slot *CPICH Slot* selects the CPICH Slot (no. 0 to 14) for the power vs. code and code dom. error vs. code diagrams (upper diagrams in the *Code Dom. Power* and *Peak Code Dom. Error* applications).

A green CPICH field in the lower diagrams (power vs. slot and code dom. error vs. slot) indicates the selected CPICH slot.

Remote control
`CONFigure:CDPower:<CDP_Application>:CONTrol:CPIChslot 0 to 14`

Unit *Unit* selects the display unit for the code domain power results in the two diagrams of the *Code Domain Power* application. It is not available in the *Peak Code Dom. Error* application.

CDP absolute (dBm) All powers are expressed in dBm units

Relat. to CPICH power All powers are expressed relative to the P-CPICH power; *0 dB = dBCPICH* is displayed in the parameter line above the diagrams

Relat. to average power All powers are expressed relative to the total power of the measured downlink WCDMA signal; *0 dB = dBAvg* is displayed in the parameter line above the diagrams

Remote control
`CONFigure:CDPower:CDPower:CONTrol:UNIT ABS | RCP | RAVG`

Spreading Factor *Spreading Factor* defines the number of code channels considered for the calculation of the Peak Code Domain Error. The spreading factor is equal to the number of code channels that are displayed in the code dom. error vs. code diagram (upper diagram in the *Peak Code Dom. Error* application).

The spreading factor can vary in the range between 4 and 512 and in powers of 2. A larger spreading factor tends to suppress the noise level. According to the conformance test specification, the PCDE must be measured with a spreading factor of 256.

Remote control
```
CONFigure:CDPower:PCDerror:CONTrol:SFACtor
      4 | 8 | 16 | 32 | 64 | 128 | 256 | 512
```

Pwr/Code Grid
Pwr/Slot Grid

Switches the grid lines in the upper and lower diagrams of the *Code Dom. Power* and *Peak Code Dom. Error* applications on or off.

Remote control
No commands, screen configuration only.

Tolerance Values (Code Domain Power Configuration – Limits)

The tab *Limits* defines upper limits for the code domain error and for the modulation parameters displayed in the *Code Domain Power* menus.

Modulation Accuracy

A poor modulation accuracy of the Node B transmitter increases the transmission errors in the downlink channel of the WCDMA network.

The Error Vector Magnitude (EVM) is the critical quantity to assess the modulation accuracy of a WCDMA Node B. According to the 3GPP Node B conformance test specification TS 25.141, the EVM measured at Node B output powers P_{max} – 3 dB and P_{max} – 18 dB and under normal operating conditions shall not exceed 17.5 %. The Carrier Frequency Error shall not exceed ±0.05 ppm.

While the EVM quantifies the modulation quality of the composite signal, the PCDE quantifies the modulation quality of the individual code channels in a considered code domain. According to the specification the PCDE shall not exceed –33 dB at spreading factor 256.

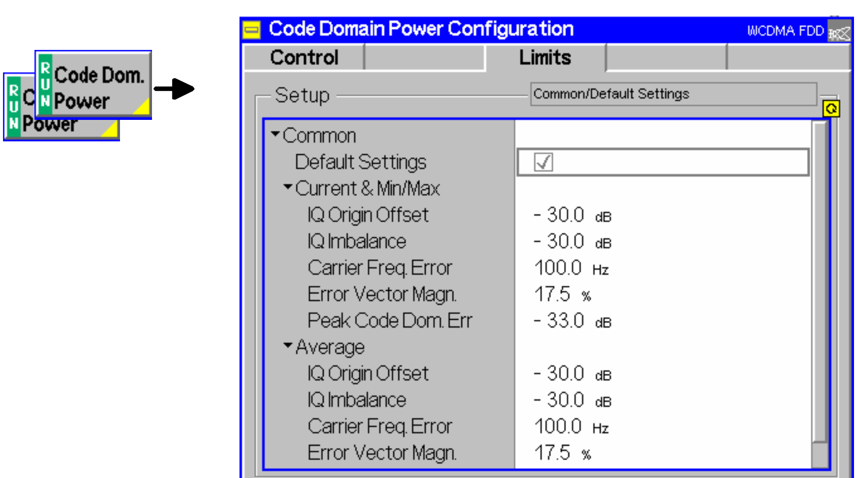


Fig. 4-11 Code Domain Power Configuration – Limits

Default Settings

The *Default Settings* switch assigns default values to all settings in the *Limits* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control
–

Common The *Common* table section defines upper limits for the modulation parameters displayed in the output tables below the diagrams in the *Code Domain Power* and *Peak Code Dom. Error* menus. Different limits can be set for the different *Display Modes,* to be set in the *Control* tab of the configuration menu.

Current & Min/Max	Common limits for the *Current* results and for the *Minimum/Maximum* results
Average	Limits for the *Average* measurement scalar results

The meaning of the error limits is the same for the *Current* or *Minimum/Maximum (Current & Max.)* and the *Average* results:

The *Carrier Frequency Error* is a quantity with alternating sign; the corresponding limits are symmetric to the origin (i.e. the absolute value must fall below the specified positive limit). For an explanation of all measured quantities refer to section *Code Domain Power Measurements* on p. 4.9.

Remote control
```
CONFigure:CDPower:<Meas_Parameter>:CMMax:LIMit[:SCALar]
:ASYMmetric:UPPer:VALue
CONFigure:CDPower:<Meas_Parameter>:CMMax:LIMit[:SCALar]
:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:<Meas_Parameter>:AVERage:LIMit[:SCALar]
:ASYMmetric:UPPer:VALue
CONFigure:CDPower:<Meas_Parameter>:AVERage:LIMit[:SCALar]
:ASYMmetric:UPPer:ENABle
```

Modulation Measurements

The menu group *Modulation* measures the modulation accuracy of the downlink WCDMA signal. Modulation accuracy is the ability of the Node B transmitter to generate an ideal WCDMA signal with a chip rate of 3.84 Mcp. Several graphical measurement menus are provided to display the measurement results. The popup menu *Modulation Configuration* is used for configuration of the measurements.

Definition of measured quantities:

According to the Conformance Test Specification TS 25.141, the quality of the modulated downlink WCDMA signal is primarily assessed by its *Error Vector Magnitude (EVM)* and *Peak Code Domain Error (PCDE).* Both quantities are displayed in the *Code Domain Power* menu; for a definition and description of the measurement procedure refer to sections *Code Domain Power Measurements* on p. 4.9 and *Measurement of CDP Parameters* on p. 4.10.

In contrast to the *Code Domain Power* measurement, the *Modulation* measurement provides diagrams to display the relative magnitude of the error vector E (relative EVM, no average), the phase error and the magnitude error as a function of time. The three quantities are defined as explained in Fig. 4-3 on p. 4.10.

The *I/Q Origin Offset, I/Q Imbalance,* and the *Carrier Freq. Error* are also defined in section *Measurement of CDP Parameters* on p. 4.10.

The *Waveform Quality* or ρ factor is a measure for the modulation accuracy and corresponds to the normalized correlated power between the actual waveform and the ideal waveform sampled at the constellation points. It is defined as:

$$\text{Waveform Quality} = \frac{|\sum_k R'_k Z_k^*|^2}{\sum_k |R'_k|^2 \sum_k |Z_k|^2} \qquad \text{(Equation 4-3)},$$

where R'_k is the k^{th} sample of the ideal signal, Z_k is the k^{th} sample of the measured signal (both in complex representation) and the sums run over all samples. For an ideal transmitter ($Z_k = R_k$ for all k), the waveform quality is equal to 1. For real transmitters, the waveform quality is a positive real number smaller than 1.

Note: *To perform* Modulation *measurements the transmitter test model set at the CMU must correspond to the Node B signal configuration and the CMU must be able to synchronize to the P-CPICH of the downlink signal. A short* Modulation *measurement example is reported in Chapter 2, section* Condensed Measurement Examples*.*

Measurement Menu (Modulation – WCDMA)

The *Modulation* measurement menu displays quantities characterizing the modulation accuracy of a 3GPP standard downlink signal with a chip rate of 3.84 Mcps.

- The measurement control softkey *Overview WCDMA* (which changes to *EVM WCDMA, Magn. Error WCDMA, Phase Error WCDMA*, if the corresponding application is selected) controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Modulation Configuration* (press twice). The hotkeys associated with the measurement control softkey define the scope of the Modulation measurement.
- The other softkeys to the right of the test diagram are combined with various hotkeys. The softkey/hotkey combinations provide test settings and switch over between different measurements. The entry of values is described in section *Test Settings* on page 4.3.

The measurement menu *Modulation* can be accessed from any other measurement menu of the *WCDMA Node B* function group using the *Modulation* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).

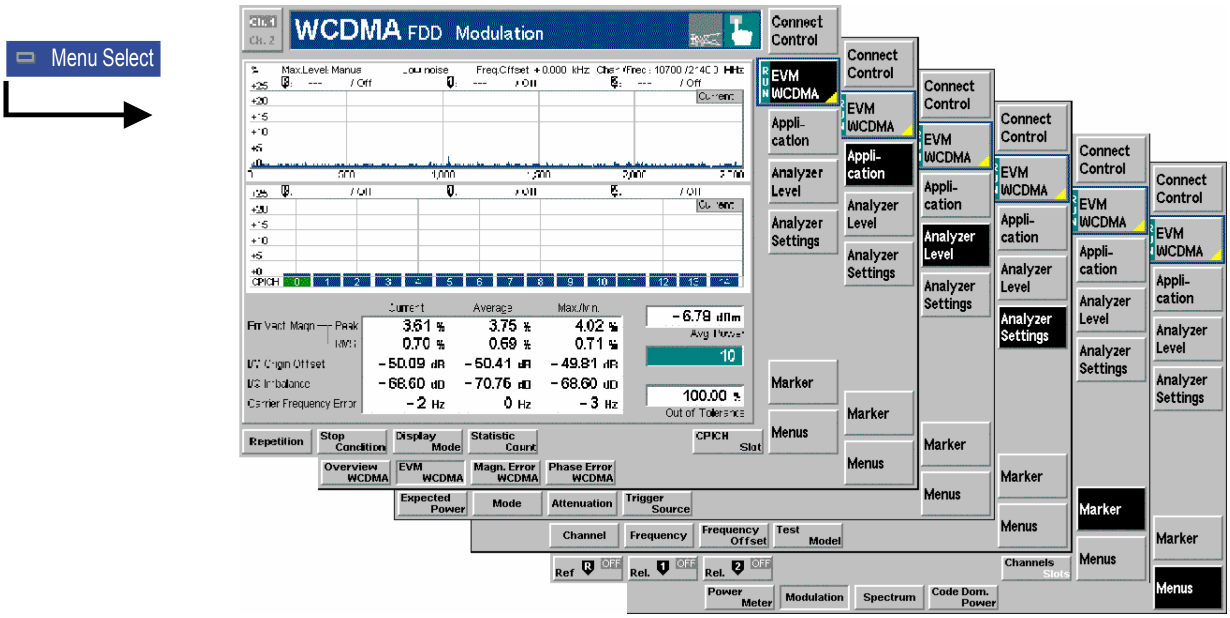


Fig. 4-12 Measurement menu Modulation – EVM WCDMA

Test Settings

The *Analyzer Level* and *Menus* test settings are identical with those in the *Power* menu (see section *Test Settings* on page 4.3). The following softkeys and hotkeys are specific to the *Modulation – WCDMA* measurement:

Overview WCDMA

The *Overview WCDMA* softkey (which changes to *EVM WCDMA, Magn. Error WCDMA, Phase Error WCDMA*, if the corresponding application is selected) controls the measurement and indicates its status *(RUN | HLT | OFF)*.

This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The status of the measurement is unaffected upon switchover to other menus controlling a *Modulation* measurement; however, a running measurement is restarted.

Remote control

```
INITiate:MODulation:<Application>
ABORt:MODulation:<Application>
STOP:MODulation:<Application>
CONTinue:MODulation:<Application> etc.
FETCh:MODulation:<Application>:STATus?
```

Measurement configuration

Pressing the *Overview WCDMA* softkey twice opens the popup menu *Modulation Configuration* (see page 4.33). Besides, the hotkeys *Repetition, Stop Condition,* and *Statistic Count* defining the scope of the measurement are associated with the *Overview WCDMA* softkey. The function of these hotkeys is explained in the *Power* menu section (see section *Test Settings* on page 4.3); they are identical with the parameters set in the *Control* tab of the *Modulation Configuration* menu (see p. 4.33). The *Display Mode* hotkey is also provided in the *Control* tab.

The *CPICH Slot* parameter is also provided in the configuration menu and described in section *Measurement of CDP Parameters* on p. 4.10.

Application

The *Application* softkey selects the measurement application and the signal configuration.

The alternative diagrams (applications) are displayed in different measurement menus. When an application is selected, the corresponding measurement menu is called up. The configuration settings for all applications, however, are listed in a common popup menu (see p. 4.33).

Overview WCDMA

The *Overview WCDMA* hotkey selects all scalar modulation results to be displayed.

Remote control
No explicit switchover command. All *Overview WCDMA* measurements are identified by the 3rd/4th/5th level keywords `...OVERview:WCMDA...`

EVM WCDMA

The *EVM WCDMA* hotkey selects the magnitude of the error vector to be displayed. The error vector connects the measured signal from the Node B and the ideal signal vector at the symbol points, see in Fig. 4-3 on p. 4.10. The diagram shows the relative magnitude (in percent), i.e. the ratio of the magnitude of the error vector to the magnitude of the ideal signal vector.

Remote control
No explicit switchover command. All *EVM WCDMA* measurements are identified by the 3rd/4th level keywords `...EVMagnitude:WCMDA...`

Phase Err. WCDMA

The *Phase Error WCDMA* hotkey selects the phase error of the modulation vector to be displayed.

The phase error is the difference in phase between the measured signal from the Node B and an ideal signal waveform at the symbol points, see in Fig. 4-3 on p. 4.10.

Remote control
No explicit switchover command. All *Phase Error WCDMA* measurements are identified by the 3rd/4th level keywords `...PERRor:WCMDA...`

Magn. Err. WCDMA

The *Magnitude Error WCDMA* hotkey selects the magnitude error of the modulation vector to be displayed.

The magnitude error is the difference in magnitude between the measured signal from the Node B and an ideal signal waveform at the symbol points, see in Fig. 4-3 on p. 4.10. The diagram shows the relative magnitude error (in percent), i.e. the ratio of the absolute magnitude error to the magnitude of the ideal signal vector.

Remote control
No explicit switchover command. All *Magn. Error WCDMA* measurements are identified by the 3rd/4th level keywords `...MERRor:WCMDA...`

Analyzer Settings

The *Analyzer Settings* softkey determines the center frequency of the RF analyzer and selects the transmitter test model of the Node B signal.

- The frequency settings are general settings and also provided in the *Connection Control* menu; see section *Analyzer Settings (Connection Control – Analyzer)* on p. 4.54.
- The test model must be selected in accordance with the *Node B* configuration. The test model settings are analogous to the *Code Domain Power* measurement; see section *User Test Models* on p. 4.15 and *Fixed Test Models* on p. 4.16.

Remote control
`[SENSe:]RFANalyzer…`
`CONFigure:MODulation:TMODel`

Marker

The *Marker* softkey positions up to 3 markers in the test diagrams and displays their values. The marker functionality is the same as in the *Spectrum* menu; see description on p. 4.39. No markers are provided in the *Overview WCDMA* application.

Curve Slots

The *Curve/Slots* hotkey toggles between the two measurement diagrams:

- If *Curve* is selected (black), the markers are positioned in the upper diagrams showing the *EVM, Magnitude Error,* or *Phase Error* as a function of time.
- If *Slots* is selected (black), the markers are positioned in the lower diagrams showing the *EVM, Magnitude Error,* or *Phase Error* in all CPICH slots.

Remote control
No commands; screen configuration only.

Measurement Results

The values shown in the *Modulation* measurement menus can be divided into three groups:

- Setting values
- Scalar measurement results (single values)
- Arrays (curves plotted as a function of time)

The measurement menu for the *Overview* application shows all scalar results but no curve. The measurement menus for the remaining three applications are analogous to each other and show the phase error, the (relative) magnitude error or the (relative) error vector magnitude as a function of time and the corresponding peak and effective values.

Scalar Results (Overview)

The measurement menu for the application *Overview WCDMA* shows all scalar modulation results. The values are indicated in a table and four additional output fields.

Output table
and additional fields

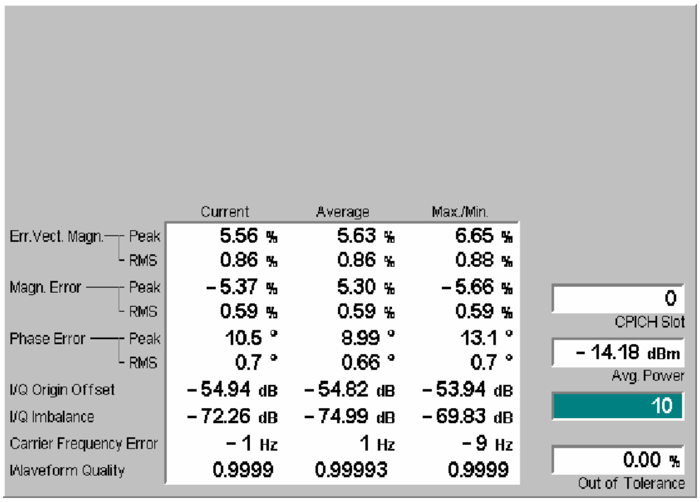


Fig. 4-13 Display of results (Modulation – Overview WCDMA)

Output table

The scalar values in the output table are explained in section *Modulation Measurements* on p. 4.26. For the *Err. Vect. Magn.*, the *Magn, Error,* and the *Phase Error,* the CMU provides the RMS values as well as the peak values within the slot. The results are displayed in three rows:

Curr.	Results of the current evaluation period (slot)
Avg.	Average of the current results referenced to a statistics cycle (see averaging rules in Chapter 3, section *General Settings)*
Max./Min.	Extreme values of all evaluation periods in the ongoing measurement

Limit Check

A red output field and an arrow pointing upwards or downwards indicates that the measurement result exceeds the upper or lower limit set in the *Limits* tab of the *Modulation* configuration menu, see p. 4.34.

Remote control
`READ[:SCALar]:MODulation:OVERview:WCMDA?` etc.
```
CALCulate[:SCALar]:MODulation:OVERview:WCMDA:
       MATChing:LIMit?
```

Additional fields

Four output fields to the right of output table indicate the following results and settings:

CPICH Slot	Number of the measured CPICH slot of the captured signal within the 10 ms frame and in the range 0 to 14. The CPICH slot number is selected by means of the *Overview WCDMA – CPICH Slot* softkey or in the configuration menu.
Avg. Power	Average power in the current CPICH slot, irrespective of the display mode set. This value is the RMS value of the power at all chip instants, obtained using a RRC filter.
Statistic Count	Number of evaluation periods per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle.
Out of Tolerance	Percentage of evaluation periods where the tolerance limits are exceeded.

Test Diagrams (EVM, Phase Error, Magn. Error)

The graphical measurement menus for the three applications *EVM WCDMA*, *Magn. Error WCDMA*, and *Phase Error WCDMA* are analogous. The results are indicated in two parameter lines, the test diagram, and a tabular overview below:

Parameter lines

Test diagram

Output fields

and table

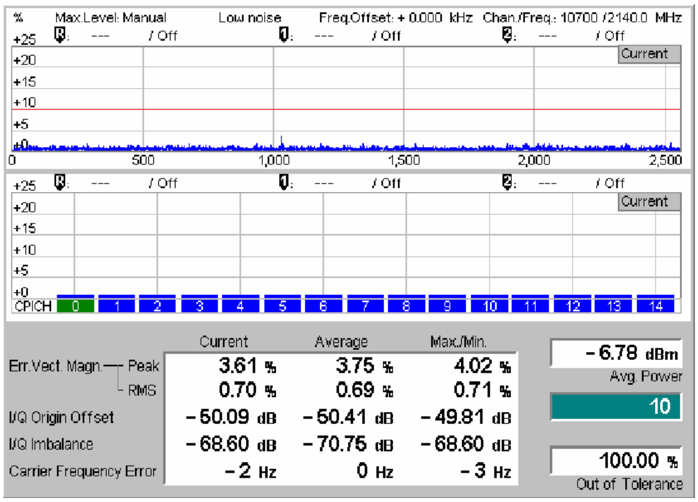


Fig. 4-14 Display of results (Modulation – EVM / Phase Error / Magn. Error WCDMA)

Parameter lines The essential analyzer settings (as set by means of the *Exp. Pow. Trigger* softkey described on p. 4.5 and the *Analyzer Settings* softkey described on p. 4.5) are indicated in a parameter line across the top of the measurement menu:

Exp. Pwr.	Expected input power in dBm
Attenuation	Setting for the internal attenuation of the input level *(Normal, Low Noise, Low Distortion)*
Freq. Offset	Frequency offset with respect to the nominal WCDMA channel frequency
Chan./Freq.	RF channel measured and associated nominal carrier frequency

2nd parameter line The second parameter line contains the following marker values:

R	Measurement result and time of reference marker
1	Measurement result and time of delta marker 1 (setting *absolute*) or difference from reference marker (setting *relative*)
2	Measurement result and time of delta marker 2 (setting *absolute*) or difference from reference marker (setting *relative*)

Remote control
The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Upper diagram The continuous curve in the test diagram shows the measured quantity in a specific CPICH slot as a function of time (in chip periods). The slot number is selected by means of the *CPICH Slot* hotkey associated with the measurement control softkey or in the configuration menu. It is highlighted with green color in the lower diagram.

The curve depends on the display mode *(Current, Max./Min., Average)* that can be set in the *Control* tab of the configuration menu (see section *Measurement Control (Modulation Configuration – Control)* on p. 4.33 f). The display mode is indicated in the upper right corner of the diagram.

The measurement curve extends over one slot comprising 2560 chips. The curve is derived from equidistant measurement points with a 1-chip spacing. The y-axis range is fixed for any of the three measured quantities (applications):

0 % to +25 %	for the error vector magnitude
–20 % to +20 %	for the magnitude error
–30 deg to +30 deg	for the phase error

The red, horizontal lines in the test diagram mark the tolerance range of the measured quantities as set in the *Limits* tab of the *Modulation Configuration* menu (see p. 4.34).

Remote control
`READ:ARRay:MODulation:EVMagnitude:WCMDA:CHANnels:CURRent?` etc.

Lower diagram The lower diagram (bar graph) in the *Modulation* measurement menu shows the RMS value of the measured quantity *(EVM, Mangnitude Error* or *Phase Error),* measured in all 15 consecutive slots of a WCDMA frame. The current P-CPICH slot for the upper bar graph is highlighted with green color. It can be selected by means of the *CPICH Slot* hotkey associated with the measurement control softkey or in the configuration menu.

The power in consecutive slots is typically constant unless the Node B is commanded to change its transmit power. The y-axis scale and *Display Mode* of the diagram is identical to the upper bar graph. No limit check is performed.

Remote control
`READ:ARRay:MODulation:EVMagnitude:WCMDA:SLOTs:CURRent?` etc.

Output table/ Additional fields The output table shows a subset of the results provided in the *Overview* application; see section *Scalar Results (Overview)* on page 4.29. The output fields to the right of the output table are also provided in the *Overview* application.

Note: *The Avg. Power displayed below the test diagrams is averaged over the complete frame, i.e. over the axis of the lower diagram. In contrast, the values in the table and the Out of Tolerance result are measured in the current CPICH slot.*

Measurement Configurations (Modulation Configuration)

The popup menu *Modulation Configuration.* contains two tabs to determine the parameters of the *Modulation* measurement including the error tolerances.

The popup menu *Modulation Configuration* is activated by pressing the measurement control softkey (labeled *Overview WCDMA, EVM WCDMA, ...* depending on the application selected) in the top right of the graphical measurement menu *Modulation* twice. By pressing the associated hotkeys, it is possible to change between the tabs.

Measurement Control (Modulation Configuration – Control)

The *Control* tab controls the *Modulation* measurement by defining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- The measurement curve displayed *(Display Mode*, not for application Overview WCDMA)
- The number of slots/evaluation periods forming a statistics cycle *(Statistic Count)*
- The *CPICH Slot* for the evaluation of measurement curves and statistical results.

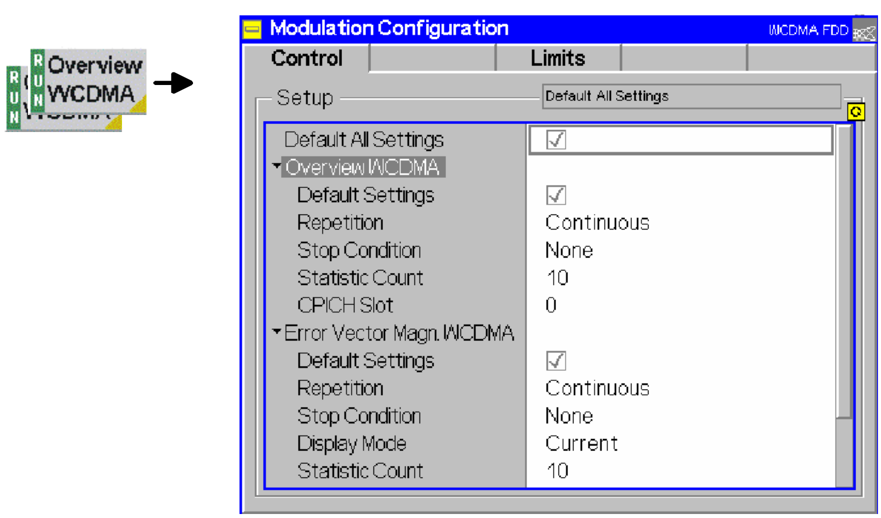


Fig. 4-15 Modulation Configuration – Control

The settings can be defined separately for the different applications of the Modulation measurement group. Most functions comply with those of the *Control* tab of the *Power Configuration* menu (see page 4.7). In the remote-control commands, the keywords `POWer:<Pow_Application>` are to be replaced by `MODulation:<Mod_Application>`. The following parameters are specific to the *Modulation* measurement:

Default Settings The *Default All Settings* switch assigns default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual). In addition, default switches for the individual signal configurations are provided.

Remote control
`DEFault:MODulation:<Mod_Application>:QPSK:CONTrol ON | OFF`
`etc.`

Display Mode

Selects one of the following display modes for the measurement curve:

Current	Measured value for current evaluation period
Max./Min.	Extreme value of a number of evaluation periods (maximum or minimum, whichever has the larger absolute value)
Average	Average value of a number of evaluation periods, referenced to a statistics cycle

The calculation of the measurement curves and the rules for averaging is also described in Chapter 3, section *General Settings*. No *Display Mode* is available in the *Overview...* applications where no measurement curve is displayed.

Remote control
No display mode set explicitly, the three measurement curves are accessible via:

```
FETCh:ARRay:MODulation:EVMagnitude:QPSK:CURRent?
FETCh:ARRay:MODulation:EVMagnitude:QPSK:MMAX?
FETCh:ARRay:MODulation:EVMagnitude:QPSK:AVERage?
```

etc.

CPICH Slot

Sets a CPICH slot number within the 10 ms frame (0 to 14) for the the measurement of the EVM, Phase Error and Magnitude Error vs. time and of the statistical results in the output tables of the *Modulation* menu.

Remote control

```
CONFigure:<Mod_Application>:CONTrol:CPIChslot
```

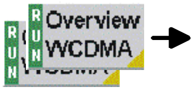
Tolerance Values (Modulation Configuration – Limits)

The *Limits* tab defines upper and lower error limits for the parameters of the *Modulation* measurement.

Conformance requirements

A poor modulation accuracy of the Node B transmitter increases the transmission errors in the downlink channel of the WCDMA network.

The Error Vector Magnitude (EVM) is the critical quantity to assess the modulation accuracy of a WCDMA Node B. According to the 3GPP standard, the EVM (RMS) measured at Node B output powers P_{max} – 3 dB and P_{max} – 18 dB and under normal operating conditions shall not exceed 17.5 %. In addition, the Peak Code Domain Error, which is the maximum EVM of all code channels, shall not exceed –15 dB (see section *Code Domain Power Measurements* on p. 4.9). The frequency error shall not exceed ±0.05 ppm.



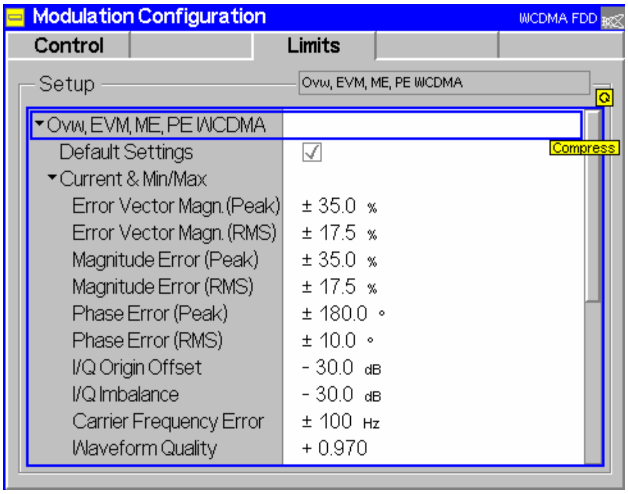


Fig. 4-16 Modulation Configuration – Limits

Default Settings

The *Default All Settings* switch assigns default values to all settings in the *Limits* tab (the default values are quoted in the command description in chapter 6 of this manual). In addition, default switches for the individual signal configurations are provided.

Remote control
`DEFault:MODulation:OEMP:WCMDA:LIMit ON | OFF`

Modulation WCDMA

The *Modulation WCDMA* table section defines upper limits for the different modulation parameters.

Current & Max./Min.	Common limits for the *Current* scalar results and for the *Minimum/Maximum* scalar results
Average	Limits for the *Average* measurement scalar results

The meaning of the error limits is the same for the *Current* or *Minimum/Maximum (Current & Max.)* and the *Average* results. The modulation parameters are explained in sections *Code Domain Power Measurements* on p. 4.9. and *Modulation Measurements* on p. 4.26.

The *Phase Error (Peak)* and the *Frequency Error* are quantities with alternating sign; the corresponding limits are symmetric to the origin (i.e. the absolute value of both quantities must fall below the specified positive limit).

Remote control

```
CONFigure:MODulation:OEMP:QPSK:CMMax:LIMit:[SCALar]:
         SYMMetric:[COMBined]:VALue
CONFigure:MODulation:OEMP:QPSK:AVERage:LIMit:[SCALar]:
         SYMMetric:[COMBined]:VALue
```
etc.

Spectrum Measurements

The menu group *Spectrum* comprises the functions for measurement of the output RF spectrum emissions that are plotted in the frequency domain. The measurement results are displayed in the graphical measurement menu *Spectrum,* the popup menu *Spectrum Configuration* is used for configuration of the measurements.

The *Spectrum* measurement serves to measure the amount of energy that spills outside the designated radio channel. An excess amount of off-carrier power increases the interference with adjacent channels and decreases the system capacity. The off-carrier power is mainly caused by the modulation and noise. It can be assessed by several different parameters:

ACLR The Adjacent Channel Leakage power Ratio (ACLR) measured by the CMU is the ratio of the power measured in an adjacent channel (Adjacent Channel Power, ACP) to the transmitted carrier power, expressed in dB. This definition differs from the 3GPP specification by a minus sign but is in line with other systems like GSM and TDMA.

OBW The Occupied Bandwidth (OBW) is the width of a frequency range around the assigned channel frequency containing 99% of the total integrated power of the transmitted spectrum.

Emission Mask The *Spectrum Emission Mask* is a template to limit the out-of-band emissions in a frequency range between 2.5 MHz and 12.5 MHz away from the UE center carrier frequency.

Fig. 4-17 below illustrates the different quantities that can be obtained in the *Spectrum* measurement. The measurement curve in Fig. 4-17 and the results were obtained using the Rohde & Schwarz high-end spectrum analyzer FSIQ.

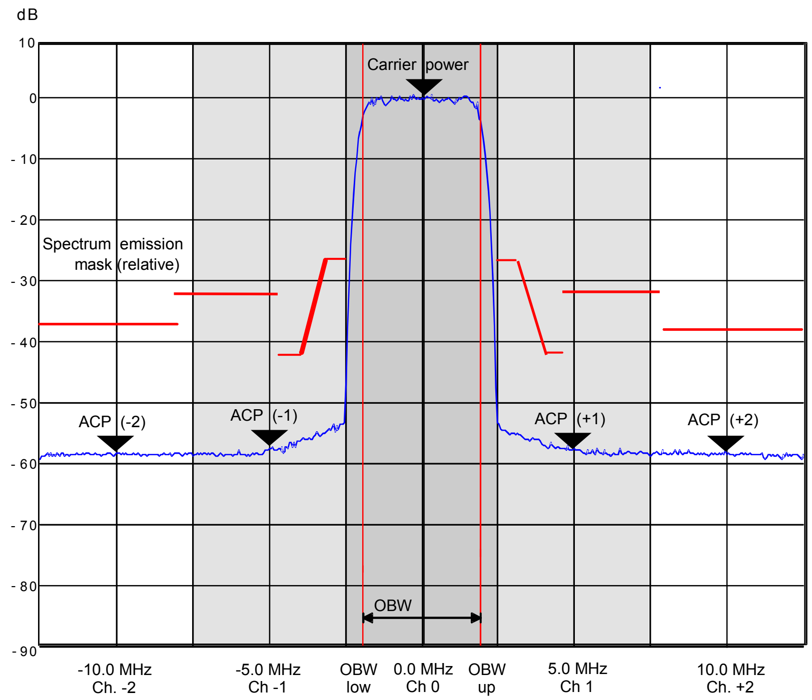


Fig. 4-17 Test parameters in the Spectrum measurement

To determine the ACLR and OBW, the CMU applies the following measurement methods:

ACLR According to the conformance specification, the Adjacent Channel Leakage power Ratio (ACLR) is measured at maximum output power of the Node B and with an RRC filter that has a roll-off α = 0.22 and a bandwidth equal to the chip rate. The measurement is carried out at the nominal carrier frequency, at ±5 MHz from the nominal frequency (1st adjacent channels), and at ±10 MHz (2nd adjacent channels or alternate channels).

In the *ACLR* application the CMU provides two alternative ACLR measurement methods:

- In the *ACLR Scanning* mode (see p. 4.48) the measurement is based on a frequency sweep. This ensures maximum dynamic range but increases the measurement time.
- If *ACLR Scanning* is switched off the measurement is performed at fixed frequency. The results are RMS values, averaged over 1 slot of a fraction of it *(Measurement Length)*. The measurement speed is enhanced at the expense of the dynamic range.

OBW

The CMU provides a third measurement method for the spectrum emissions where the signal power is first measured as a function of time at constant frequencies using a filter of definite bandwidth and then transformed to the frequency domain by means of a Fast Fourier Transform (FFT). After resampling in the frequency domain with an appropriate resolution, the FFT provides a spectral curve representing the current transmit power in a 25 MHz wide frequency range centered around the carrier frequency.

To activate the FFT measurement method, the *OBW* application must be selected.

According to the standard, the Occupied Bandwidth (OBW) is measured at maximum output power of the Node B, over a frequency span of 10 MHz and using a resolution filter of Gaussian shape with a bandwidth of less than 30 kHz. The CMU uses the FFT method to determine the OBW. From the spectral curve, the lower and upper OBW limit frequencies below and above which 0.5% of the total integrated power is transmitted are calculated. The OBW is then the difference between the upper and lower limit frequency. The OBW is available in the *OBW* application.

Spectrum Emission

According to the standard, the spectrum emission is measured at maximum gain and output power of the node B, in a frequency range between 2.5 MHz and 12.5 MHz away from the node B center carrier frequency and using a resolution filter of Gaussian shape with a bandwidth of 30 kHz (for measurement filter center frequencies between 2.515 MHz and 4.0 MHz from the carrier) or 1 MHz (for frequencies between 4 MHz and 12 MHz). All measured spectrum emission values are represented relative to the *Node B Power* measured with a wideband filter.

The emission mask measurement is based on a sweep over the entire frequency range. At extreme off-carrier frequencies (between 8 MHz and 12.5 MHz from the carrier) the hardware settings in the RF input path are re-adjusted to the input level. This measurement method ensures that the CMU reaches maximum dynamic range, however, the measurement time is slightly longer than in the *OBW* application. To obtain the spectrum emission values, the *Emission Mask* application must be selected.

Note: *A short Spectrum measurement example is reported in Chapter 2, section* Condensed Measurement Examples*.*

Some of the *Spectrum* measurements require special trigger and analyzer settings. The table below gives an overview.

Table 4-2 Spectrum measurement settings

Application	**Measurement Method**	**ACLR Scanning (see p. 4.48)**	**Measurement Length (p. 4.48)**	**Trigger Source (see p. 4.79)**	**Expected Power (see p. 4.55)**
ACLR	Freq. sweep	On	–	Free Run	Manual
	Fixed frequency	Off	1 slot 1/2 slot 1/4 slot 1/8 slot	Free Run External	Manual Auto
OBW	FFT	–	– CMU uses 1 slot)	Free Run External	Manual Auto
Emission Mask	Freq. sweep	– CMU uses On)	–	Free Run	Manual

Measurement Menu (Spectrum)

The graphical measurement menu *Spectrum* displays the measurement results for the output RF spectrum emissions.

- The measurement control softkey *ACLR* (which changes to *OBW* or *Emission Mask* if one of these applications is selected) controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Spectrum Configuration*. The hotkeys associated with the measurement control softkey define the scope of the *Spectrum* measurement.
- The softkeys *Application, Exp. Power Trigger, Analyzer Settings, Marker* and *Menus* to the right of the test diagram are combined with various hotkeys. The softkey/hotkey combinations provide test settings and switch over between different measurements. The entry of values is described in section *Test Settings* on page 4.3.

The measurement menu *Spectrum* can be accessed from any other measurement menu of function group WCDMA Node B FDD using the *Spectrum* hotkey. It can be opened also from the *Menu Select* main menu (with the associated key at the front of the instrument).

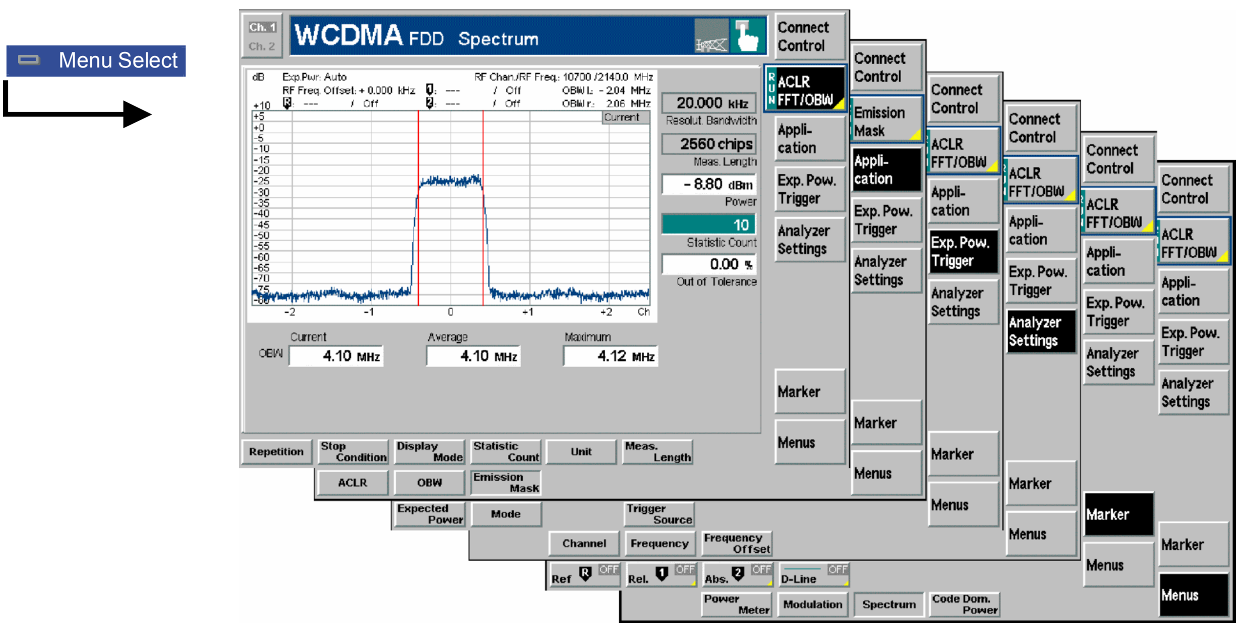


Fig. 4-18 Measurement menu Spectrum

Test Settings

The *Exp. Power Trigger, Analyzer Settings,* and *Menus* functions are identical with those in the *Power* menu (see section *Test Settings* on page 4.3). The following softkeys and hotkeys are not provided in the *Power* measurement:

ACLR

The *ACLR* softkey (which changes to *OBW* or *Emission Mask* if one of these applications is selected) controls the *Spectrum* measurement and indicates its status *(RUN | HLT | OFF)*.

This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The status of the measurement is unaffected upon switchover to other menus controlling a *Spectrum* measurement, however, a running measurement is restarted.

Remote control
`INITiate:SPECtrum:<Application>`

`ABORt:SPECtrum:<Application>`
`STOP:SPECtrum:<Application>`
`CONTinue:SPECtrum:<Application>` etc.

Measurement configuration

Pressing the *ACLR* softkey twice opens the popup menu *Spectrum Configuration* (see page 4.46). Besides, the hotkeys *Repetition, Stop Condition,* and *Statistic Count* defining the scope of the measurement are associated with the *ACLR* softkey. The function of these hotkeys is explained in the *Power* menu section (see section *Power Configuration* on page 4.7); they are identical with the parameters set in the *Control* tab of the *Spectrum Configuration* menu (see section *Measurement Control (Spectrum Configuration – Control)* on page 4.47). The *Display Mode,* the *Measurement Length* and the *Display Unit* parameters are also provided in the *Control* tab.

Application

The Application softkey selects the measurement method for the Spectrum measurement and the type of measurement parameters. For a detailed description see background information in section *Spectrum Measurements* on p. 4.36.

The alternative applications call up different measurement menus. The configuration settings for all *Spectrum* applications, however, are listed in a common popup menu (see p. 4.46).

ACLR

The *ACLR* hotkey selects the measurement of the Adjacent Channel Leakage power Ratio (ACLR) using either the frequency sweep (ACLR scanning) or fixed frequency method. This measurement method yields ACLR values at five distinct frequencies (at the carrier frequency, at ±5 MHz and at ±10 MHz from the carrier frequency).

Remote control
The *ACLR* application is selected by the keyword `:ACLR` in the 3rd level of the `Spectrum` commands, e.g. `CONFigure:SPECtrum:ACLR...`

OBW

The *OBW* hotkey selects the measurement of the Occupied Bandwidth (OBW) using the Fast Fourier Transform (FFT) method.

Remote control
The *OBW* application is selected by the keyword `:OBW` in the 3rd level of the `Spectrum` commands, e.g. `CONFigure:SPECtrum:OBW...`

Emission Mask

The *Emission Mask* hotkey selects the measurement of the spectrum emissions using a frequency sweep *(ACLR scanning)*.

Remote control
The *Emission Mask* application is selected by the keyword `:EMASk` in the 3rd level of the `Spectrum` commands, e.g. `CONFigure:SPECtrum:EMASk...`

Marker

The *Marker* softkey positions up to 3 markers and a D-line in the test diagram and displays their values.

Markers — The markers are graphical tools for marking points on the measurement curve and for numerical output of measured values. The measurement menu *Spectrum* provides a reference marker and two further markers that permit to measure distances (delta marker 1 and 2).

The coordinates of the three markers are indicated in the format Ordinate value (ACLR)/abscissa value (frequency) in a parameter line above the test diagram. The position of the reference marker is expressed in absolute units (MHz), the delta marker can be defined by absolute or relative frequency values (i.e. frequency differences from the reference marker).

D-line The D-line is a horizontal line that can be positioned to mark or read out an arbitrary level in the test diagram.

Ref R

The hotkey *Ref. R* switches the reference marker on or off (use the *ON/OFF* key).

The reference marker is represented by the symbol R in the test diagram. The marker position (abscissa) is defined in the input field *Ref. Marker R*. The marker is switched off in the default setting *(Off).* The marker value is given by the measurement curve at the marker position. The position of all markers can be varied using the roll-key.

Remote control
No command, screen configuration only.

Rel 1

The *Rel. 1* hotkey switches the delta marker 1 on or off (use the *ON/OFF* key).

The delta marker 1 is represented by the symbol 1 in the test diagram. The marker position (abscissa) is defined in the input field *Rel. Marker 1*. The marker is switched off in the default setting *(Off).* The marker value is given by the measurement curve at the marker position.

The toggle switch *Rel 1 Config* pops up when the hotkey is pressed for the second time. It defines whether the position of delta marker 1 is measured and indicated in absolute units or relative to the reference marker.

Remote control
No command, screen configuration only.

Rel 2

The *Rel. 2* hotkey switches the delta marker 2 on or off (use the *ON/OFF* key). Functions and remote control are analogous to delta marker 1.

D-Line

The *D-Line* hotkey switches the D-line in the test diagram on or off.

The D-line is a horizontal, colored auxiliary line in the test diagram and is used for marking an ordinate value or for measuring differences. The ordinate value is determined in the input field *D-Line* and indicated on the D-line. The permissible value range is the diagram area, the default setting is *Off*.

Remote control
No command, screen configuration only.

Measurement Results

The *Spectrum* menu group contains two separate measurement menus corresponding to the three applications *ACLR*, *OBW* and *Emission Mask*. These menus contain different test diagrams.

ACLR Measurement

In the *ACLR* measurement, the RMS Adjacent Channel Leakage power Ratio ACLR at five distinct frequencies (at the carrier frequency, at ±5 MHz and at ±10 MHz from the carrier frequency) is displayed. The results and the corresponding measurement settings are indicated in two parameter lines, the test diagram (bar graph) and a tabular overview:

Parameter lines

Bar graph

Output tables

Output fields

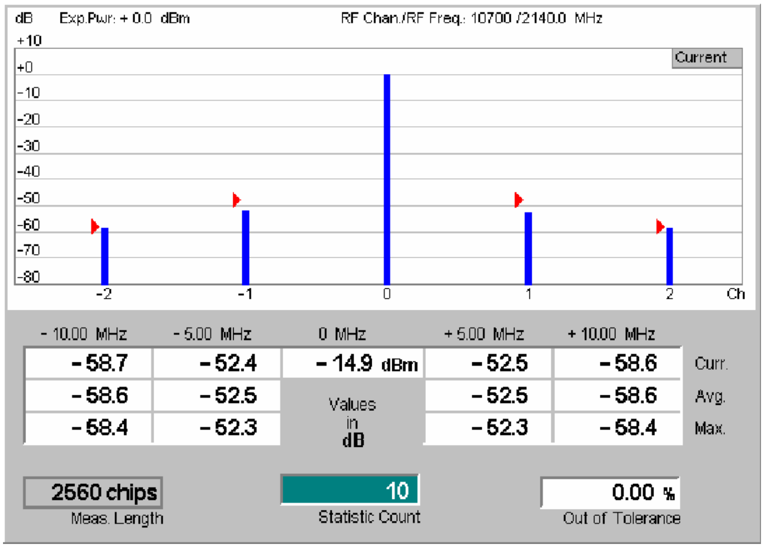


Fig. 4-19 Display of results (ACLR)

Parameter lines The essential analyzer settings (as set via the *Exp. Pow. Trigger* softkey described on p. 4.5 and the *Analyzer Settings* softkey described on p. 4.5) are indicated in two parameter lines across the top of the measurement menu:

Exp. Pwr.	Expected input power in dBm
RF Chan./Freq.	RF channel measured and associated nominal carrier frequency

Bar graph The bar graph shows the RMS values of the *ACLR* in channels no. –2 to +2, i.e. the results in one row of the output table below the diagram. Depending on the *Display Mode* set in the configuration menu, either the *Current,* the *Average* or the *Maximum* values are displayed. The display mode is also indicated in the upper right corner of the diagram´.

The red triangles indicate the upper relative limits set in the *Spectrum Configuration – Limits* menu (see section *Tolerance Values (Spectrum Configuration – Limits)* on p. 4.49).

Output table The output table presents a statistical evaluation of the RMS values of the ACLR in channels no. –2 to +2. The results are displayed in three rows:

Curr.	Results (ACLR (RMS) and carrier power (RMS)) of the current burst
Avg.	Average ACLR (RMS) values referenced to a statistics cycle (see averaging rules in Chapter 3, section *General Settings)*

Max. Maximum of all ACLR (RMS) values in the measurement (= maximum ACLR (RMS) ever measured)

The central value (RMS carrier power of the current slot) is always expressed in absolute units (dBm). The adjacent channel results can be expressed either in absolute units (adjacent channel powers in dBm) or in relative units (ACLR in dB); see *Display Unit* parameter on p. 4.48. The relative powers are calculated first for all evaluation periods. From these *Current* relative powers, the statistical results are derived:

$$ACLR\ Avg.\,(RMS)_{rel}^{Ch.n} = ACLR\ Avg.\,(Curr.(RMS)_{rel})^{Ch.n} = ACLR\ Avg.\left(\frac{Curr.(RMS)^{Ch.n}}{Curr.(RMS)^{Ch.0}}\right)$$

$$ACLR\ Max.\,(RMS)_{rel}^{Ch.n} = ACLR\ Max.\,(Curr.(RMS)_{rel})^{Ch.n} = ACLR\ Max.\left(\frac{Curr.(RMS)^{Ch.n}}{Curr.(RMS)^{Ch.0}}\right)$$

Remote control
`READ[:SCALar]:SPECtrum:ACLR:RELative?`
`READ[:SCALar]:SPECtrum:ACLR:ABSolute?` etc.

Output fields Below the output table, the following results and settings are displayed:

Meas. Length Time interval measured as set in the *Control* tab of the configuration menu, see section *Measurement Control (Spectrum Configuration – Control)* on p. 4.47.

Statistic Count Number of evaluation periods per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle.

Out of Tolerance Percentage of evaluation periods where the tolerance limits are exceeded.

Remote control
The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Limit Check A red output field indicates that the measurement result exceeds the upper relative limits set in the *Limits* tab of the *Spectrum* configuration menu, and that the absolute power in the channel is above the absolute limit set, see section *Tolerance Values (Spectrum Configuration – Limits)* on p. 4.49.

Remote control
`CALCulate[:SCALar]:SPECtrum:ACLR:MATChing:LIMit?`

OBW Measurement

In the *OBW* measurement, the Adjacent Channel Leakage power Ratio ACLR determined by means of the FFT method is plotted as a function of the frequency. From this curve the Occupied Bandwidth (OBW) is calculated and displayed. The results and the corresponding measurement settings are indicated in three parameter lines, the test diagram and a tabular overview below:

Parameter lines

Test diagram

Output fields

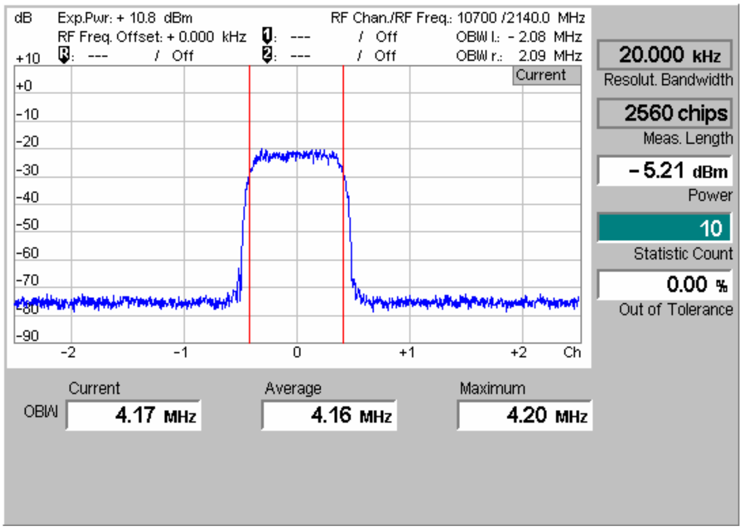


Fig. 4-20 Display of results (OBW)

Settings/ Results Scalar measurement results and settings are indicated in the three parameter lines above the test diagram and in the output table below.

1st / 2nd Parameter line

The essential analyzer settings (as set via the *Exp. Pow. Trigger* softkey described on p. 4.5 and the *Analyzer Settings* softkey described on p. 4.5) are indicated in the first and second parameter lines across the top of the measurement menu:

Exp. Pwr. Expected input power in dBm

RF Chan./RF Freq. RF channel measured and associated nominal carrier frequency

RF Freq. Offset Frequency offset with respect to the nominal WCDMA channel frequency

2nd / 3rd parameter line

The second and third parameter lines contain the following marker values and results:

R Measurement result and frequency (distance from the carrier) of reference marker

1 Measurement result and frequency of delta marker 1 (setting *absolute*) or difference from reference marker (setting *relative*)

2 Measurement result and frequency of delta marker 2 (setting *absolute*) or difference from reference marker (setting *relative*)

OBW left Lower limit frequency of the Occupied Bandwidth (OBW) calculation: 0.5% of the total integrated power of the spectrum is transmitted in the range below this frequency.

OBW right Upper limit frequency of the Occupied Bandwidth (OBW) calculation: 0.5% of the total integrated power of the spectrum is transmitted in the range above this frequency.

Output fields To the right of the diagram, the following settings are displayed:

Resol. Bandwidth Fixed bandwidth of the resolution filter used to obtain the spectral FFT curve displayed in the diagram from the Fast Fourier Transform data.

Meas. Length Time interval measured (number of consecutive chips) as set in the *Control* tab of the configuration menu, see section *Measurement Control (Spectrum Configuration – Control)* on p. 4.47.

Power	Average power in the current evaluation period, irrespective of the display mode set. This value is measured with a wide band filter.
Statistic Count	Number of evaluation periods per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle.
Out of Tolerance	Percentage of evaluation periods where the tolerance limits are exceeded.

Remote control
The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Diagram

The continuous curve in the test diagram shows the spectral FFT curve in a 25 MHz wide frequency range centered around the nominal carrier frequency. The display mode for the curve is always *Current*. The curve is calculated by means of the FFT method described in section *Spectrum Measurements* on p. 4.36. The fixed y-axis range extends from –90 dB to +10 dB relative to the *Node B Power* measured with a wide band filter.

The limits *OBW left* and *OBW right* are also indicated as two vertical red lines left and right from the carrier frequency.

Remote control
`READ:ARRay:SPECtrum:OBW:CURRent?`
`FETCh:ARRay:SPECtrum:OBW:CURRent?`
`SAMPle:ARRay:SPECtrum:OBW:CURRent?` etc.

Output fields

The output fields below the diagram show the Occupied Bandwidth (OBW). The OBW is the difference between the *OBW left* and *OBW right* values shown in the parameter lines above the diagram.

The values are calculated for all evaluation periods measured and displayed in the *Current* fields. From these *Current* results the average value referenced to a statistics cycle (*Average,* see averaging rules in Chapter 3, section *General Settings)* and the maximum value of all evaluation periods measured *(Maximum)* is calculated.

Remote control
`READ[:SCALar]:SPECtrum:OBW:RELative?`
`READ[:SCALar]:SPECtrum:OBW:ABSolute?` etc.

Limit Check

A red output field indicates that the OBW measurement result exceeds the upper limits set in the *Limits* tab of the *Spectrum* configuration menu, see section *Tolerance Values (Spectrum Configuration – Limits)* on p. 4.49.

Remote control
`CALCulate[:SCALar]:SPECtrum:OBW:MATChing:LIMit?`

Emission Mask Measurement

In the *Emission Mask* measurement, the spectrum emissions are plotted in a frequency range between –12.5 MHz and +12.5 MHz from the carrier. A statistical evaluation of the reference power is displayed in addition. The results and the corresponding measurement settings are indicated in two parameter lines, the three test diagrams and several output fields below:

Parameter lines

Test diagrams

Output fields

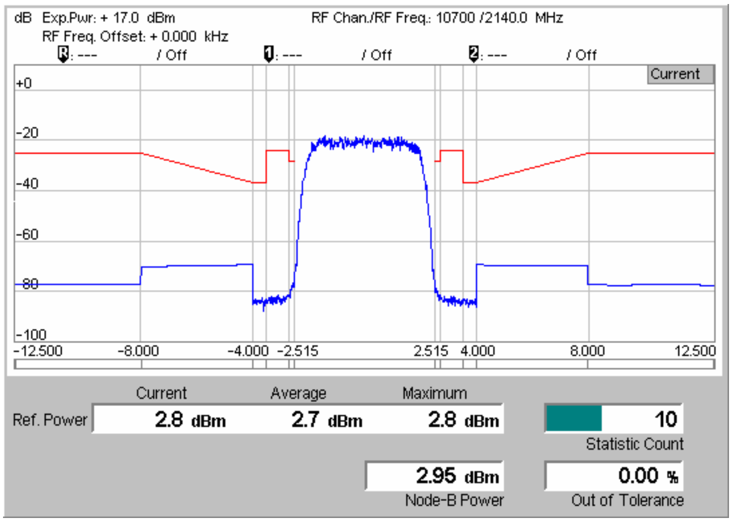


Fig. 4-21 Display of results (Spectrum Emission Mask)

Settings/ Results Scalar measurement results and settings are indicated in the parameter lines above the test diagram and in the output table below.

1st parameter line The essential analyzer settings (as set via the *Exp. Pow. Trigger* softkey described on p. 4.5 and the *Analyzer Settings* softkey described on p. 4.5) are indicated in the first and second parameter lines across the top of the measurement menu:

Exp. Pwr. Expected input power in dBm

RF Chan./RF Freq. RF channel measured and associated nominal carrier frequency

RF Freq. Offset Frequency offset with respect to the nominal WCDMA channel frequency

2nd parameter line The second parameter line contains the following marker values and results:

Measurement result and frequency (distance from the carrier) of reference marker

Measurement result and frequency of delta marker 1 (setting *absolute*) or difference from reference marker (setting *relative*)

Measurement result and frequency of delta marker 2 (setting *absolute*) or difference from reference marker (setting *relative*)

Remote control
The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Output fields Below the diagram, the following settings are displayed:

Ref. Power Node B output power measured in a 3.84 MHz bandwidth (reference power). The three output fields show the *Current, Average* and *Maximum* results.

Node B Power	Average power in the current evaluation period. This value is measured with a wide band filter, so it should be slightly higher than the *Current* value of the *Ref. Power*. The spectrum emission curve is calculated as the ratio of the *Current, Average* or *Maximum* off-carrier power to the *Node B Power*.
Statistic Count	Number of evaluation periods per statistics cycle. The colored bar indicates the relative measurement progress in the statistics cycle.
Out of Tolerance	Percentage of evaluation periods where the tolerance limits are exceeded.

Remote control
`READ[:SCALar]:SPECtrum:EMASk?`
`FETCh[:SCALar]:SPECtrum:EMASk?`
`SAMPle[:SCALar]:SPECtrum:EMASk?`

Diagrams

The blue curve in the test diagram shows the spectrum emissions in a fixed frequency range between –12.5 MHz and +12.5 MHz from the carrier.

The display mode (*Current, Maximum, Average*) for the curves is indicated in the upper right corner of the diagram. It can be set in the *Control* tab of the configuration menu, see section *Measurement Control (Spectrum Configuration – Control)* on p. 4.47. The curve is calculated as described in section *Spectrum Measurements* on p. 4.36. The fixed y-axis range extends from –100 dB to +10 dB relative to the *Node B Power*.

The red curves in the test diagram show the emission mask (limit lines) defined in the *Limit Lines* tab of the configuration menu, see section *Tolerance Values (Spectrum Configuration – Limits)* on p. 4.49. Many parts of the emission mask are defined as absolute power values and therefore shifted in vertical direction as the measured input power changes.

Remote control
`READ:ARRay:SPECtrum:EMASk:CURRent`,
`FETCh:ARRay:SPECtrum:EMASk:CURRent`,
`SAMPle:ARRay:SPECtrum:EMASk:CURRent` etc.

Measurement Configurations (Spectrum)

The popup menu *Spectrum Configuration* contains two tabs to define the parameters of the *Spectrum* measurement including the error tolerances.

The popup menu *Spectrum Configuration* is called up by pressing the measurement control softkey in the top right of the graphical measurement menu *Spectrum* twice (this softkey reads *ACLR* or *OBW*, depending on the selected application). By pressing the associated hotkeys, it is possible to change between the tabs.

Measurement Control (Spectrum Configuration – Control)

The *Control* tab controls the *Spectrum* measurement by defining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- The measurement curve displayed *(Display Mode)*
- The number of slots/evaluation periods forming a statistics cycle *(Statistic Count)*
- The unit for the ACLR values displayed in tables *(Display Unit)*
- The measurement mode for the ACLR application *(ACLR Scanning)*
- The number of chips measured *(Measurement Length,* for *ACLR)*

Besides, it influences the graphical measurement menus by adding or removing the *Grid* and the OBW line *(OBW Line Display)*.

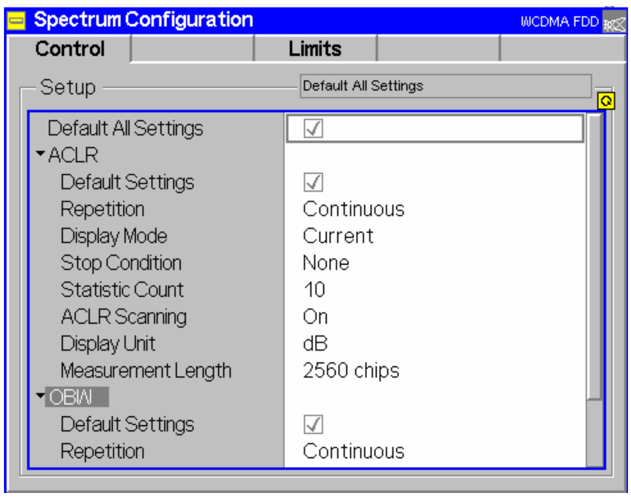


Fig. 4-22 Spectrum Configuration – Control

The settings can be defined separately for the different applications of the *Spectrum* measurement group. Most functions comply with those of the *Control* tab of the *Power Configuration* menu (see page 4.7). In the remote-control commands, the keywords POWer:<Pow_Application> are to be replaced by SPECtrum:<Spec_Application>. The following parameters are specific to the *Spectrum* measurement:

Default Settings The *Default All Settings* switch assigns default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual). In addition, default switches for the individual applications are provided.

Remote control
`DEFault:SPECtrum:OBW:CONTrol ON | OFF`

Display Mode The *Display Mode* hotkey selects one of the following display modes for the bar graph in the *ACLR* diagram:

Current	Measured value for current evaluation period
Maximum	Maximum of a number of evaluation periods
Average	Average value of a number of evaluation periods, referenced to a statistics cycle

The calculation of the measurement curves and the rules for averaging is described in Chapter 3, section *General Settings*. No *Display Mode* is available in the *OBW* application where no measurement curve is displayed.

Remote control
No display mode set explicitly, the commands always retrieve all measurement results:
`READ[:SCALar]:SPECtrum:ACLR:RELative?`
`READ[:SCALar]:SPECtrum:ACLR:ABSolute?` etc.

Display Unit

The *Display Unit* parameter selects the display unit for scalar ACLR results. It is possible to select absolute (dBm) or relative units (dB). Switchover to relative units affects the ACLR results for the adjacent channels displayed in the tables below the *ACLR* and *OBW* diagrams. The diagram scales are not affected. The calculation of relative statistical values is explained in section *ACLR Measurement* on p. *4.41*.

Remote control
no explicit switchover command; relative and absolute results can be retrieved with a keyword RELative or ABSolute annexed to the measurement results commands, e.g.:
`READ[:SCALar]:SPECtrum:ACLR:ABSolute?`
`READ[:SCALar]:SPECtrum:ACLR:RELative?` etc.

ACLR Scanning

ACLR Scanning controls the measurement mode for the ACLR application (see description of *Spectrum* measurement methods on p. 4.36 and Table 4-2 on p. 4.37).

On	Frequency sweep with enhanced dynamic range. The *Measurement Length* parameter is not used.
Off	Maximum measurement speed. The ACLR is measured and averaged over the *Measurement Length.*
Note:	*To change the ACLR Scanning setting, the Spectrum measurement must be switched off.*

Remote control
`CONFigure:SPECtrum:ACLR:SCANning ON | OFF`

Measurement Length

The *Measurement Length* parameter selects a time interval (number of consecutive chips) to be measured in the *ACLR* application if *ACLR Scanning* is switched *Off* (see description of *Spectrum* measurement methods on p. 4.36 and Table 4-2 on p. 4.37). The following values are provided:

2560 Chips	The measurement extends over the complete WCDMA slot comprising 2560 chips.
1280 Chips	The measurement extends over half of the WCMDA slot.
640 Chips	The measurement extends over a quarter of the WCMDA slot.
320 Chips	The measurement extends over an eighth of the WCMDA slot.

A short measurement length reduces the measurement time. The position of the time interval measured within the slot is generally not critical for the *Spectrum* results. With *Free Run* trigger, the position is random.

Remote control
```
CONFigure:SPECtrum:ACLR:CONTrol:MLENgth
      2560 | 1280 | 640 | 320
```

Tolerance Values (Spectrum Configuration – Limits)

The *Limits* tab defines upper limits for the parameters of the *Spectrum* measurement.

Conformance requirements: ACLR, OBW

The energy that spills outside the designated radio channel increases the interference with adjacent channels and decreases the system capacity.

According to the 3GPP standard, the amount of unwanted off-carrier energy is assessed by the Occupied Bandwidth (OBW) and the out of band emission (excluding spurious emissions) that are specified in terms of a spectrum emission mask and Adjacent Channel Leakage power Ratio (ACLR). The OBW and ACLR limits are specified as follows:

The ACLR of the Node B signal shall not exceed –45 dB at frequencies ±5 MHz from the carrier (channels ±1) and –50 dB at frequencies ±10 MHz from the carrier (channels ±2)[1]. The limits must hold even in the presence of switching transients.

For the OBW, an upper limit of 5 MHz based on a chip rate of 3.84 MHz is specified.

Emission Mask

According to the standard 3GPP TS 25.141, the spectrum emission mask is symmetric and divided into several areas where the maximum level is either constant or a linear function of the frequency. This means that the entire emission mask can be defined by a series of limit values at the points A, B, C, … , J shown in Fig. 4-23 below. The limits can be defined in two different ways:

- As an absolute level in dBm
- As a level relative to the maximum output power P of the node B transmitter

3GPP specifies four different emission masks, to be applied in the maximum output power ranges P < 31 dBm, 31 dBm < P < 39 dBm, 39 dBm < P < 43 dBm, and 43 dBm < P. An example (39 dBm < P < 43 dBm) is reported in Table 4-3 below.

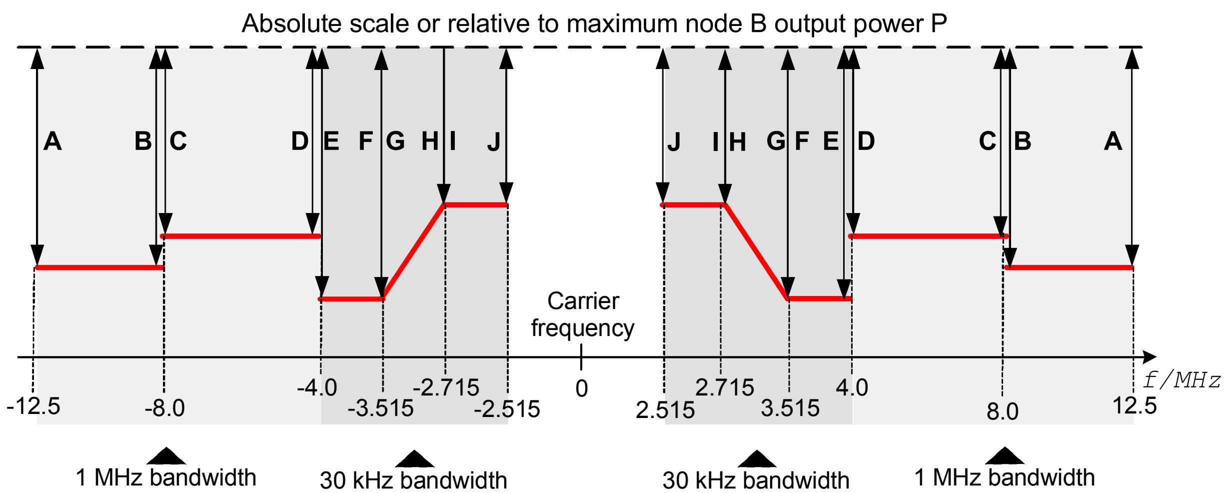


Fig. 4-23 3GPP spectrum emission mask

Table 4-3 3GPP spectrum emission mask (39 dBm < P < 43 dBm)

Point	Offset from carrier frequency[2]	Absolute limit	Relative limit	Measurement bandwidth
A	±12.5 MHz	–	P – 56 dB	1 MHz
B	±8.0 MHz	–	P – 56 dB	1 MHz
C	±8.0 MHz	–13 dBm	–	1 MHz
D	±4.0 MHz	–13 dBm	–	1 MHz

[1] To keep our results in line with networks like GSM and TDMA, we define the ACLR and the limits with a relative minus sign compared to the 3GPP standard. The role of upper and lower limits is accordingly interchanged.
[2] The values denote the offset of the measurement filter center from the carrier frequency. An offset of 2.515 MHz means that the 3 dB point of the filter is at 2.5 MHz from the carrier.

Point	Offset from carrier frequency[2]	Absolute limit	Relative limit	Measurement bandwidth
E	±4.0 MHz	–26 dBm	–	30 kHz
F	±3.515 MHz	–26 dBm	–	30 kHz
G	±3.515 MHz	–26 dBm	–	30 kHz
H	±2.715 MHz	–14 dBm	–	30 kHz
I	±2.715 MHz	–14 dBm	–	30 kHz
J	±2.515 MHz	–14 dBm	–	30 kHz

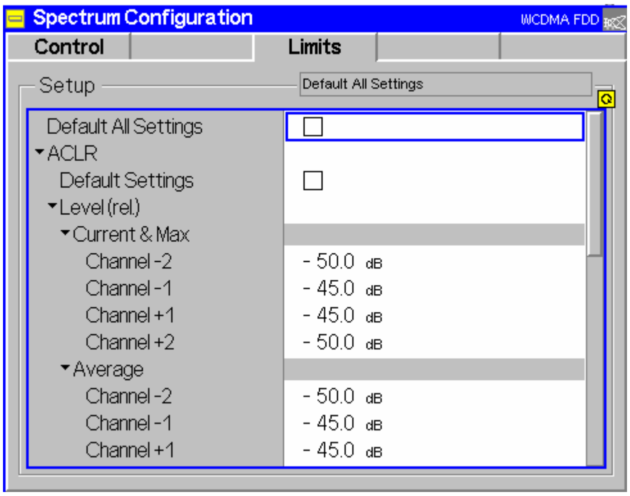


Fig. 4-24 Spectrum Configuration – Limits

Default Settings

The *Default All Settings* switch assigns default values to all settings in the *Limits* tab (the default values are quoted in the command description in chapter 6 of this manual). In addition, default switches for the individual applications are provided.

Remote control
`DEFault:SPECtrum:<Application>:LIMit <Enable>`

ACLR

The *ACLR* table section defines upper limits for the ACLR measured with the direct filter method. The following relative values *Level (rel.)* can be set for channels ±1 (at ±5 MHz from the carrier) and ±2 (at ±10 MHz from the carrier):

Curr. & Max Upper limit for the effective ACLR (RMS) of the current evaluation period (second table row in the upper table of the *ACLR* menu)

Average Upper limit for the average of all *Current (RMS)* values referenced to the last statistics cycle (first table row in the lower table of the *ACLR* menu)

The limit check for each channel can be switched off using the *On/Off* key.

The absolute limits *Level (abs.)* are the powers in dBm below which no relative limit check needs to be performed. Common absolute limits for all channels can be set in the *All channels table section.*

Remote control
```
CONFigure:SPECtrum:ACLR:LEVel:CMAX:LIMit[:SCALar]
:ASYMmetric:UPPer:CHANnel<nr>:VALue
CONFigure:SPECtrum:ACLR:LEVel:CMAX:LIMit[:SCALar]
```

`:ASYMmetric:UPPer:CHANnel<nr>:ENABle` etc.

OBW

The *OBW* table section defines upper limits for the OBW. The following relative values *Level (rel.)* can be set for the OBW:

Curr. & Max	Upper limit for the OBW of the current slot
Average	Upper limit for the average of all *Current* values referenced to the last statistics cycle

The limit check can be switched off using the *On/Off* key.

Remote control
`CONFigure:SPECtrum:OBW:OBANdwidth:CMAX:LIMit[:SCALar]`
`:ASYMmetric:UPPER:VALue`
`CONFigure:SPECtrum:OBW:OBANdwidth:CMAX:LIMit[:SCALar]`
`:ASYMmetric:UPPER:ENABle` etc.

Emission Mask: Select

Pre-selects how the emission mask is defined:

Auto	The CMU measures the *Node B Power* an selects the spectrum emission mask specified in standard 3GPP TS 25.141 accordingly. The remaining parts of the *Emission Mask* section are hidden
P >= 43 dBm	Range of the node B maximum output power for which the standard defines a specific emission mask (see introduction of this section). If a range is selected, the corresponding limits are shown in the *Current & Max* and in the *Average* sections below.
User Defined	User-defined emission mask according to the values entered in the *Current & Max* and in the *Average* sections

Remote control
`CONFigure:SPECtrum:EMASk:LIMit:SELect`
`AUTO | CL1 | CL2 | CL3 | CL4 | USER`

Limit Line Info

The *Limit Line Info* diagram shows a preview of the spectrum emission mask that represents a simplified version of Fig. 4-23 above.

Current & Max.

The *Current & Max* table section contains the (relative and absolute) level values defining the emission mask for the *Current* and for the *Maximum* spectrum curve. The values are fixed (grayed) if an emission mask defined in the standard is used (see *Select* parameter above); they can be edited for *User Defined* selection.

The points A to J are located at fixed frequencies; see Fig. 4-23 and Table 4-3 above. At each point, it is possible to define either an absolute (dBm value) or – after checking the *P – x* box – a relative limit.

Remote control
`CONFigure:SPECtrum:EMASk:CMAX:LIMit:LINE:ASYMmetric:UPPer`

Average

The *Average* table section contains the (relative and absolute) level values defining the emission mask for the *Average* spectrum curve. The definition is analogous to the *Current & Max.* section.

Remote control
`CONFigure:SPECtrum:EMASk:AVERage:LIMit:LINE:ASYMmetric:UPPer`

HSDPA TX Tests

With option R&S® CMU-K79, the R&S® CMU 300 provides TX tests on a WCDMA downlink signal containing High Speed Downlink Packet Access (HSDPA) channels. *Power* and *Spectrum* measurements can be performed with any downlink signal configuration. To obtain *Modulation* and *Code Domain Power* results, the R&S® CMU 300 must be able to synchronize to the downlink signal, which means that the test model defining the basic downlink signal parameters must be known.

Basic Test Procedure for HSDPA Modulation and CDP Tests

The procedures for modulation and CDP tests on HSDPA downlink signals are analogous. The test models to be used for the different TX tests are defined in standard 3GPP TS 25.141. For reference information about the HSDPA test model settings in the R&S® CMU refer to section *HSDPA Test Model Settings* on p. 4.52.

Modulation

To measure the modulation parameters of a downlink signal proceed as follows:

1. Provide a WCDMA downlink signal and adjust the CMU's analyzer frequency and the scrambling codes according to your signal (see also *Condensed Measurement Examples – Modulation* in Chapter 2 of the WCDMA Node B operating manual).
2. Open the *Modulation* menu *(Menus – Modulation)* and press the *Analyzer Settings* softkey.
3. If your WCDMA downlink signal is configured according to one of the HSDPA test models, press *Select Test Model* and select *Model 5* with the appropriate number of DPCHs and HS-PDCHs. Skip the following steps.
4. If you wish to define a new test model, or if you wish to vary one of the fixed, predefined test models, press *User Test Models* and enter the downlink signal parameters into the test model *1* section.
5. Press *Select Test Model* and select *UM1.*

You can now observe the modulation results in the measurement menu. The HSDPA channels are included in the calculation of the results.

Code Domain Power

To measure the code domain power of a downlink signal open the *Code Domain Power* menu and use the same procedure as for *Modulation* measurements.

The code domain power results are displayed in the measurement menu. A specific HSDPA code channel in the upper (power/CDE vs. code) bar graph can be selected for a power/CDE vs. slot analysis in the lower bar graph.

HSDPA Test Model Settings

All transmitter test models including the HSDPA models are directly accessible from the *Modulation* and *Code Domain Power* measurement menus.

➢ Press the *Analyzer Settings* softkey and configure your test model using the *Select Test Model, User Test Model,* or *Fixed Test Models* hotkeys.

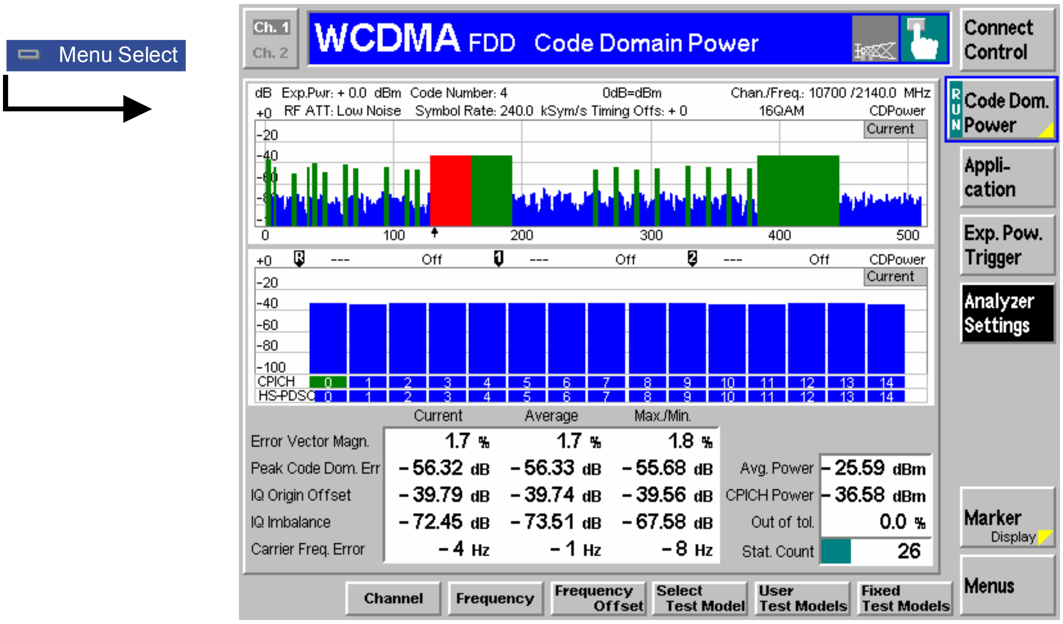


Fig. 4-25 Test model settings

HSDPA tests can be performed with one of the variants of the fixed test model no. 5 (see section *Fixed Test Models* on p. 4.16) or with a user test model (see section *User Test Models* on p. 4.15).

Connection Control (Non Signalling)

The popup menu *Connection Control* contains several tabs to configure the inputs and outputs of the CMU, the respective signals and the trigger settings. The menu group is activated via the softkey *Connect. Control* to the right of the header of each measurement menu. The individual tabs *(Analyzer, Generator, Node B, AF/RF*, *Sync., Trigger)* can be accessed via the hotkey bar at the lower edge of the screen.

The settings in the *Connection Control* menu are general settings that are valid for the entire function group WCDMA Node B FDD *Non Signalling.* Changing general settings in any application will have an impact on all measurements and applications of the function group.

Analyzer Settings (Connection Control – Analyzer)

The *Analyzer* tab adjusts the RF input path to the expected input power *(Expected Power)* and sets the center frequency of the RF analyzer. The CMU provides a softkey-oriented version of the *Analyzer* tab and a table-oriented version with extended functionality. The *Analyzer* hotkey toggles between the two versions if it is pressed repeatedly.

Softkey-Oriented Version

The softkey-oriented version of the *Analyzer* tab determines the expected power *(Exp. Power)* and the center frequency of the RF analyzer *(RF Channel, Frequency Offset)*. All settings of this menu are also provided in the table-oriented version of the *Analyzer* tab; see section Table-Oriented Version on p. 4.55.

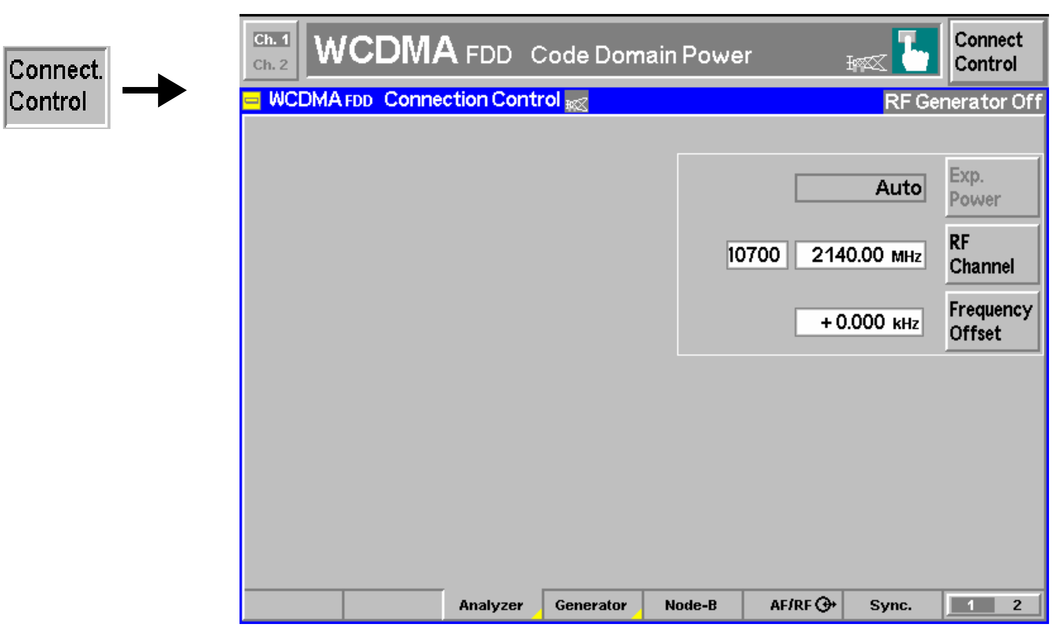


Fig. 4-26 Connection Control – RF analyzer settings (softkey)

Table-Oriented Version

The table-oriented version of the *Generator* tab determines:

- The expected input power *(Expected Power)* and the way it is defined *(Mode)*
- An attenuation or gain in the input path *(Attenuation)*
- The center frequency of the RF analyzer *(Channel, Frequency, Frequency Offset)*

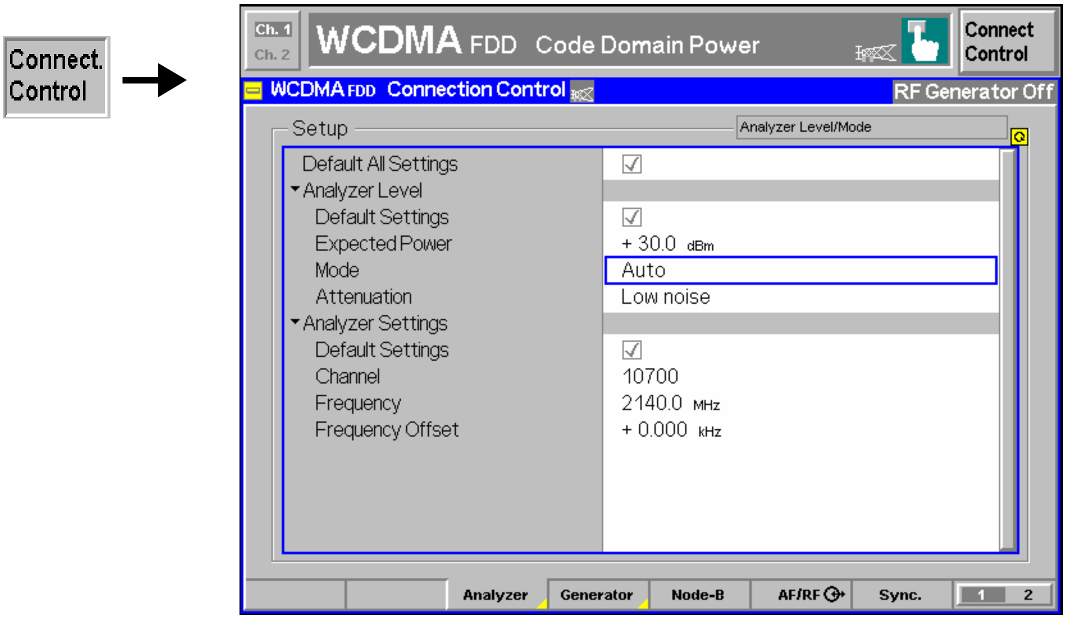


Fig. 4-27 Connection Control – RF analyzer settings (table)

Default Settings *Default All Settings* assigns default values to all settings in the *Analyzer* tab. Additional default switches are provided for the *Exp. Power Trigger* and *Analyzer Settings* table sections.

Remote Control
`DEFault:EPOWer`

Expected Power *Expected Power* sets the expected input power (overload level). This level corresponds to the input power that the CMU is able to measure. Input powers exceeding the *Expected Power* overdrive the input path and cause invalid results ("– – –").

The behavior of the *Expected Power* softkey depends on the way the input power is set (see *Mode* function below):

- In manual mode, the *Expected Power* setting applies. This value should be adapted to the power of the Node B signal, allowing for a crest factor of a few dB. Note the remarks on external input attenuation below.
- If autoranging is selected the *Expected Power* is used as a start value for the autoranging routine and is also important to ensure safe switchover to manual setting.

Note: *Spectrum measurements with ACLR Scanning on and Spectrum Emission Mask measurements cannot be performed in autoranging mode (see* *Table 4-2 on p. 4.37**).*

Remote control
`[SENSe:]EPOWer:VALue <Level>`

Mode *Mode* determines how the expected power is set:

Manual Manual input of expected power

Auto Automatic setting of expected power (autoranging) according to the power of the applied signal.

Remote control
`[SENSe:]EPOWer:MODE MANual | AUTomatic`

The value range depends on the selected RF input (see section *RF Connectors (Connection Control – AF/RF)* on p. 4.74):

External attenuation If an external input attenuation is reported to the instrument (see section *RF Connectors (Connection Control – AF/RF)* on p. 4.74), all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Signals exceeding the *Expected Power* can not be measured; the corresponding measurement result fields indicate invalid results "– – –".

Error messages If the value determined for *Expected Power* is too high or too low, a window with the error message *"<Exp_Power> is out of range. <permissible max. value> is limit*." and three fields will appear:

Accept The permissible max. value is accepted as Expected Power

Re-edit Expected Power is entered once again

Cancel The last valid input value is maintained

When switching over to another input, the current value of *Expected Power* is automatically adapted, if required:

- Towards lower values to the maximum value of the new input,
- Towards upper values to the minimum value of the new input.

Attenuation *Attenuation* defines how the RF analyzer of the CMU is tuned to meet the requirements of the current measurement type. In general, a compromise between the acceptable noise level in the displayed result and the contribution of internally generated distortion must be reached.

Normal Mixer level in normal range

Low noise Mixer level enhanced by +10 dB (full dynamic range of CMU, therefore recommended for *Power* measurements)

Low distortion Mixer level reduced by –10 dB (high intermodulation spacing)

The *Attenuation* setting permits the CMU to be adapted to the requirements of the measurement. The advantages and disadvantages of the settings *Low noise* and *Low distortion* are listed in the following table.

Note: *Spectrum measurements are always performed at fixed* Low noise *attenuation setting.*

	Advantages	**Disadvantages**
Low noise	Low noise high dynamic range	No RF overdrive reserve Risk of intermodulation
Low distortion	High intermodulation spacing	Lower dynamic range

Remote control
`[SENSe:]EPOWer:ATTenuation  NORMal | LNOise | LDIStortion`

Analyzer Settings

The *Analyzer Settings* table section defines the center frequency of the RF analyzer.

Channel / Frequency

Channel and *Frequency* define the channel number (UARFCN, UTRA Absolute Radio Frequency Channel Number) and the carrier frequency of the measured RF signal. The assignment between channel numbers *N* and carrier frequencies *F* is defined in the 3GPP specification. The following relation holds for both directions of transmission (uplink and downlink):

$$N = 5 \cdot (F / MHz), \quad 0.0\ MHz \leq F \leq 3276.6\ MHz$$

This means that it is sufficient to enter only one value (frequency **or** channel number), the other one is automatically adjusted.

The Node B is designed to operate in the nominal downlink band between 2110 MHz and 2170 MHz, corresponding to channel numbers 10550 to 10850. It is possible, however, to enter arbitrary UARFCNs or RF frequencies outside the downlink band, provided that the frequencies are in multiples of 200 kHz and within the allowed range of the RF analyzer. Moreover, the analyzer frequency can be modified by an additional *Frequency Offset* entered in the input field below so that an arbitrary analyzer frequency can be set.

Note: *The 200 kHz frequency raster given by the UARFCN frequencies is much finer and must not be confused with the WCDMA carrier spacing of 5 MHz.*

Remote control
```
[SENSe:]RFANalyzer:FREQuency:UNIT <Unit>
[SENSe:]RFANalyzer:FREQuency <Frequency>
```

Frequency Offset

The *Frequency Offset* softkey defines an offset for the frequency set under RF Channel. This enables fine tuning of the frequency measured by the CMU, e.g. in order to simulate a detuned transmitter or receiver.

Remote control
`[SENSe:]RFANalyzer:FOFFset <Offset>`

Generator Settings

The *Generator* tab of the *Connection Control* menu controls the R&S CMU's RF generator and configures the generated uplink WCDMA signal. The R&S CMU provides a panel oriented version of the *Generator* tab and a table-oriented version with extended functionality. The *Generator* hotkey toggles between the two versions if it is pressed repeatedly.

The properties of the **uplink WCDMA signal** are defined in 3G TS 25.213, *Spreading and modulation (FDD):*

The WCDMA signal is composed of one control channel (DPCCH) and n data channels (DPDCH), where n is between 1 and 6. The symbols of all channels are first spread to the chip rate by the channelization codes c, weighted by gain factors β and summed to form a complex-valued stream of chips. This complex-valued signal is then scrambled by a long or short scrambling code and finally QPSK modulated. For a WCDMA signal consisting of the DPCCH plus one DPDCH, the different spreading and modulation stages are shown in *Fig. 4-28 below*.

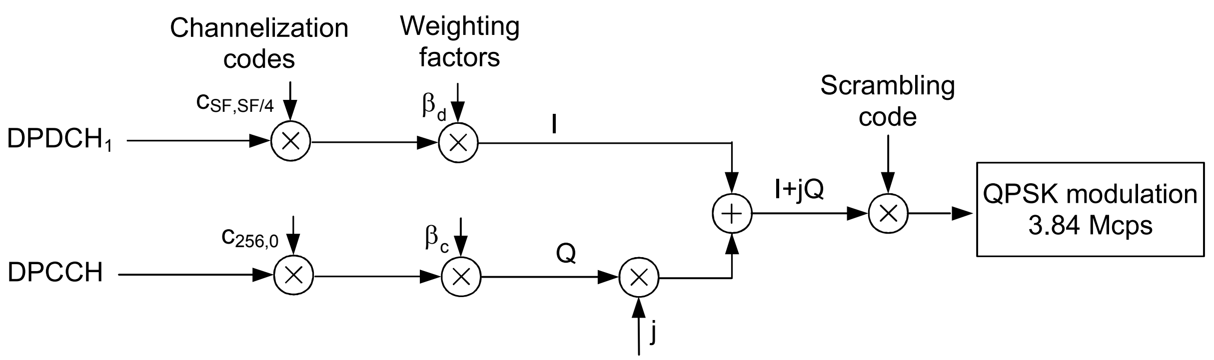


Fig. 4-28 Uplink WCDMA signal with up to 1 data channel

The **channelization codes** are defined in terms of the spreading factors SF and an index k ranging from 0 to SF – 1. The spreading factor relates the chip rate of the total WCDMA signal to the symbol rate of the individual channel: SF (Channel) x Symbol rate (Channel) = 3.84 Mcps.

According to the standard, the DPCCH is always spread with code $c_{256,0}$, corresponding to a symbol rate of 15 kbps. In the signal configuration of *Fig. 4-28*, where one DPDCH is transmitted, spreading factors of 4, 8, 16, 32, 64, 128 or 256 may be used, and the corresponding DPDCH channelization codes are $c_{SF,SF/4}$. The R&S CMU sets the spreading factor implicitly after selecting the symbol rate for the first DPDCH. With several DPDCHs, $DPDCH_n$ is spread by $c_{4,k}$, where k = 1 if n ∈ {1, 2}, k = 3 if n ∈ {3, 4}, and k = 2 if n ∈ {5, 6}. The corresponding signal configuration is shown in *Fig. 4-29 below*.

The R&S CMU is able to generate standard WCDMA signals with any of the symbol rates and number of DPDCHs defined in the standard.

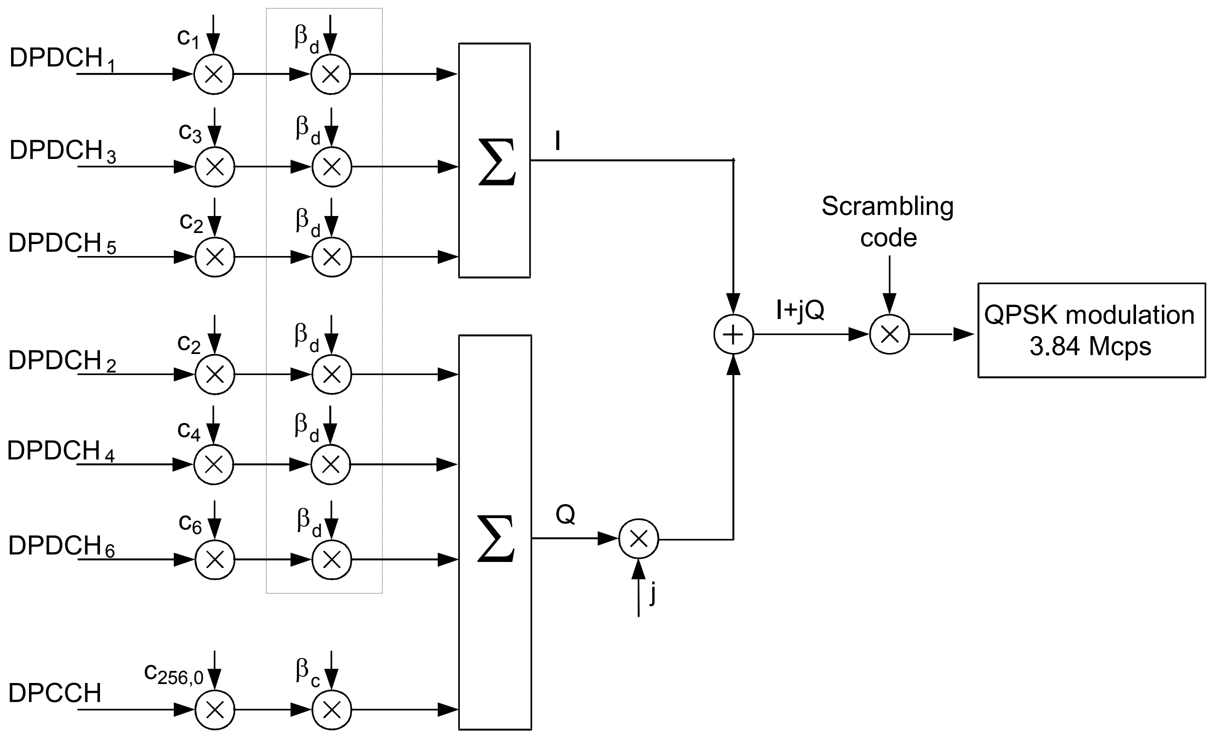


Fig. 4-29 Spreading of the uplink channels

The **weighting factors** are equal for all transmitted DPDCHs, so they essentially determine the DPCCH/DPDCH power ratio.

The **scrambling code** is a complex-valued sequence of either long or short type that is identified by its scrambling code number.

Panel Oriented Generator Tab

The panel oriented version of the *Generator* tab provides softkeys to

- Control the R&S CMU's RF generator *(Generator)*
- Define the *RF Channel* and *Frequency Offset* of the signal analyzed by the R&S CMU
- Define the *Total TX Power* and the level in the Dedicated Physical Control Channel *(DPCCH Level*)
- Select the information bit rate of the generated 3GPP uplink reference channel *(Ref. Channel Type*)

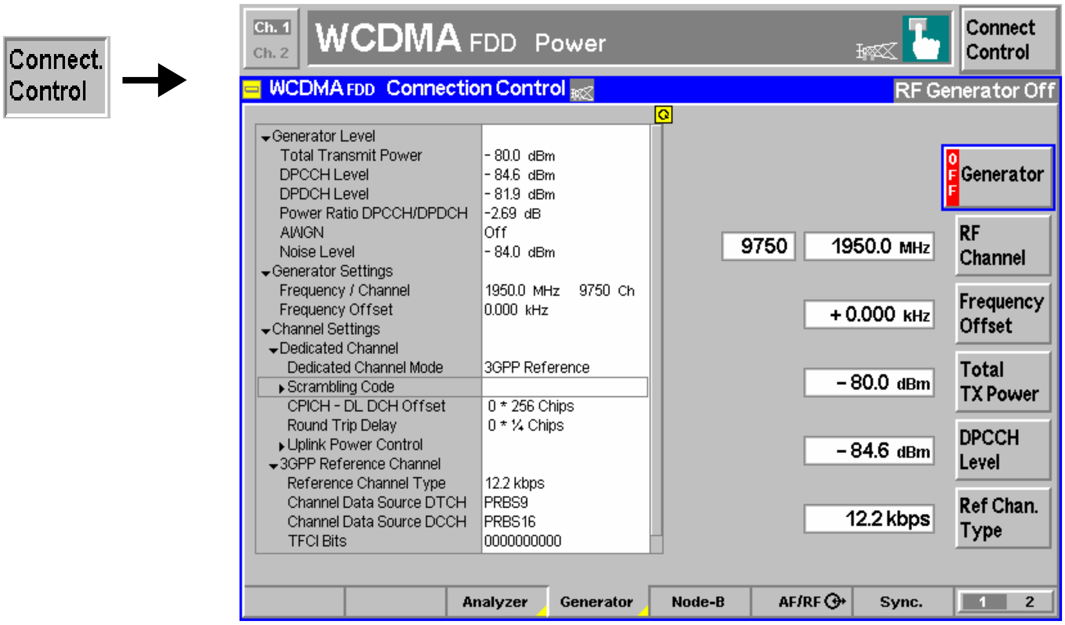


Fig. 4-30 Connection Control – Generator (panel)

Generator

The *Generator* softkey indicates the operating status of the RF generator *(ON* or *OFF)*. Pressing the *Generator* softkey and the *ON/OFF* key switches the generator on or off.

Remote control
```
INITiate:RFGenerator
ABORt:RFGenerator
FETCh:RFGenerator:STATus?
```

RF Channel

The *RF Channel* softkey defines the carrier frequency and channel number (UARFCN, UTRA Absolute Radio Frequency Channel Number) of the generated signal. The assignment between channel numbers *N* and carrier frequencies *F* is defined in the 3GPP specification. The following relation holds for both directions of transmission (uplink and downlink):

$$N = 5 \cdot (F / MHz), \quad 0.0\ MHz \le F \le 3276.6\ MHz$$

This means that it is sufficient to enter only one value (frequency **or** channel number), the other one is automatically adjusted.

The RF generator is particularly designed to operate in the nominal uplink band between 1920 MHz and 1980 MHz, corresponding to channel numbers 9600 to 9900. It is possible, however, to enter arbitrary UARFCNs or RF frequencies outside the uplink band, provided that the frequencies are in multiples of 200 kHz and within the allowed range of the RF generator. Moreover, the generator frequency can be modified by an additional *Frequency Offset* entered in the input field below so that an arbitrary generator frequency can be set.

Note: *The 200 kHz frequency raster given by the UARFCN frequencies is much finer and must not be confused with the WCDMA carrier spacing of 5 MHz.*

Remote control

```
UNIT:RFGenerator:FREQuency <Unit>
SOURce:RFGenerator:FREQuency <Frequency>
```

Frequency Offset

The *Frequency Offset* softkey defines an offset for the frequency set under *RF Channel*. This enables an arbitrary modification or fine tuning of the generated frequency.

Remote control

```
SOURce:RFGenerator:FOFFset <Number>
```

Total TX Power

The *Total TX Power* softkey sets the total transmit power of the RF generator in the selected RF channel, averaged over 1 slot. The *Total TX Power* is the sum of the *DPCCH Level* and the level of the individual DPDCHs; a possible AWGN contribution is not included.

Remote control

```
SOURce:RFGenerator:LEVel:TTPower <Power>
```

DPCCH Level

The *DPCCH Level* softkey sets the absolute level in dBm of the control part (DPCCH) of the Dedicated Physical Channel (DPCH). According to *Fig. 4-29* (see p. 4.58), the levels of the n_{ch} DPDCH data channels ($1 \le n_{ch} \le 6$) in the uplink generator signal are all equal but may be different from the *DPCCH Level*. The sum of all channel contributions must be equal to the *Total TX Power:*

$$P_{total} = n_{ch} \cdot P_{DPDCH} + P_{DPCCH} = \left(n_{ch} \cdot \frac{\beta_d}{\beta_c} + 1 \right) P_{DPCCH}$$

The number n_{ch} of data channels is given implicitly by the *Reference Channel Type* (if the generator signal is configured as a 3GPP reference measurement channel) or the *Symbol Rate* (if the generator signal is configured as a physical channel). The power ratio β_d/β_c is fixed for a given 3GPP reference channel type; for physical channels it can be set in the table-oriented version of the *Generator* tab. This means that if one of the values *Total TX Power* and *DPCCH Level* is changed, the other one is automatically adapted according to the formula above. If the power ratio for a physical channel is changed explicitly, the *Total TX Power* is kept constant and the *DPCCH Level* is adapted.

Further DPCH settings are provided in the table-oriented version of the *Generator* tab; see section *Dedicated Channel* on p. 4.63. and *Fig. 4-34* on p. 4.68.

Remote control

```
SOURce:RFGenerator:LEVel:DPCCh <Level>
```

Ref. Chan. Type

The *Ref. Chan. Type* softkey selects the information bit rate of the 3GPP reference channel (12.2 kbps, 64 kbps, 144 kbps, 384 kbps, or 2048 kbps). The information bit rate determines various physical and transport channel parameters of the reference channel. An example (12.2 kbps) is given in *Table 4-1* and *Table 4-2* on p. 4.66.

The *Ref. Chan. Type* setting is not relevant if the uplink signal is configured as a *Physical Channel*; see p. 4.67.

Remote control
`SOURce:RFGenerator:GPPReference:CTYPe`

Table-Oriented Generator Tab

The table-oriented version of the *Generator* tab provides settings to

- Control the RF generator and define its level *(Generator Level)*
- Define channel-independent settings *(Generator Settings)*
- Configure the Dedicated Channel, either as a 3GPP UL Reference Channel or as a Physical Channel
- Define the uplink Transmit Power Control *(TPC)* settings.

Connect. Control →

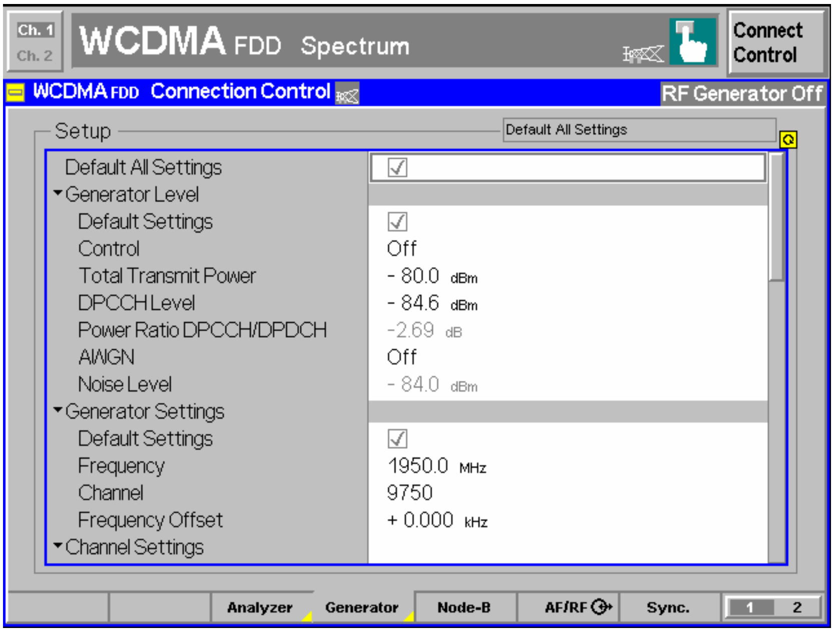


Fig. 4-31 Connection Control – Generator (table)

Default Settings The *Default All Settings* switch assigns default values to all settings in the *Generator* tab. Further *Default Settings* switches are provided for several sections of the generator setup table.

Remote control
`DEFault:RFGenerator ON | OFF` etc.

Generator Level The parameters of the *Generator Level* section control the RF generator and define the power of the generated uplink signal.

Control	Switches the RF generator on or off. This parameter corresponds to the *Generator* softkey in the panel oriented version of the *Generator* tab.
Total Transmit P.	Defines the total transmit power of the RF generator in the selected RF channel (DPCCH and DPDCH contributions; a possible AWGN contribution is not included).
DPCCH Level	Defines the absolute level in dBm of the control part (DPCCH) of the Dedicated Physical Channel.
Power Ratio DPCCH/DPDCH	Defines the ratio β_c/β_d between the control part and the data part of the generator signal; see *DPCCH Level* softkey on p. 4.60. This parameter is available only if the dedicated channel is configured as a physical channel *(Dedicated Channel Mode = Physical;* see below). The nominal power ratio of 3GPP reference measurement channels is fixed for a given information bit rate; see *Table 4-1* on p. 4.66.
AWGN	Switches the Additional White Gaussian Noise contribution to the RF generator signal on or off. The AWGN represents an interfering signal of variable level which impairs the generator signal in a controlled way. It is available with option R&S CMU-K77, *AWGN and BER Simulation.* An AWGN contribution is required for several tests described in the conformance specification 3GPP TS 25.141. In addition to the AWGN the CMU can include bit errors and block errors into the generator signal; see *BER/BLER Verification* on p. 4.67.
Noise Level	Determines the absolute AWGN level (if *AWGN* is switched *On)*.

The parameters correspond to the softkeys *Generator* (see p. 4.59), *Total TX Power,* and *DPCCH Level* in the panel oriented version of the *Generator* tab. The *Total Transmit Power,* the *DPCCH Level* and the *Power Ratio DPCCH/DPDCH* depend on each other. On changing one value, the other one is automatically adapted. See description of the *DPCCH Level* softkey on p. 4.60.

Remote control

```
INITiate:RFGenerator
ABORt:RFGenerator
FETCh:RFGenerator:STATus?
SOURce:RFGenerator:LEVel:TTPower <Power>
SOURce:RFGenerator:LEVel:DPCCh <Level>
SOURce:RFGenerator:LEVel:RCD:PHYS
SOURce:RFGenerator:LEVel:RCD:GPPR?
SOURce:RFGenerator:LEVel:AWGN ON | OFF
SOURce:RFGenerator:LEVel:NOISe <Level>
```

Generator Settings

The *Generator Settings* table section defines channel-independent properties of the generated RF signal:

Frequency	Carrier frequency of the generator signal (see *RF Channel* softkey description on p. 4.59)
Channel	UARFCN (see *RF Channel* softkey description on p. 4.59)
Frequency Offset	Frequency offset with respect to the carrier frequency

Remote control

```
SOURce:RFGenerator:FREQuency
UNIT:RFGenerator:FREQuency
SOURce:RFGenerator:FOFFSet
```

Channel Settings Dedicated Channel

The *Dedicated Channel* section provides general settings of the uplink dedicated channel including the channel type, scrambling code, frame timing relations, and power control parameters.

Dedicated Channel Mode Configuration of the dedicated channel as a 3GPP uplink (UL) reference channel according to 3GPP TS 25.141 or as a physical channel. The parameters of both channel types are defined in the table sections below.

Scrambling Code Type and value of the scrambling code that is used to scramble the uplink WCDMA signal; see *Fig. 4-29* on p. 4.58 and background information below. The R&S CMU supports scrambling codes of long type. The scrambling code value must be in the range 0 to FFFFFF (hex).

Remote control

```
SOURce:RFGenerator:DCHannel:DPDCh:MODE
SOURce:RFGenerator:DCHannel:SCODe:VALue "<hex_value>"
```

Uplink scrambling codes

Uplink scrambling codes are used to separate different users in a cell. Both the long and the short scrambling codes are complex sequences. The scrambling codes are constructed as described in standard 3GPP TS 25.213 by combining two real sequences.

The standard defines 2^{24} long and 2^{24} short uplink scrambling codes. In hexadecimal representation, the scrambling code numbers range from 0 to FFFFFF. The DPCCH/DPDCH may be scrambled by either long or short scrambling codes.

Frame Timing

To be received by the Node B under test, the timing of the generator signal must be in accordance with the timing that the Node B expects for an uplink signal. To achieve time synchronization the Node B must provide a periodic TTL signal that serves as an external trigger signal *(Wired Sync. Trigger)* and is fed in at pin 6 of the AUX 3 connector (see also *trigger settings* on p. 4.79)[3)].

The signal timing for wired synchronization is defined relative to the reference frame timing of the Node B (Node B Frame Number counter, BFN). The timing depends on the following parameter:

CPICH – UL DPCH O. Timing delay of the start of the UL-DPCH relative to the CPICH.

The timing relations are explained in *Fig. 4-32* and the background information below. To compensate for a delay of the trigger time relative to the CPICH timing, it is recommended to use the *Slot Offset* and *Chip Delay* parameters in the *Trigger* tab of the *Connection Control* menu.

Remote control

```
SOURce:RFGenerator:DCHannel:ULDPoffset
```

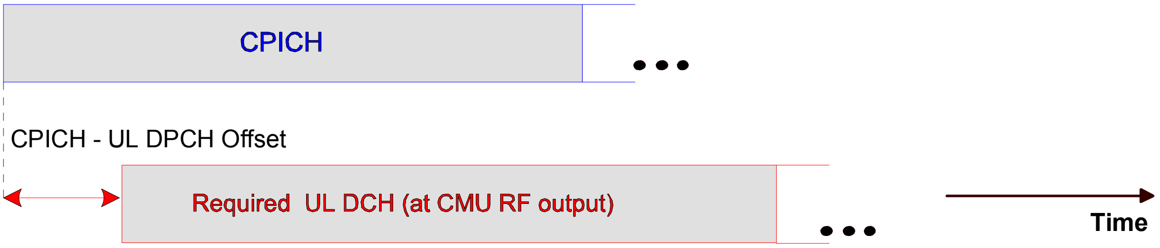


Fig. 4-32 Downling/Uplink timing relation

[3] If option R&S CMU-K78, *BCH Synchronization and Monitor*, is **not** available, the R&S CMU 300 provides an alternative mode where the uplink signal is synchronized to the P-CPICH or BCH in the downlink WCDMA signal (see section *Time Synchronization and BCH Trigger Generator* on p. 4.70). In this mode the generator is controlled by the *Signalling* parameters including the *CPICH – UL DPCH Offset* defined in the *UE Signal* tab of the *Connection Control* menu.

Synchronization Parameters

The counters and parameters used in the different UTRAN synchronization procedures are described in standard 3GPP TS 25.402. The timing of all DL and UL frames in all cells belonging to a Node B is related to the common Node B Frame Number counter (BFN). The range of this counter is 0 to 4095 frames. In the downlink signal, the Primary Common Control Physical Channel (PCCPCH) carries the BCH transport channel and the System Frame Number (SFN) and is used as a timing reference for all physical channels. Its timing is equal to the timing of the CPICH.

Uplink Power Control

Uplink inner loop power control in the UTRAN is the process of adjusting the UE transmit power in order to limit the uplink signal-to-noise interference ratio. The R&S CMU assumes an alternating TPC command pattern (1010...) and provides the following power control parameters for the generator signal:

TPC Step Size Relative power difference of the RF generator between two consecutive slots if the power control algorithm commands the R&S CMU to change its output power. The step size is always a positive dB value; the actual generator power may be increased or decreased by the step size, depending on the TPC *Mode*.

Mode Power control algorithm 1 or 2 used to control the R&S CMU RF generator power. With power control *Algorithm 1* and the fixed TPC command pattern of the R&S CMU, the generator power toggles up and down by the *TPC Step Size*. Power control. *Algorithm 2* implies a constant generator power.

For more information refer to the background information below. The R&S CMU is also capable of testing *Downlink Power Control* of the Node B; see notes on p. 4.69.

Remote control

```
SOURce:RFGenerator:DCHannel:ULPControl:TPCSsize
SOURce:RFGenerator:DCHannel:ULPControl:MODE
```

WCDMA Uplink Power Control

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 channel. The UE receives the TPC commands and adjusts its transmit power according to one of the following algorithms for uplink power control (see standard 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_cms times the *TPC Step Size* of 1 dB or 2 dB.

Channel Settings 3GPP Reference Channel

The *3GPP Reference Channel* section configures the generated 3GPP UL reference channel. According to 3GPP TS 25.141, the data content of the *3GPP UL Reference Channel* is defined on transport channel level. The data sequence to be transferred is directly fed into the Dedicated Traffic Channel (DTCH) and Dedicated Control Channel (DCCH). The transport channels are channel coded, multiplexed and mapped onto a Dedicated Physical Channel (DPCH) with variable data rate; see *Fig. 4-33 below*.

The uplink reference measurement channel generated in this way is to be used for various transmitter and receiver tests specified in standard 3GPP TS 25.141. The channel settings apply if the *Dedicated Channel Mode* parameter is set to *3GPP Reference*.

Reference Channel Type — Information bit rate of the reference channel (12.2 kbps, 64 kbps, 144 kbps, 384 kbps, or 2048 kbps). The information bit rate determines various physical channel parameters of the reference channel. An example (12.2 kbps) is given in *Table 4-1* and *Table 4-2 below*.

Channel Data Source DTCH — 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, PRBS15, PRBS16).*

TFCI Bits — 10-bit TFCI bit sequence. The TFCI labels different configurations of a signal containing several transport channels with different transport blocks. The generator signal of the R&S CMU is fixed. The *TFCI Bits* must be set according to the assignment that the Node B expects for a 3GPP reference measurement channel with a definite information bit rate and no empty blocks.

Note: *At present, the R&S CMU uses a fixed TFCI bit sequence. The* TFCI Bits *setting will be included in future firmware versions.*

Remote control

```
SOURce:RFGenerator:GPPReference:CTYPe
SOURce:RFGenerator:GPPReference:CDSource:DTCH
SOURce:RFGenerator:GPPReference:CDSource:DCCH?
SOURCe:RFGenerator:GPPReference:TFCIbits?
```

Uplink reference measurement channels

According to 3GPP TS 25.141, the data content of the 3GPP UL Reference Channel is defined on transport channel level. The data sequence to be transferred is directly fed into the Dedicated Traffic Channel (DTCH) and Dedicated Control Channel (DCCH). The transport channels are channel coded, multiplexed and mapped onto a Dedicated Physical Channel (DPCH) with variable data rate.

The following example illustrates the generation of a 3GPP reference measurement channel from the DTCH and DCCH transport channels and the parameters for an information bit rate of 12.2 kbps. For other bit rates refer to standard 3GPP TS 25.141.

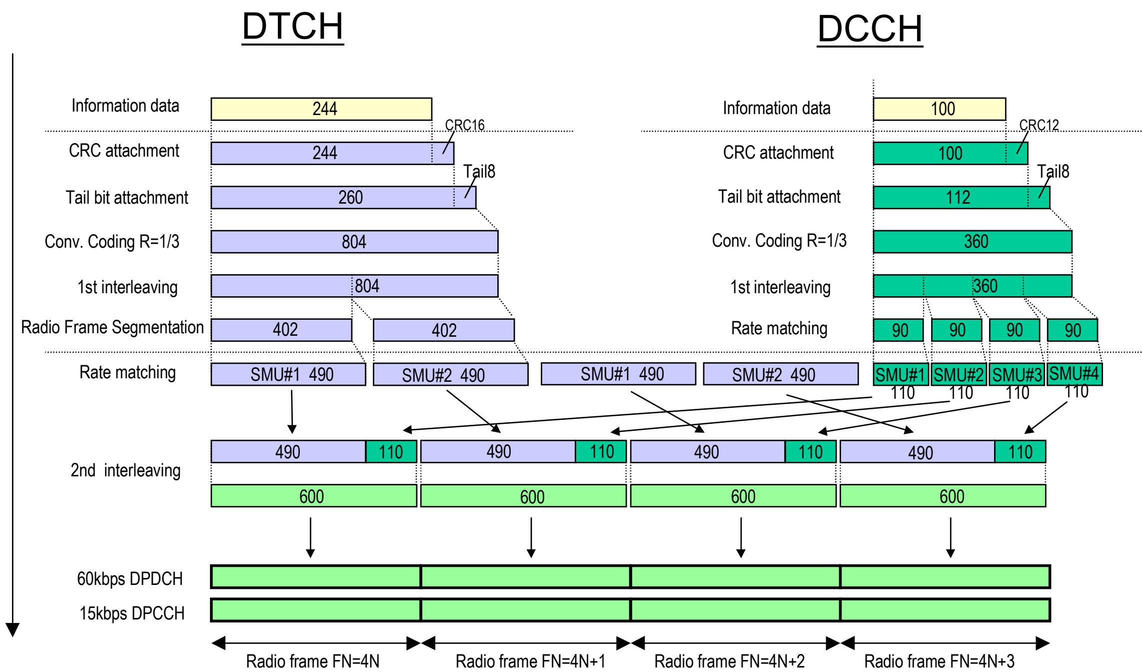


Fig. 4-33 Channel coding of UL reference measurement channel (12.2 kbps)

Table 4-1 UL reference measurement channel, physical parameters (12.2 kbps)

Parameter	**Unit**	**Level**
Information bit rate	kbps	12.2
DPDCH	kbps	60
DPCCH	kbps	15
DPCCH Slot Format #i	-	0
DPCCH/DPDCH power ratio	dB	–2.69
TFCI	–	On
Repetition	%	23
Note: *Slot Format #2 is used for closed loop tests in subclause 8.6.2. Slot Format #2 and #5 are used for site selection diversity transmission tests in subclause 8.6.3*		

Table 4-2 UL reference measurement channel, transport channel parameters (12.2 kbps)

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

Channel Settings – 3GPP Reference Channel – BER/BLER Verification

In *BER/BLER Verification* mode the R&S CMU generates an uplink 3GPP reference channel signal with a definite number of bit or block errors. These errors impair the signal in a controlled way. The *BER/BLER Verification* mode is available with option R&S CMU-K77, *AWGN and BER Simulation.*

An uplink 3GPP reference channel signal with a definite number of bit or block errors is required for the *Verification of Internal BER/BER Calculation* tests described in the conformance specification 3GPP TS 25.141. In addition to the bit and block errors the R&S CMU can superimpose an AWGN contribution to the generator signal; see *AWGN* on p. 4.62.

Mode Selects the *BER* or *BLER Verification* mode on (either the *BER Value* or the *BLER Value* is used) or deactivates both modes (no bit and block errors included)

BER Value Percentage of faulty bits used if the *BER/BLER Verification* mode is switched on

BLER Value Percentage of faulty blocks used if the *BER/BLER Verification* mode is switched on

Remote control

```
SOURce:RFGenerator:GPPReference:BBVermode OFF | BER | BLER
SOURce:RFGenerator:GPPReference:BERValue<Rate>
SOURce:RFGenerator:GPPReference:BLERvalue<Rate>
```

Channel Settings Physical Channel DPCCH – TFCI Field Settings

The *Physical Channel DPCCH* section defines the properties of the control part of the uplink physical channel. The DPCCH is I/Q code multiplexed with the DPDCH according to standard 3GPP TS 25.211; see *Fig. 4-34 below*. The channel settings apply if the *Dedicated Channel Mode* parameter is set to *Physical*.

The following parameters control the TFCI field in the DPCCH (see *Fig. 4-34* on p. 4.68):

TFCI Code Word 8-digit hex number to be used as a TFCI.

Remote control

```
SOURce:RFGenerator:PCHannel:DPCCh:TFCI:CWORd "<hex_value>"
```

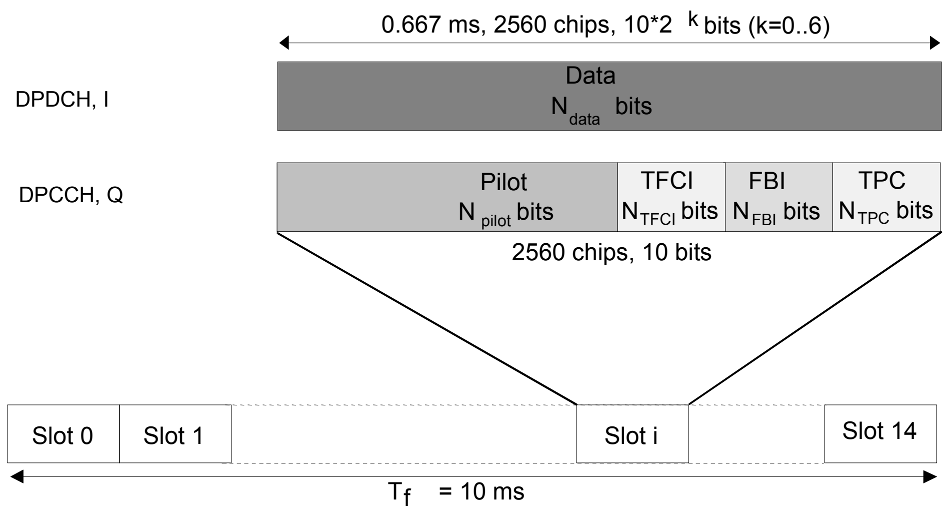


Fig. 4-34 Structure of an uplink DPCH in time domain

DPCCH	Dedicated Physical Control Channel
DPDCH	Dedicated Physical Data Channel
TFCI	Transport Format Combination Indicator
FBI	Feedback Information
TPC	Transmit Power Control
Pilot	Pilot Symbols

Channel Settings Physical Channel DPCCH – TPC Field Settings

The following parameters control the TPC field in the DPCCH (see Fig. 4-34 on p. 4.68) and define the downlink power control procedure that the R&S CMU uses to control the network transmit power. Downlink transmit power control is described in standard 3GPP TS 25.214. The R&S CMU provides the following settings:

Read Out Mode Rule for constructing a TPC pattern of infinite length to be transferred to Node B. The actual pattern transferred depends on the finite single *Pattern* defined below and the *Read Out Mode;* see *Table 4-3 below*. Together with the *Downlink Power Control Mode*, the TPC pattern determines the power steps of the Node B transmitter between consecutive slots.

Pattern Length Length of the finite TPC command pattern in bits (see *Pattern* below).

Pattern TPC command sequence of finite length used to construct the pattern transferred to Node B; see *Read Out Mode* above. The sequence is truncated after the *Pattern Length* defined above; all bits after the *Pattern Length* are discarded (single pattern).

Remote control
```
SOURce:RFGenerator:PCHannel:DPCCh:TPC:ROMode
SOURce:RFGenerator:PCHannel:DPCCh:TPC:PLENgth
SOURce:RFGenerator:PCHannel:DPCCh:TPC:PATTern
```

Table 4-3 Read out mode and TPC pattern

Read Out Mode	Transferred Pattern for an single defined pattern <Sing_Pattern>
Continuous	<Sing_Pattern><Sing_Pattern><Sing_Pattern><Sing_Pattern>...
Single Pattern + All 0	<Sing_Pattern>000...
Single Pattern + All 1	<Sing_Pattern>111...
Single Pattern + Alternating	<Sing_Pattern>010101... (the first bit after <Sing_Pattern> is always different from the last bit in <Sing_Pattern>)
All 0	000000... (irrespective of <Sing_Pattern>)
All 1	111111... (irrespective of <Sing_Pattern>)
Alternating starting 10	101010... (irrespective of <Sing_Pattern>)
Alternating starting 01	010101... (irrespective of <Sing_Pattern>)

WCDMA Downlink Power Control

Downlink power control essentially serves the same purpose as uplink power control described on p. 4.64. To control the transmit power of Node B, the UE transmits a series of Transmit Power Control (TPC) commands on the UL channel. The Node B receives the TPC commands and adjusts its transmit power according to one of the following Downlink Power Control modes (see standard 3GPP TS 25.214):

DPC_MODE 0 The UE generates a TPC command in each slot and transmits the TPC command in the first available TPC field in the uplink DPCCH. If the received TPC command is equal to 1 (0), then the Node B changes its transmit power by a power step $+\Delta_{TPC}$ ($-\Delta_{TPC}$) plus a possible correction. This implies that the Node B transmitter output power changes after each slot.

DPC_MODE 1 The UE repeats the same TPC command over 3 slots, and the Node B updates its transmit power every three slots, according to the same rules as for DPC_MODE 0.

The R&S CMU always uses DPC_MODE 0.

Channel Settings Physical Channel DPDCH

The *Physical Channel DPDCH* section defines the properties of the data part of the uplink physical channel. The *UL Physical Channel* is defined in terms of its total *Symbol Rate*. The data sequence to be transferred is fed into the data fields of the DPDCH without channel coding. The DPDCH is I/Q-code multiplexed with the DPCCH according to standard 3GPP TS 25.211; see Fig. 4-34 above. The channel settings apply if the *Dedicated Channel Mode* parameter is set to *Physical*.

Channel Data Source

DPDCH Bit pattern transmitted as user information on the DPDCH: Bit sequence consisting of zeros *(All 0)*, ones *(All 1)* 010101... *(Alternating)*, or pseudo-random bit sequences of variable length *(PRBS9, PRBS11, PRBS15, PRBS16).*

Symbol Rate Channel symbol rate in ksps determining the properties of the UL physical channel. The R&S CMU supports all symbol rates from 15 ksps to 960 ksps; for 960 ksps channels the number of DPDCHs to be multiplexed with a DPCCH can be set from 1 to 6 (see Fig. 4-29 on p. 4.58). The channel parameters corresponding to the different symbol rates are listed in Table 4-4 below.

Remote control

```
SOURce:RFGenerator:PCHannel:DPDCh:CDSource
SOURce:RFGenerator:PCHannel:DPDCh:TOTal:SRATe
```

Table 4-4 Uplink DPDCH slot formats and symbol rate

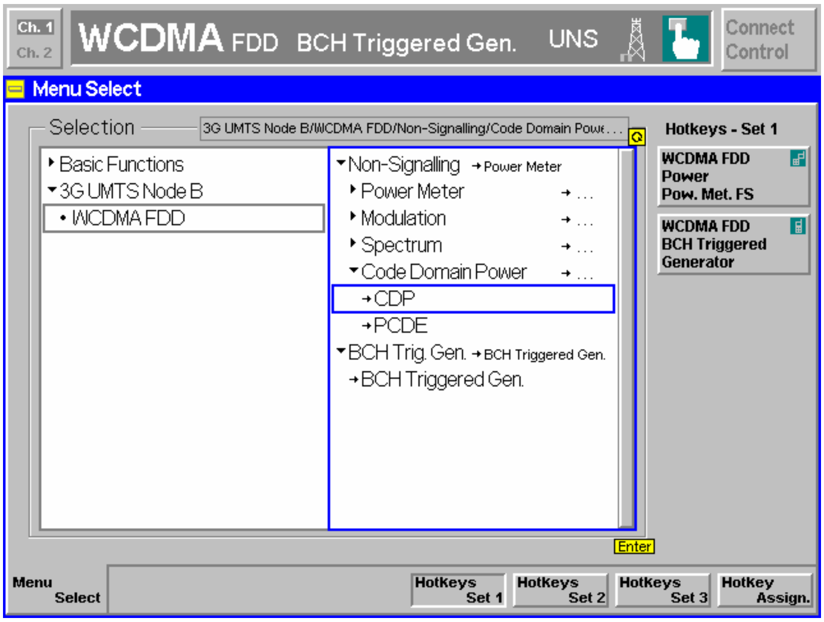
Slot Format #i	Channel Bit Rate (kbps)	Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{data}
0	15	15	256	150	10	10
1	30	30	128	300	20	20
2	60	60	64	600	40	40
3	120	120	32	1200	80	80
4	240	240	16	2400	160	160
5	480	480	8	4800	320	320
6	960	n_{ch} * 960	4	n_{ch} * 9600	n_{ch} * 640	n_{ch} * 640

Time Synchronization and BCH Trigger Generator

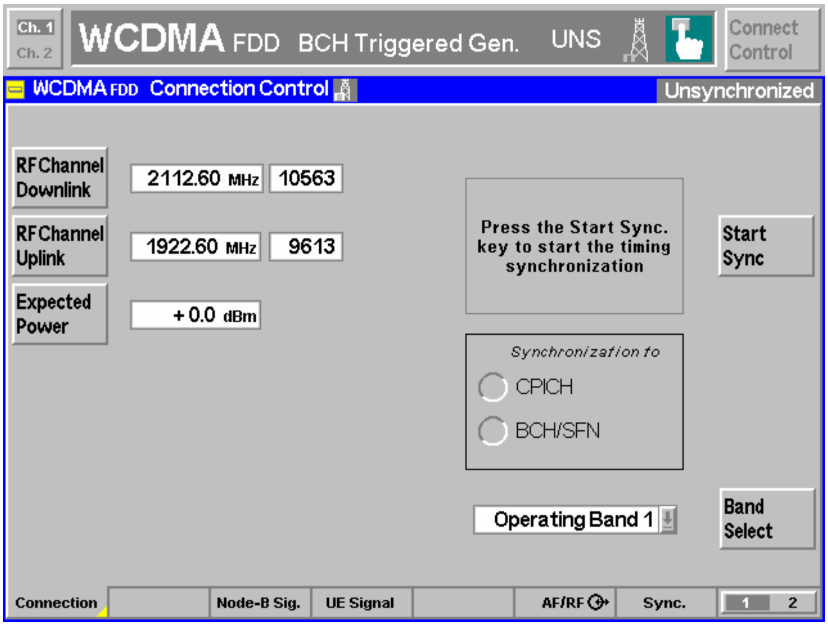
The *Non Signalling* generator signal is usually synchronized by means of an external trigger signal provided by the Node B under test; see also *Frame Timing* on p. 4.63 and *trigger settings* on p. 4.79. If option R&S CMU-K78, *BCH Synchronization and Monitor,* is **not** available, the R&S CMU 300 provides an alternative mode where the uplink signal is synchronized to the P-CPICH or BCH in the downlink WCDMA signal. In this *BCH Trigger Generator* mode the generator is controlled by the *Signalling* parameters including the *CPICH – UL DPCH Offset* defined in the *UE Signal* tab of the *Connection Control* menu.

Accessing the BCH Trigger Generator

If option R&S CMU-K76, *WCDMA Generator (3GPP FDD, Release 99, Uplink),* is enabled and option R&S CMU-K78, *BCH Synchronization and Monitor,* is disabled, the *Menu Select* menu contains an entry for the *BCH Triggered Generator*.



Selecting BCH Triggered Gen. opens the *Connection Control* menu for the *Signalling* mode:



All settings in this menu are described in section *Connection Control (Signalling)* below.

Starting and synchronizing the generator

To generate a *BCH Triggered Generator* signal, the Node B must be configured appropriately, and the R&S CMU must know the basic properties of the Node B signal in order to achieve synchronization (see also section *Connection Control (Signalling)* below). Proceed as follows:

1. Configure a Node B signal with a P-CPICH (for CPICH synchronization) or a CPICH + BCH (for BCH/SFN synchronization) and feed this signal to one of the RF connectors of the R&S CMU, preferably to RF2 (default input/output connector).
2. Press the *Connection* hotkey and select one of the UMTS operating bands I to VI *(Band Select).*
3. Press the *Node B Sig.* hotkey and adjust the R&S CMU to the basic characteristics of your Node B signal. In particular, select the proper analyzer frequency *(RF Channel Downlink)*.
4. To enable timing synchronization, set the *DL Scrambling Code (CPICH).* To make data decoding possible (e.g. for the *DL BER Test),* set the *DL Scrambling Code (DPCH).* Ensure that both scrambling codes are equal until synchronization has been achieved.
5. Press the *Connection* hotkey to access the *Connection* tab again and press *Start Sync.*
6. Open the *UE Signal* tab and select *UE Signal – Transmit: On* to start the generator.

Functionality

The R&S CMU 300 and the *BCH Triggered Generator* signal can be configured with all the settings in the *Signalling – Connection Control* menu (note trigger restrictions below). In particular, the properties of the generator signal are defined in the *UE Signal* tab of this menu.

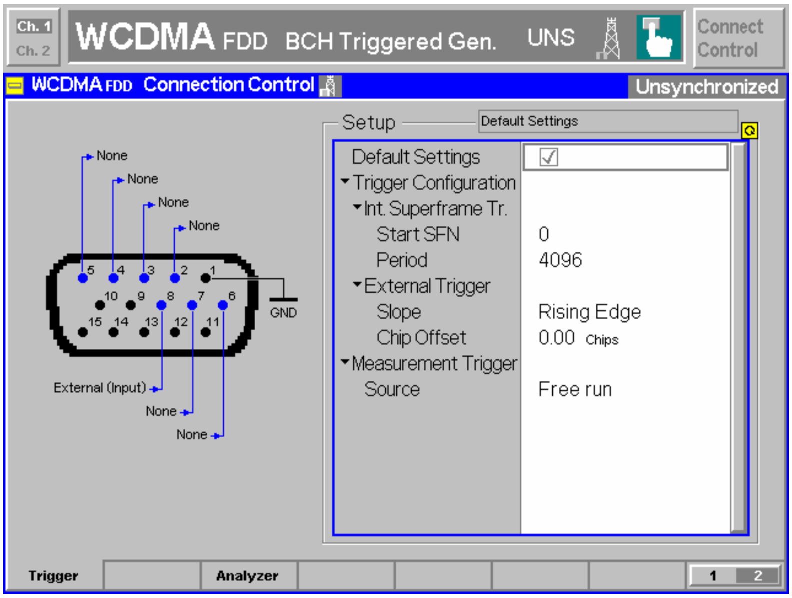
Remote Control

The *BCH Triggered Generator* signal can be configured using the *Connection Control* remote commands for the *Signalling* mode, in particular the `CONFigure:UESignal…` commands.

Restrictions

The *BCH Triggered Generator* cannot be combined with any of the TX and RX measurements that the R&S CMU 300 provides in *Signalling* mode. Any measurements using the synchronized UL generator signal must be performed at the Node B under test. The *Connection Control* popup menu cannot be closed; the *Connect. Control* softkey is unavailable.

In addition, no *HS UE-ID Trigger* and no output trigger signals are available. The *Trigger* tab of the *Connection Control* menu is simplified as follows:



Node B Signal (Connection Control – Node B)

The *Node B* tab of the *Connection Control* menu describes the Node B signal configuration. The CMU is able to synchronize to the received downlink (Node B) signal and make *Code Domain Power* and *Modulation* measurements only if it is in accordance with the signal configuration defined in the *Node B* tab.

Note: *The CMU uses the P-CPICH of the Node B signal for synchronization. Synchronization fails unless the downlink (Node B) signal contains a P-CPICH and the CMU knows the primary and secondary scrambling codes.*

The WCDMA uplink and downlink signals differ in their channel structure and in the way the physical channels are built. *Table 4-5 below* summarizes the parameters that are relevant for this section.

Table 4-5 WCDMA specifications

Parameter	**Uplink**	**Downlink**
Chip rate	3.84 Mcps	3.84 Mcps
Frame structure	10 ms radio frame divided into 15 slots (2560 chips/slot)	10 ms radio frame divided into 15 slots (2560 chips/slot)
Spreading codes	Orthogonal Variable Spreading Factor (OVSF) channelization codes and long and short scrambling codes (Gold sequences) for user separation	Orthogonal Variable Spreading Factor (OVSF) channelization codes for channel separation, Gold sequences of length $2^{18} - 1$ for cell and user separation
Spreading factors / symbol rates	4, 8, 16, ..., 256 960 ksps, ..., 15 ksps	4, 8, 16, ..., 512 960 ksps, ..., 7.5 ksps
Channel multiplexing	Control and pilot channel time-multiplexed, I/Q multiplexing for data and control channels	Data and control channels time-multiplexed

The *Node B* tab defines the following Node B properties:

- The *Antenna Diversity*
- The *Primary* and the *Secondary Scrambling Code* used to scramble the DPCH

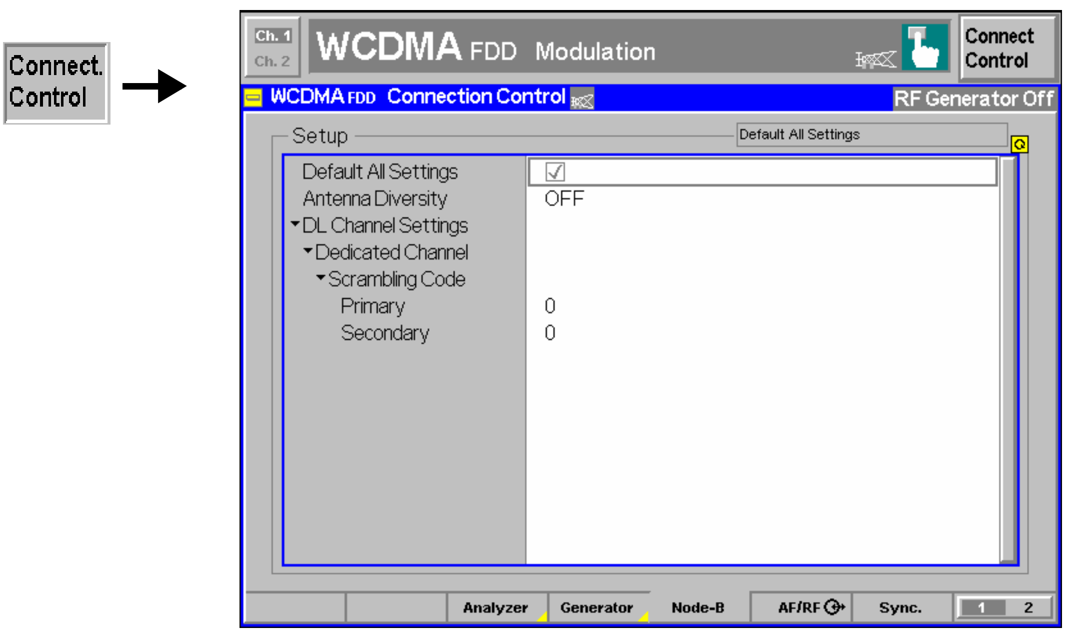


Fig. 4-35 Connection Control – Node B

Antenna Diversity Antenna Diversity of the Node B *(Antenna 1, Antenna 2, or Off).*

Remote control
`CONFigure:NB:ADIVersity`

Scrambling Code *DL Channel Settings – Dedicated Channel – Scrambling Code* defines the scrambling codes of the downlink WCDMA signal; see background information on *Downlink scrambling codes below*.

Primary Number of the primary scrambling code. The scrambling code must be in the range 0 to 1FF (hex), corresponding to 0 to 511 decimal; see background information on *Downlink scrambling codes below*.

Secondary Number of the secondary scrambling code that is used to scramble the DPCH component of the WCDMA signal; see background information on *Downlink scrambling codes below*. The scrambling code must be in the range 0 to F (hex). The value 0 means that the primary scrambling code is used for the DPCH.

Remote control
`CONFigure:NB:DCHannel:SCODe:PRIMary`
`CONFigure:NB:DCHannel:SCODe:SECondary`

Downlink scrambling codes

Downlink scrambling codes are used to separate different cells and users. According to standard 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 is 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. The P-CPICH, P-CCPCH and PICH are always transmitted using the primary scrambling code. The other downlink physical channels in the CMU generator signal 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.

RF Connectors (Connection Control – AF/RF)

The *AF/RF* tab configures the RF connectors of the R&S CMU. This includes the setting of

- The RF input and output of the R&S CMU *(RF Output, RF Input)*
- An external attenuation at the connectors *(Ext. Att. Output, Ext. Att. Input)*

Note: *The configuration of the input connectors is not relevant in TX mode.*

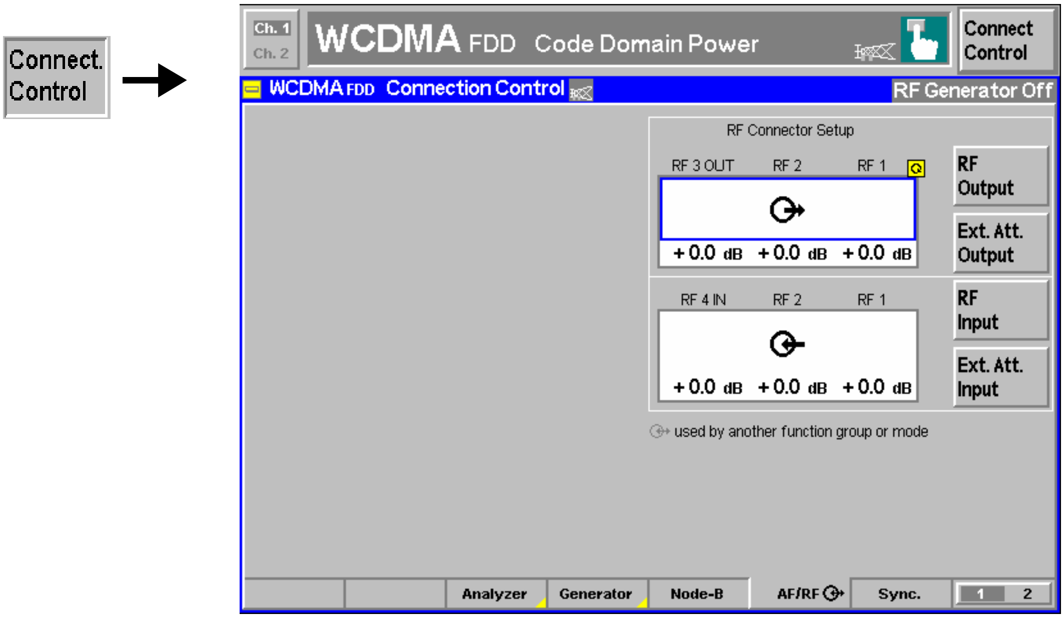


Fig. 4-36 Connection Control – RF connectors

RF Output

The *RF Output* softkey defines which of the three connectors RF 1, RF 2 and RF 3 OUT is to be used as RF output connector. A symbol ⊖→ indicates the selected RF output.

Note: *It is possible to combine any pair of input and output connectors. The bidirectional connectors RF 1 and RF 2 can be used as RF inputs and outputs at the same time.*

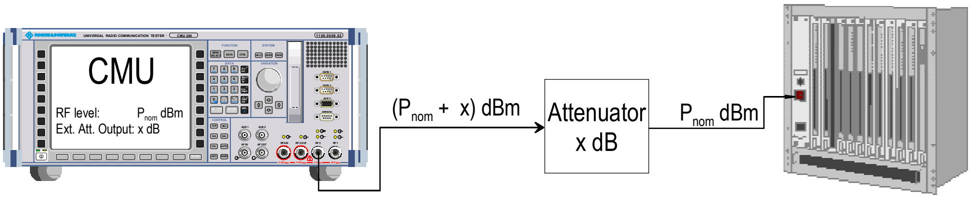
The LEDs on the front panel are only „on“ (light) if the output level is switched on.

Remote control
`OUTPut[:STATe] RF1 | RF2 | RF3`

Ext. Att. Output

The softkey *Ext. Att. Output* defines an external attenuation (or gain, if the value is negative) at the selected RF output. Input of an external attenuation is suitable, for example, if a path attenuation (cable) is included in the test setup, which is to be corrected by an increased signal level.

If an external attenuation is defined, the output signal level is referenced to the input of the DUT, the generator level is therefore shifted with respect to the actual level at the input connector of the R&S CMU. The default value for the generator power and the level ranges for the RF outputs are also shifted provided that the generator can output the required power, compensating for the external attenuation or gain. Otherwise it is adapted to the level closest to the shifted default value.



Remote control
`[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]`

RF Input

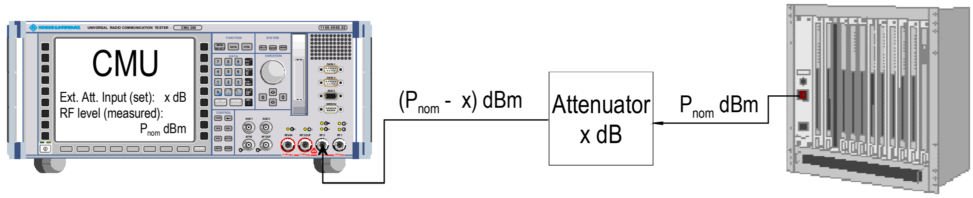
The *RF Input* softkey determines which of the three connectors RF 1, RF 2 and RF 4 IN is to be used as RF input connector. If a connector is selected as RF input, a symbol ⊖← will appear in the respective field. Input and output connectors can be arbitrarily combined.

Remote control
`INPut[:STATe] RF1 | RF2 | RF4`

Ext. Att. Input

The softkey *Ext. Att. Input* enters the value of the external attenuation (or gain) at the selected RF input. Input of an external attenuation is required if, for example, external attenuator pads are used for protection of the sensitive RF inputs of the R&S CMU or if a path attenuation is included in the test setup.

If an external input attenuation is reported to the instrument, all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the R&S CMU. The level ranges for the input connectors are shifted as well.



Note: *The LEDs on the front panel are only “on“ (light) if the measurement is active.*

Remote control

`[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]`

Reference Frequency (Connection Control – Sync.)

The popup menu *Sync.* defines the reference signals for synchronization. This includes

- The internal or external *Reference Frequency*
- The output mode for the network-specific system clock *(REF OUT 2)*

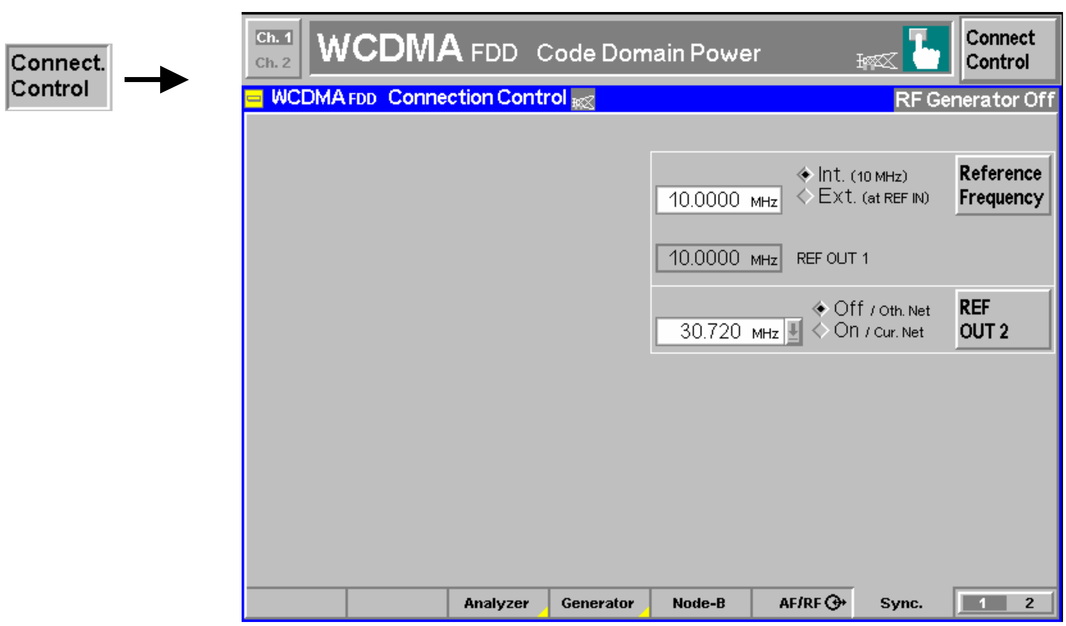


Fig. 4-37 Connection Control – Sync.

Reference Frequency

The *Reference Frequency* softkey determines the source and the frequency of the reference signal.

The associated field permits to select between two alternatives:

Int. (10 MHz)	Internal synchronization with 10 MHz (TCXO or OCXO, R&S CMU-B11/-B12) applied to output REF OUT 1 at the rear of the instrument.
Ext. (at REF IN)	External reference signal to be fed in via input *REF IN* and applied to output REF OUT 1 at the rear of the instrument.

The frequency of the external reference signal must be entered in the input field to the left of the *Ext. (at REF IN)* radio button.

The reference signal used is applied to output *REF OUT 1* so that it can be fed to other instruments as well. It can be used for synchronization to another instrument.

Note:

1. *When external synchronization is selected, the header cyclically displays a warning Reference frequency not synchronized if the synchronization failed, e.g. because of a missing or faulty input signal. At the same time, bit no. 6 (RFNL, Reference Frequency Not Locked) is set in the STATus:OPERation:CMU:SUM1:CMU1 sub-register associated with the R&S CMU base system.*
2. *In the case of external synchronization with squarewave signals (TTL) ensure correct signal matching to avoid reflections. Otherwise, resulting overshoots may cause trigger problems at the R&S CMU input. A possible remedy is to use a lowpass filter or an attenuator pad directly at the R&S CMU input. Correct synchronization may be checked by comparing the signal REF OUT 1 with the input signal.*
3. *This configuration is valid in all R&S CMU function groups.*

Remote control
The commands for the reference frequency are part of the R&S CMU base system (see R&S CMU200/300 operating manual):

```
CONFigure:SYNChronize:FREQuency:REFerence:MODE
            INTernal | EXTernal
CONFigure:SYNChronize:FREQuency:REFerence <Frequency>
```

REF OUT 2

The softkey *REF OUT 2* configures a network-specific system clock REF OUT 2 to be fed to the output REF OUT 2 at the rear of the instrument.

The associated field permits to select between two alternatives:

OFF (other network)	The clock frequency of the current function group is not fed to the output *REF OUT 2*. With this setting the system clock of another active function group is still applied to *REF OUT 2* provided that the output *REF OUT 2* is switched on in the other function group. However, if *REF OUT 2* is explicitly switched over from *On* to *Off* the clock signal is definitely removed.
On (current network)	The network-specific system clock of the current function group is fed to output REF OUT 2. The system clock of any other function group applied to REF OUT 2 before is replaced.

Besides the basic clock frequency of 39 MHz one of the following clock frequencies may be selected:

0.960	0.991	1.024	1.059	1.097	1.138	1.181	1.229	1.335	1.396
1.463	1.536	1.617	1.706	1.807	1.920	2.028	2.194	2.363	2.560
2.793	3.072	3.143	3.840	4.388	5.120	6.144	7.680	10.240	15.360
30.720									

(The values are calculated according to the formula F_{out} = *30.720 MHz / n* where *n = 1, ..., 31*.)

The clock frequency can be used to synchronize other instruments to the R&S CMU.

Remote control

```
SOURce:DM:CLOCk:STATe ON | OFF
SOURce:DM:CLOCk:FREQuency <Frequency>
```

Trigger (Group Configuration – Trigger)

The *Trigger* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Trigger* tab defines

- The source of the measurement trigger
- The *Polarity* and timing *(Slot Offset, Chip Delay)* of the external and of the *Wired Sync.* trigger signal

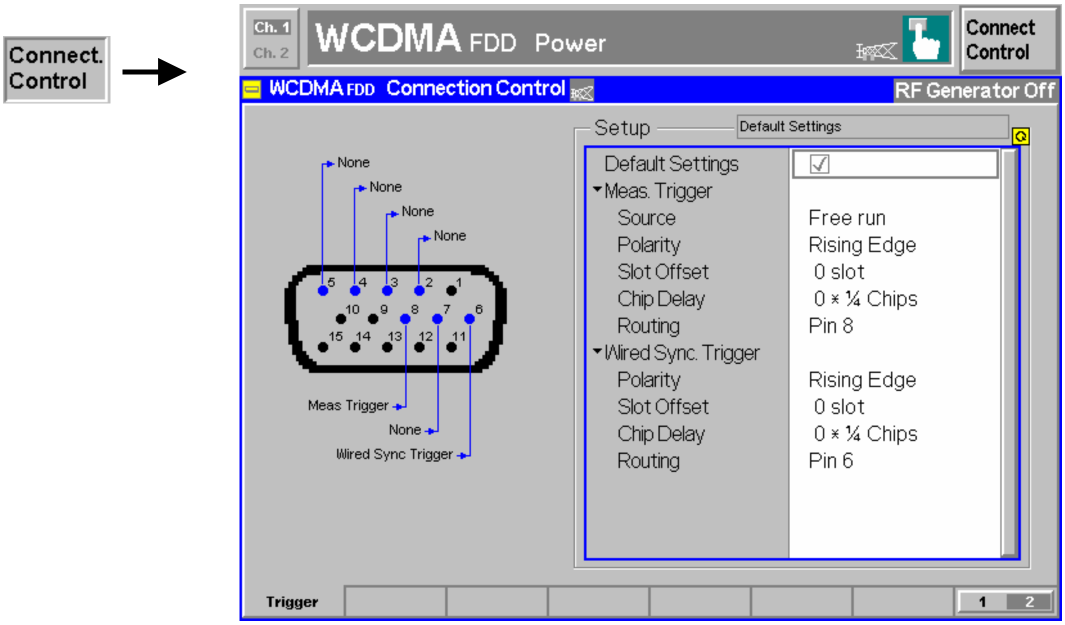


Fig. 4-38 Connection Control – Trigger

Meas. Trigger – Source

Selects a signal source to trigger the measurements:

Free Run Trigger provided by the analyzed RF signal: The CMU decodes the RF signal to derive its slot timing. The *Polarity, Slot Offset, Chip Delay* and *Routing* parameters in the *Meas. Trigger* section are not used.

External External trigger signal (TTL) fed in via connector AUX 3 (pin 8). The timing information for the measurement is provided by the rising or falling edge (see *Polarity* setting below) of an external trigger[4)] signal to which a delay *(Slot Offset* + *Chip Offset)* can be added.

Note: *Some measurements require particular trigger settings.* Spectrum *measurements with* ACLR Scanning *on and* Spectrum Emission Mask *measurements cannot be performed with External trigger (see* Table 4-2 *on p. 4.37).*

Remote control
`CONFigure:MEAS:TRIGger:SOURce FRUN | EXTern`

Meas. Trigger – Polarity

Qualifies whether the trigger event occurs on the *Rising Edge* or on the *Falling Edge* of the *External* TTL trigger signal.

Remote control
`CONFigure:MEAS:TRIGger:POLarity`

Meas. Trigger – Slot Offset

Corrects the *External* trigger time by a (positive) integer number of slots. With an offset setting of n slots the measurement is started n slots after the trigger event.

An *Chip Delay* can be added to the *Slot Delay*.

Remote control
`CONFigure:MEAS:TRIGger:SOFFset <Slot_Offset>`

Meas. Trigger – Chip Delay

Corrects the *External* trigger time by a (positive) integer number of chips. With an offset setting of n chips the measurement is started n chips after the trigger event. The *Chip Delay* is added to the *Slot Delay*.

Remote control
`CONFigure:MEAS:TRIGger:CDELay <Delay_Offset>`

Meas. Trigger – Routing

Indicates that the *External* trigger signal must be fed in at pin 8 of the *Aux 3* connector.

Remote control: –

Wired Sync. Trigger

The functions under *Wired Sync. Trigger* define trigger settings that must correspond to the properties of an external TTL trigger signal provided by the Node B under test. The trigger signal is required for time synchronization of the generator signal with the frame timing of Node B (see also *Frame Timing* on p. 4.63). The trigger period must be related to the Transmission Time Interval (TTI) of the DL dedicated channel (at least 2, 4, or 8 frames for the different 3GPP reference channels, 1 frame is sufficient for physical channels). The trigger signal is fed in via connector AUX 3 (pin 6)[5)].

[4] The external measurement trigger signal at AUX 3 must be a high or low pulse with the following characteristics: Rise/fall time <20 ns; minimum high or low time ≥ 200 ns. The impedance of the trigger source must be ≤ 50 Ω.

[5] The *Wired Sync.* trigger signal at AUX 3 must be a high or low pulse with the following characteristics: Rise/fall time <20 ns; minimum high or low time ≥ 200 ns. The impedance of the trigger source must be ≤ 50 Ω.

Polarity

Qualifies whether the trigger event occurs on the *Rising Edge* or on the *Falling Edge* of the *Wired Sync.* TTL trigger signal.

Remote control
`CONFigure:EXTernal:TRIGger:SYNC:POLarity`

Slot Offset

Corrects the *Wired Sync.* trigger time by a (positive) integer number of slots. With an offset setting of n slots the trigger pulse is assumed to arrive at the R&S CMU n slots after the beginning of the Transmission Time Interval (TTI) of the DL dedicated channel.

An *Chip Delay* can be added to the *Slot Delay*.

Remote control
`CONFigure:EXTernal:TRIGger:SYNC:SOFFset` *<Slot_Offset>*

Chip Delay

Corrects the *Wired Sync.* trigger time by a (positive) integer number of chips. With an offset setting of n chips the trigger pulse is assumed to arrive at the R&S CMU n chip periods after the beginning of the Transmission Time Interval (TTI) of the DL dedicated channel. The *Chip Delay* is added to the *Slot Delay*.

Remote control
`CONFigure:EXTernal:TRIGger:SYNC:CDELay` *<Delay_Offset>*

Routing

Indicates that the *Wired Sync.* trigger signal must be fed in at pin 6 of the *Aux 3* connector.

Remote control: –

Measurements in Signalling Mode

The scope and functionality of the *Signalling* TX measurement applications is the same as in *Non Signalling* mode. The *Signalling* mode requires option R&S CMU-K78, *BCH Synchronization and Monitor.* In this mode the R&S CMU can synchronize to the DL signal from the Node B and is able to transmit and receive signalling information and data, using the settings defined in the *Connection Control* menu, in particular the uplink and downlink signal settings from the *Node B Signal* and *UE Signal* tabs. A typical example is shown below.

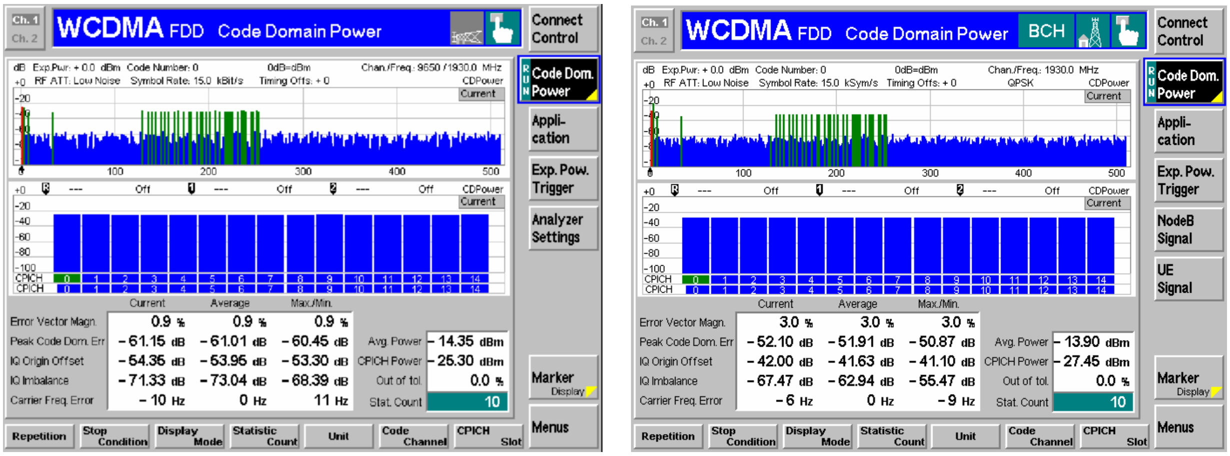


Fig. 4-39 Comparison of Non Signalling and Signalling measurement menu

In addition to the TX measurements *(Power, Code Domain Power, Modulation, Spectrum)* provided in *Non Signalling* mode, the *Signalling* mode offers a *DL BER Test* using a test loop from the R&S CMU to the Node B and back. Moreover the R&S CMU can decode and display the System Information Blocks received from the Node B *(BCH Monitor*, see section *SIB Monitoring (Connection Control – BCH Monitor)* on p. 4.134). Both the *DL BER Test* and the *BCH Monitor* require a BCH/SFN synchronization of the R&S CMU to the BCH from the Node B; see example procedure on p. 4.115.

The measurement functionality in Signalling mode is also extended by the trigger modes described in section *Trigger (Connection Control – Trigger)* on p. 4.131.

The following additional *Signalling* measurements are available as options:

- *RACH Preamble Test* (option R&S CMU-K71)
- *HSDPA Analyzer* (option R&S CMU-K72, to be complemented by *HSDPA Stimulate,* R&S CMU-K73)

For a general overview of the measurement functionality in both test modes see also Chapter 3, section *Measurement Groups.*

DL BER Test

In the *DL BER Test* (with option R&S CMU-K70, *DL BER Test)* the CMU receives and decodes a known bit sequence transmitted on a DL channel and evaluates the BER and D(BLER). The measurement can be used to assess the Node B receiver characteristics and performance.

The structure of the *DL BER Test* menu group is analogous to the TX measurements: The popup menu *DL BER Test Configuration* is used to configure the measurements; the measurement results and the most important test settings are indicated in the main menu *DL BER Test*.

Principle of the measurement

The *DL BER Test* is based on a comparison of the bit content of the received DL signal with a known bit sequence supposedly transmitted by the Node B. The bit sequence can be any of the Pseudo Random Bit Sequences PRBS9, PRBS11, PRBS15, or PRBS16; the DL signal must be configured as a 3GPP Reference Measurement Channel (RMC). The R&S CMU synchronizes to the bit sequence and provides the BER and BLER results (plus an additional DBLER, see below) in parallel. The bit synchronization process is successful unless the actual bit sequence differs too much from the expected sequence (BER ≥ 10%).

The BER test with a single DL signal (no UL generator, no loopback) can be used e.g. to test BTS configurations and algorithms involved in channel coding and RMC generation.

Receiver quality tests

The *DL BER Test* is especially suitable to perform Node B receiver quality tests. In a receiver quality test scenario the Node B receives an UL signal from the R&S CMU and returns the received data blocks to the tester.

A receiver quality test is typically performed at low UL and higher DL signal levels so that transmission errors produced on the way back (from the Node B to the CMU) can be neglected. The CMU compares the DL signal with its own UL signal to calculate the bit errors produced in the Node B receiver; no internal BER/BLER calculation at the Node B is required.

The uplink *WCDMA Generator* (option CMU-K76) provides a reference measurement channel with variable signal power, information bit rate *(Reference Channel Type)* and test data pattern *(Channel Data Source DTCH)*. The UL signal level during the BER measurement can be different from the usual generator level. Moreover it is possible to impair the uplink signal in a controlled way using a superimposed *AWGN* contribution or the *BER/BLER Verification* mode.

Bit and block error rates

The Bit Error Rate *(BER,* sometimes also termed Bit Error Ratio) is the ratio of bit errors in the data part of the transport block to the total number of transferred data bits in percent:

BER = Data bit errors / total number of data bits * 100%

To calculate the BER the R&S CMU compares the transmitted UL data bits with the data bits looped back by the Node B under test.

The Block Error Rate (BLER*,* sometimes also termed Block Error Ratio) is the ratio of data blocks that contain bit errors in their data or CRC field to the total number of transferred blocks in percent:

BLER = Blocks with erroneous data or CRC fields / total number of blocks * 100%

To obtain the BLER the R&S CMU performs a CRC check of the looped-back data blocks.

The Data Block Error Rate (DBLER) is the ratio of data blocks that contain bit errors in their data field (excluding the CRC) to the total number of transferred blocks in percent:

DBLER = Blocks with erroneous data fields / total number of blocks * 100%

To calculate the DBLER the R&S CMU compares the transmitted UL data bits with the data bits looped back by the Node B under test. The DBLER is generally a good approximation to the BLER; see below.

Relation between BER, BLER and DBLER

The BER, BLER and DBLER are independent quantities characterizing the quality of the NODE B receiver. It is instructive, however, to consider a simple stochastic model where the BLER and DBLER are both determined by the BER and the transport block size. This model relies on the following approximations:

1. The probability for a bit error is the same for all bits in a transport block, including the CRC; it is therefore equal to the BER.
2. Additional effects due to channel coding and imperfect interleaving are negligible.

Consider a transport block with k data bits and (n – k) CRC bits so that the total number of bits in the block is n. The BLER and DBLER can be calculated as follows:

BLER = 1 – <Probability that all bits are correct>
= 1 – <Probability that 1 bit is correct>^{n} = 1 – (1 – BER)^n

DBLER = 1 – <Probability that all bits are correct>
= 1 – <Probability that 1 bit is correct>^{k} = 1 – (1 – BER)^k

Conclusions and Example

In this approximation it is obvious that BLER > DBLER for 0 < BER < 1 and that DBLER = BLER = 0 for BER = 0 and DBLER = BLER = 1 for BER = 1. The relation between the three quantities for the transport block size of the 12.2 kbps 3GPP reference measurement channel (n = 260, k = 244) is plotted in *Fig. 4-40 below*.

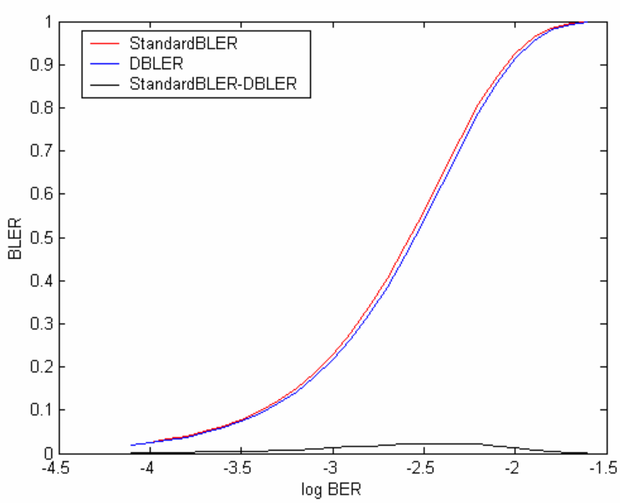


Fig. 4-40 Approximate relation between BER, BLER and DBLER

Performing a DL BER Test

A *DL BER Test* must be performed in the *Synchronized* signalling state with a BCH/SFN synchronization established. BCH/SFN synchronization is a prerequisite for proper decoding of the received RMC data blocks. To test the Node B receiver quality the UL generator must be switched on and the Node B must be set to loopback mode.

The test can largely be performed with default settings. To establish BCH/SFN synchronization the *Node B* settings must be accordance with the DL WCDMA signal.

An example procedure for synchronization and Node B settings is reported on p. 4.115.

Measurement Menu (DL BER Test)

The measurement menu *DL BER Test* shows the results and the most important parameters of the BER measurement.

- The measurement control softkey *BER* controls the measurement, indicates its status *(RUN, HLT, OFF)* and opens the configuration menu *DL BER Test Configuration*. The hotkeys associated with the measurement control softkey define the scope of the measurement.
- The softkeys *Application, Exp. Pow. Trigger, Node B Signal, UE Signal* and *Menus* on the right softkey bar are combined with various hotkeys. When a softkey is selected and an associated hotkey pressed, a popup window appears which indicates a setting or enables an entry.
- In the tables in the center of the menu, the test settings of the current *DL BER Test* and the results are displayed.

The measurement menu *DL BER Test* is opened from the main menu *Menu Select* (with the associated key at the front of the instrument) or from the menu group *WCDMA NODE B TX Test (3GPP/FDD)* using the hotkey *DL BER Test*.

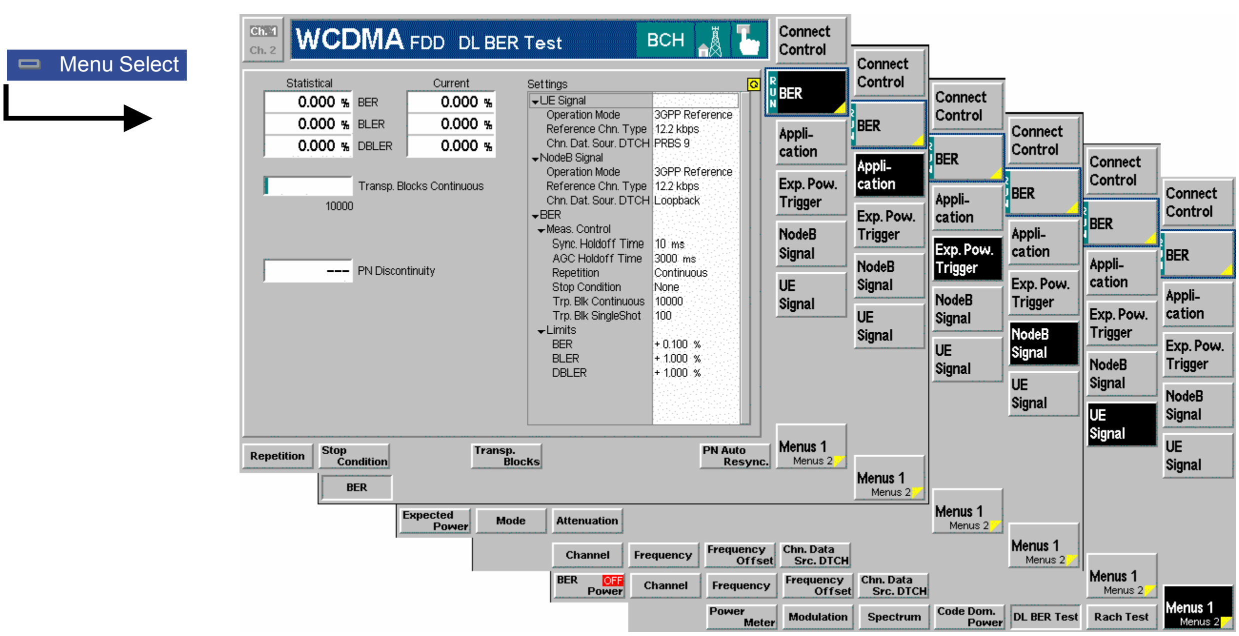


Fig. 4-41 DL BER Test menu

Test Settings

The softkeys and hotkeys in the *DL BER Test* menu provide the following settings.

BER

The *BER* softkey controls the measurement and indicates its status *(RUN | HLT | OFF*).

This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key.

Remote control
```
INITiate:DLBer:BER
ABORt:DLBer:BER
STOP:DLBer:BER
CONTinue:DLBer:BER
FETCh:DLBer:BER:STATus?
```

Measurement configuration

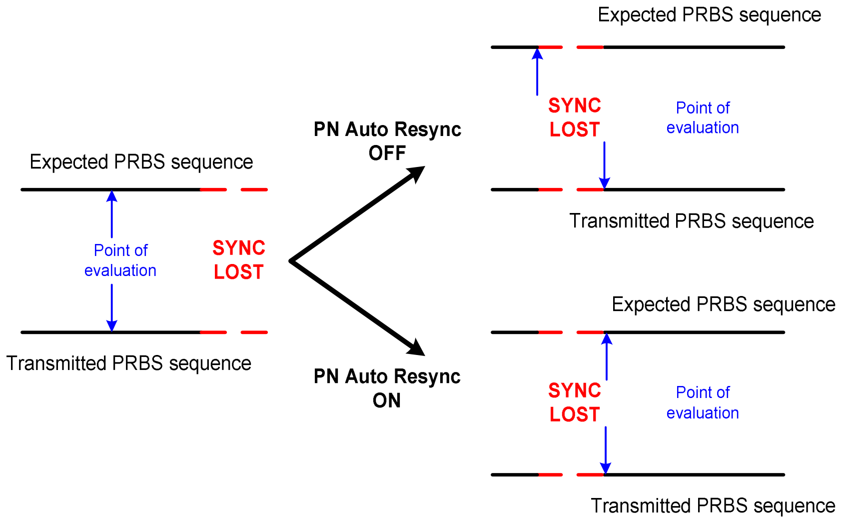
Pressing the *BER* softkey twice opens the popup menu *DL BER Test Configuration*. Besides, hotkeys defining the scope of the measurement are associated with the *BER* softkey. These hotkeys are also provided in the configuration menu; see section *Measurement Configurations (DL BER Test Configuration)* on page 4.89.

PN Auto Resync

Specifies if an automatic resynchronization to the PRBS data sequence should be performed in case that synchronization is lost.

If the *PN Auto Resync* is switched OFF and the synchronization is lost (even for a short time), the expected PRBS sequence and the transmitted PRBS sequence are not aligned any more due to lost transport blocks. As a consequence, the BER values will increase to about 50%, the DBLER to 100% (the BLER is not affected).

To avoid this behavior, the *PN Auto Resync* functionality can be used. If the synchronization is lost, a resynchronization to the PRBS pattern is performed and the Transport Blocks involved in this resynchronization procedure are discarded (not taken into account for the BER measurement). To indicate this incident, the number of resynchronizations during the measurement is displayed in the measurement menu.



Remote control
```
CONFigure:DLBer:BER:CONTrol:PAResync
      ON | OFF
```

Application

The *Application* softkey selects the application of the *DL BER Test*. At present only a single application *BER* is available.

Exp. Pow. Trigger

The *Exp. Pow. Trigger* softkey controls the level in the RF input signal path and the trigger settings for the measurement.

The expected power settings are general settings and therefore described in more detail in section *Connection Control (Non Signalling) – Analyzer Settings – Table-Oriented Version* and *Trigger (Connection Control – Trigger)* on p. 4.131.

Node B Signal

The *Node B Signal* softkey determines the center frequency of the RF analyzer. The frequency settings are general settings and therefore described in more detail in section *Downlink Signal (Connection Control – Node B Signal)* on p. 4.120.

An additional measurement-specific hotkey defines the data that the R&S expects from the Node B.

Chn. Data Src. DTCH

Specifies which data sequence the R&S CMU expects to be transmitted on the DL DTCH.

Loopback	The PRBS sequence is the same as the UL sequence selected via *UE Signal – Chn. Data Src. DTCH.* This setting is suitable if the Node B loops back the UL data.
PRBS…	The R&S CMU expects a specific pseudo random bit sequence. The PRBS may be generated by the Node B or looped back.

The channel data settings are specific to the *DL BER Test* and not provided in the *Connection Control* menu.

Remote control

```
CONFigure:DLBer:BER:NBSignal:DTCH
      LOOP | PR9 | PR11 | PR15 | PR16
```

UE Signal

The *UE Signal* softkey controls the uplink WCDMA (UE) signal generator, sets the RF frequency, and selects the bit pattern transmitted on the DTCH. The frequency settings are general settings and therefore also provided in the Connection Control menu. They are described in more detail in section *Uplink Signal (Connection Control – UE Signal)* on p. 4.125.

Two additional measurement-specific hotkeys define the data that the R&S expects from the Node B and the signal levels.

BER Power

BER Power specifies the power of the UL signal used in the BER test. The power parameters *Total Transmit Power, DPCCH Level, DPDCH Level, Power Ratio DPCCH/DPDCH, AWGN and Noise Level* are analogous to the settings in the *UE Signal* tab of the *Connection Control* menu described in section *Uplink Signal (Connection Control – UE Signal)* on p. 4.125.; however, the *BER Power* settings are measurement-specific and only used while a *DL BER Test* is running (measurement state *RUN).* The *Ratio DPCCH/DPDCH* is fixed for the 3GPP RMCs used in the BER test, so only one power value must be set; the others are adjusted automatically.

At the beginning of the BER measurement the UL signal power is adjusted as follows:

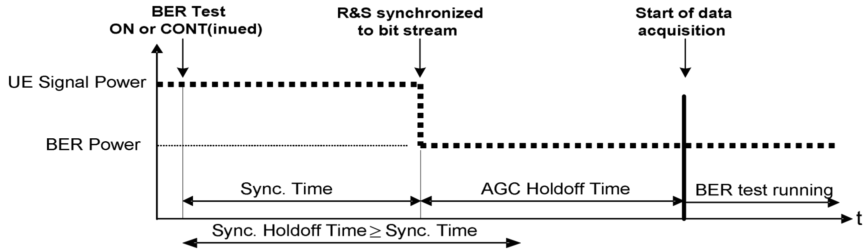


Fig. 4-42 BER power settings and holdoff times

The holdoff times are set in the *Control* tab of the *DL BER Test Configuration* menu. The *UE Signal* power is restored as soon as the BER measurement enters the *HLT* or *OFF* state.

Pressing *ON/OFF* while the *BER Power* softkey is selected switches the UL generator on or off. The *ON/OFF* settings in the *DL BER Test* menu and in the *UE Signal* tab overwrite each other; the power settings are independent.

Remote control

```
INITiate:UESignal; ABORt:UESignal
CONFigure:DLBer:BER:UESignal:TTPower <Level>
CONFigure:DLBer:BER:UESignal:DPCCh <Level>
CONFigure:DLBer:BER:UESignal: AWGN ON|OFF
CONFigure:DLBer:BER:UESignal: NLEVel <Level>
```

Chn. Data Src. DTCH

Specifies the PRBS data sequence that the R&S CMU transmits on the UL DTCH. The pseudo random bit sequences PRBS9, PRBS11, PRBS15, and PRBS16 are available.

The channel data settings are specific to the *DL BER Test*; they replace the *Channel Data Source (DTCH)* selected in the *Connection Control* menu while a *DL BER TEST* is running (measurement state *RUN).*

Remote control

```
CONFigure:DLBer:BER:UESignal:DTCH
      PR9 | PR11 | PR15 | PR16
```

Measurement Results

The *BER* measurement results and the test settings are displayed in the measurement menu.

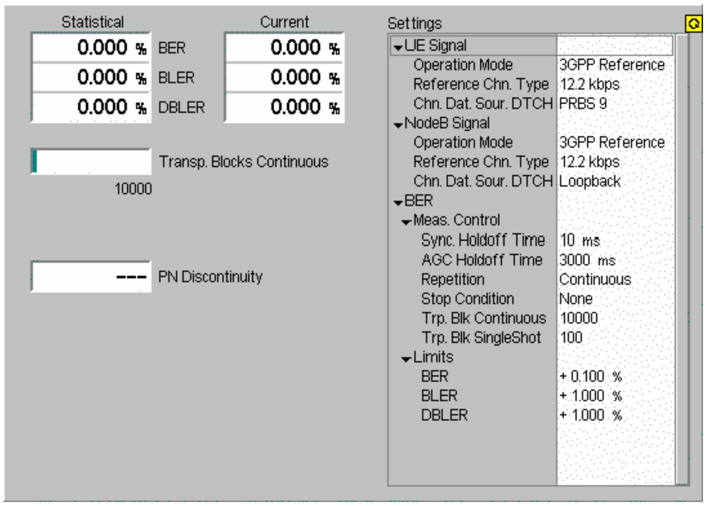


Fig. 4-43 Display of test settings and measurement results (BER, Signalling)

Results

The output in the left half of the menu shows the results of the *DL BER Test*:

BER Bit Error Rate, ratio of data bit errors to total number of transferred data bits.

BLER Block Error Rate, ratio of blocks received with wrong data or CRC bits to total number of received blocks.

DBLER Data Block Error Rate, ratio of blocks received with wrong data bits to total number of received blocks.

The three quantities are explained in more detail in section *DL BER Test* on p. 4.82. The *Current* results are intermediate results which are averaged over a few radio blocks and constantly updated. As a consequence the *Current* BLER and DBLER always amount to m/n, where n is a small number (e.g. 10) and $n \leq m$. The averaging period for the *Statistical* results depends on the *Repetition* mode:

- The *Single Shot* results are averaged over all blocks since the start of the measurement.
- The average for the *Continuous* results are referenced to the number of *Transp. Blocks Continuous* selected in the *Control* tab of the configuration menu.

A bar below the output tables indicates the relative measurement progress, i.e. the ratio between the current number of measured transport blocks and the total number of transport blocks. The total number of transport blocks per measurement cycle, depending on the *Repetition* mode defined in the *Control* tab of the *DL BER Test Configuration* menu *(Continuous* or *Single Shot),* is indicated below the bar.

PN Discontinuity Number of resynchronizations during the measurement, only displayed if *PN Auto Resync.* (see p. 4.85) is enabled.

Limit Check

A red output field indicates that the measurement result exceeds the upper limit set in the *Limits* tab of the *DL BER Test* configuration menu; see p. 4.91.

Remote Control

```
READ[:SCALar]:DLBer:BER?
FETCh[:SCALar]:DLBer:BER?
SAMPle[:SCALar]:DLBer:BER?
CALCulate[:SCALar]:DLBer:BER:MATChing:LIMit?
```

Settings

The *Settings* table gives an overview of the current measurement configuration. This includes the settings made via the softkeys and hotkeys of the *DL BER Test* menu or in the *Control* tab of the configuration menu, and the tolerances set in the *Limits* tab of the *DL BER Test Configuration* menu, see section *Measurement Configurations (DL BER Test Configuration)* on page 4.89.

Remote control
See sections *Test Settings* on page 4.85 and *Measurement Configurations (DL BER Test Configuration)* on page 4.89.

Measurement Configurations (DL BER Test Configuration)

The popup menu *DL BER Test Configuration* is opened by pressing the measurement control softkey *BER* at the top right in the main menu *DL BER Test* twice. It is possible to change between the two tabs in the menu by pressing the associated hotkeys.

Measurement Control (DL BER Test Configuration – Control)

The *Control* tab controls the *DL BER Test* by determining

- *Holdoff Times* for automatic gain control and synchronization
- The *Repetition* mode
- The *Stop Condition* for the measurement
- The number of transport blocks per measurement cycle *(Transp. Blocks Continuous/Single Shot))*

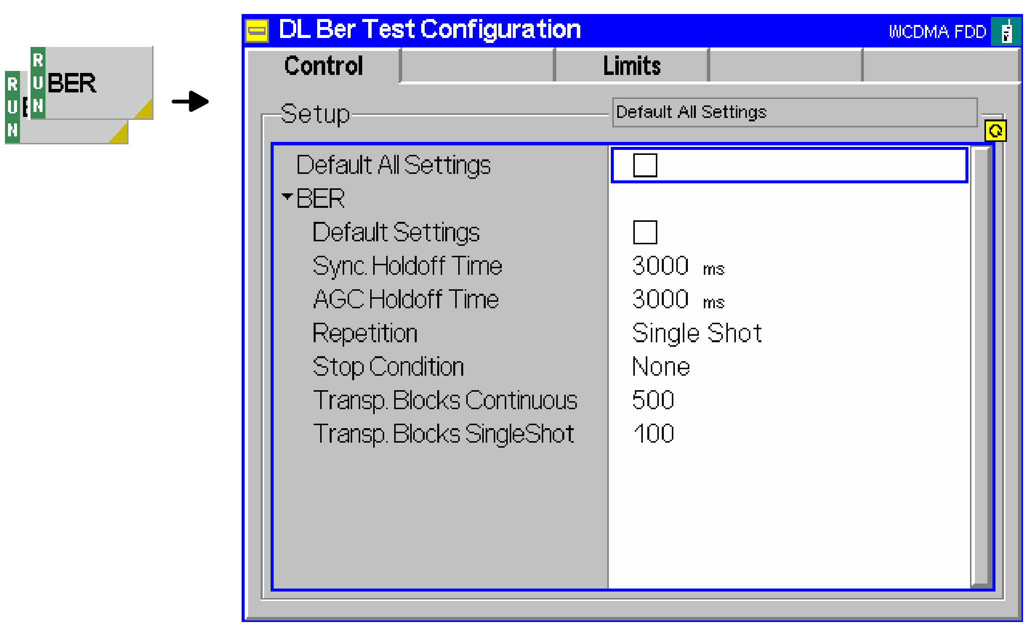


Fig. 4-44 DL BER Test – Control (Signalling)

The *Repetition* mode and *Stop Condition* comply with the corresponding settings in the *Control* tab of the *Power Configuration* menu (see page 4.7). In the remote-control commands, the keywords `POWer:<Pow_Application>` are to be replaced by `DLBer:BER`. The following parameters are specific to the *DL BER Test*:

Default The *Default* switches overwrite all settings in the *Control* tab with default values. The default values are quoted in the command description in chapter 6 of this manual.

Remote control
`DEFault:DLBer:CONTrol ON | OFF`

Holdoff The *Holdoff Times* are necessary for the adjustment of the R&S CMU to the conditions of the *Receiver Quality* measurement:

AGC Holdoff Time Time for which the R&S CMU analyzer can adjust itself to the new RF level at the beginning of the receiver quality measurement *(automatic gain control).* Reducing the *AGC Holdoff Time* can accelerate the measurement.

Sync. Holdoff Time Maximum time for which the signalling unit of the CMU attempts synchronizing to the bit stream after the *Receiver Quality* measurement is started. If no synchronization can be achieved during the *Sync. Holdoff Time,* the measurement is halted *(HLT)* and a notice box is displayed. The R&S CMU always attempts at least one synchronization (which will be successful unless the BER is too large), even if the holdoff time is set to zero.

Remote control
```
CONFigure:DLBer:BER:CONTrol:AHOTime <AGCTime>
CONFigure:DLBer:BER:CONTrol:SHOTime <SynchTime>
```

Transport Blocks The *Transport Blocks* parameter defines the number of transport blocks to be measured or averaged per 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 Node B and back.

Transp. Blocks Continuous Number of received transport blocks used for averaging in continuous measurements (statistics count). The continuous measurement is continued after the CMU has received the specified number of transport blocks from the Node B, however, average results are referenced to the last statistics count (see Chapter 3).

Transp. Blocks Single Shot Number of received transport blocks for single shot measurements. The single shot measurement is terminated after the CMU has received the specified number of transport blocks from the Node B.

Different numbers can be defined for single shot *BER* measurements (only one measurement cycle) and continuous measurements (measurement cycle repeated periodically).

Remote control
```
CONFigure:DLBer:BER:CONTrol:TBContinuous <Blocks>
CONFigure:DLBer:BER:CONTrol:TBSingleshot <Blocks>
```

Upper Limits for Bit Error Rate (DL BER Test Configuration – Limits)

The *Limits* tab defines the upper limits for the individual measured quantities in the *DL BER Test* menu. The conformance test specification TS 25.141 stipulates a maximum BER of 0.1% and a maximum BLER of 1% for most test cases. The DBLER is closely related to the BLER; see *Fig. 4-40 on p. 4.83.*

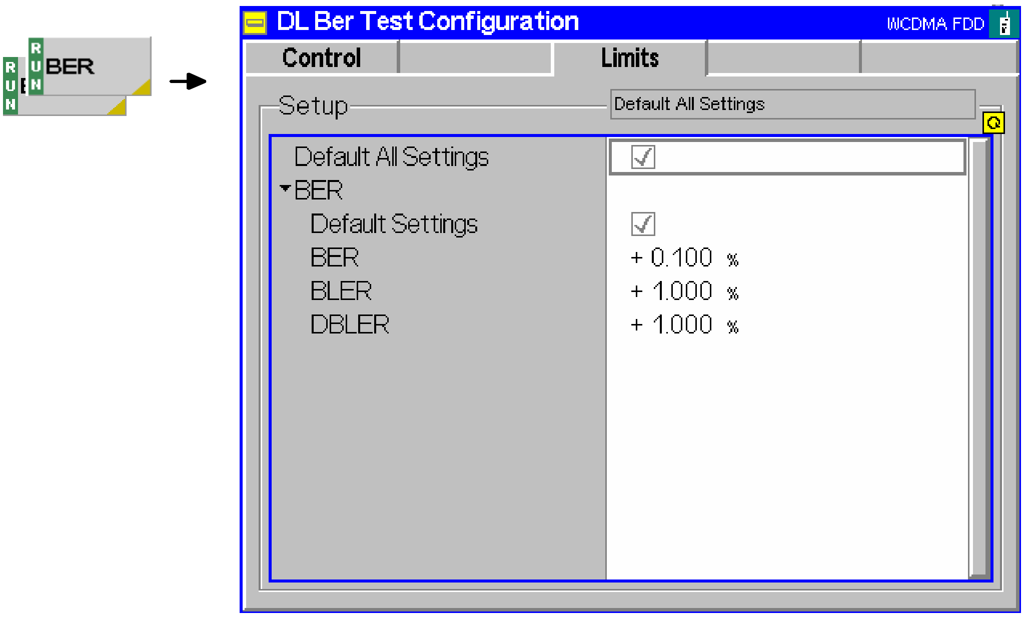


Fig. 4-45 DL BER Test Configuration – Limits

Default Settings The *Default* switches overwrite all settings in the *Control* tab with default values. The default values are quoted in the command description in chapter 6 of this manual.

Remote control
`DEFault:DLBer:BER:LIMit ON | OFF`

BER The *BER* section defines upper limits for the three different bit error rates and the remaining results obtained in the *DL BER Test* (see section *BER Results* on p. 4.88). All limits are in the value range 0% to 100%.

Remote control
```
CONFigure:DLBer:BER:CURRent:LIMit[:SCALar]:ASYMmetric
    :UPPer:VALue  <Limit_BER>, <Limit_BLER>, <Limit_DBLER>
```

RACH Preamble Test (Option R&S CMU-K71)

In the *RACH Preamble Test*the CMU sends a configurable sequence of RACH preambles and analyzes all received AICHs with regard to correct timing and signature. The measurement can be used to assess the Node B receiver and transmitter characteristics, performance and the receiver's ability to detect RACH preambles under static propagation conditions.

The structure of the *RACH Preamble Test* menu group is analogous to the TX measurements: The popup menu *RACH Preamble Test Configuration* is used to configure the RACH preamble sequence and the expected AICHS; the measurement results and the most important test settings are indicated in the main menu *RACH Preamble*.

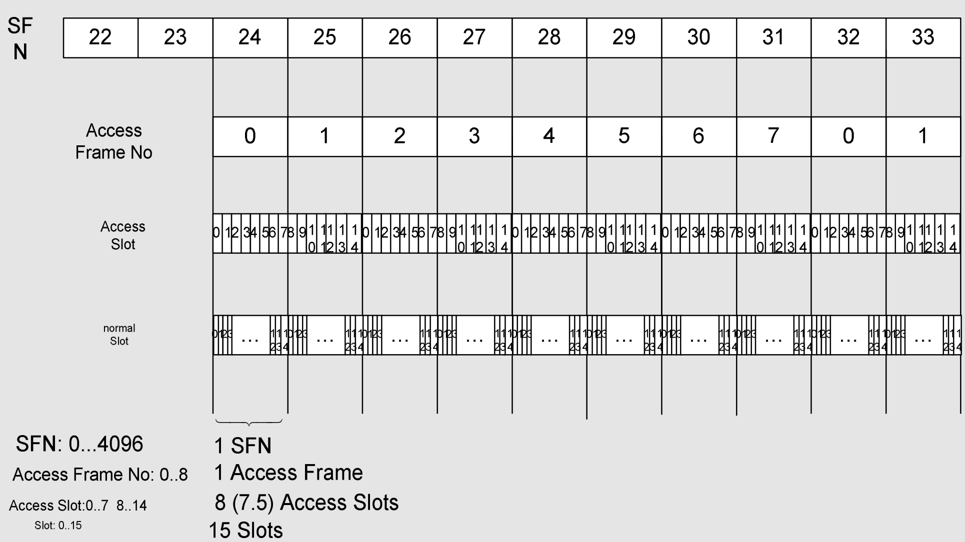
Principle of the measurement

The RACH preamble test is based on a comparison of Signature and timing of a configurable sequence of RACH preambles and the according information of all received AICHs, sent out by Node B as answers for RACH preambles. The sequence of RACH preambles can be configured by a number of total preambles that should be sent out and by a sequence of preambles with more detailed information that is repeated till the total number of preambles is reached. For such a preamble sequence an Access Frame number together with an Access Slot and a Signature can be defined for each preamble.

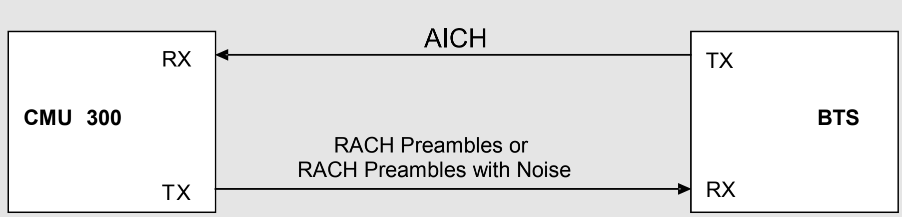
Exactly one preamble can be sent out per slot !

RACH Preamble tests

General structure of a timing pattern with respect to SFN, Access Frame and Access Slot.



The RACH Preamble Test is especially suitable to verify the ability of the Node B to detect RACH preambles and also for stress tests. In such a test scenario the Node B receives RACH preambles in UL from the R&S CMU and reacts by sending the corresponding AICHs to the tester.



In addition it is possible to impair the uplink signal in a controlled way using a superimposed AWGN contribution to vary the Signal to Noise Ratio E_c/N_0.

Probability of Preamble detection

The probability of preamble detection (P_d) is defined as a conditional probability of detection of one or a sequence of preambles when the signal is present. The probability of preamble false detection (P_{fa}) is defined as a conditional probability of erroneous detection of one or a sequence of preambles when input is only noise (see 3GPP TS 25.141).

To calculate the P_d the R&S CMU sets the number of *Correct AICHs* in relation to the number of preambles sent out so far. To obtain which AICH is correct and which is not, the R&S CMU compares on the one hand the transmitted RACH preamble Signature with the Signature of the received AICH and checks on the other hand the correct timing of the AICH. If both are identical the received AICH is declared to be a *Correct AICH*, otherwise the AICH is declared to be a *Wrong AICH*.

To calculate the P_{fa} the R&S CMU sets the number of *Wrong AICHs* in relation to the total number of Access Slots observed so far.

Performing a RACH Preamble Test

A RACH Preamble Test must be performed in the Synchronized signalling state with a BCH/SFN synchronization established. BCH/SFN synchronization is a prerequisite for proper decoding of the received AICHs. It is required for the test that the UL generator is switched OFF.

The test can largely be performed with default settings. To establish BCH/SFN synchronization the Node B settings must be in accordance with the DL WCDMA signal.

TIP

An example procedure for synchronization and Node B settings is reported on p. 4.115.

Measurement Menu (RACH Preamble Test)

The measurement menu *RACH Test* shows the results and the most important parameters of the RACH-preamble test.

- The measurement control softkey *Rach Preamble* controls the measurement, indicates its status *(RUN, HLT, OFF)* and opens the configuration menu *Rach Test Configuration*. The hotkeys associated with the measurement control softkey define the scope of the measurement.
- The softkeys *Application, Exp. Pow. Trigger, Node B Signal* and *Menus* on the right softkey bar are combined with various hotkeys. When a softkey is selected and an associated hotkey pressed, a popup window appears which indicates a setting or enables an entry.
- In the tables in the center of the menu, the test settings of the current *Rach Test* and the results are displayed.

The measurement menu *RACH Test* is opened from the main menu *Menu Select* (with the associated key at the front of the instrument) or from the menu group *WCDMA NODE B TX Test (3GPP/FDD)* using the hotkey *Rach Test*.

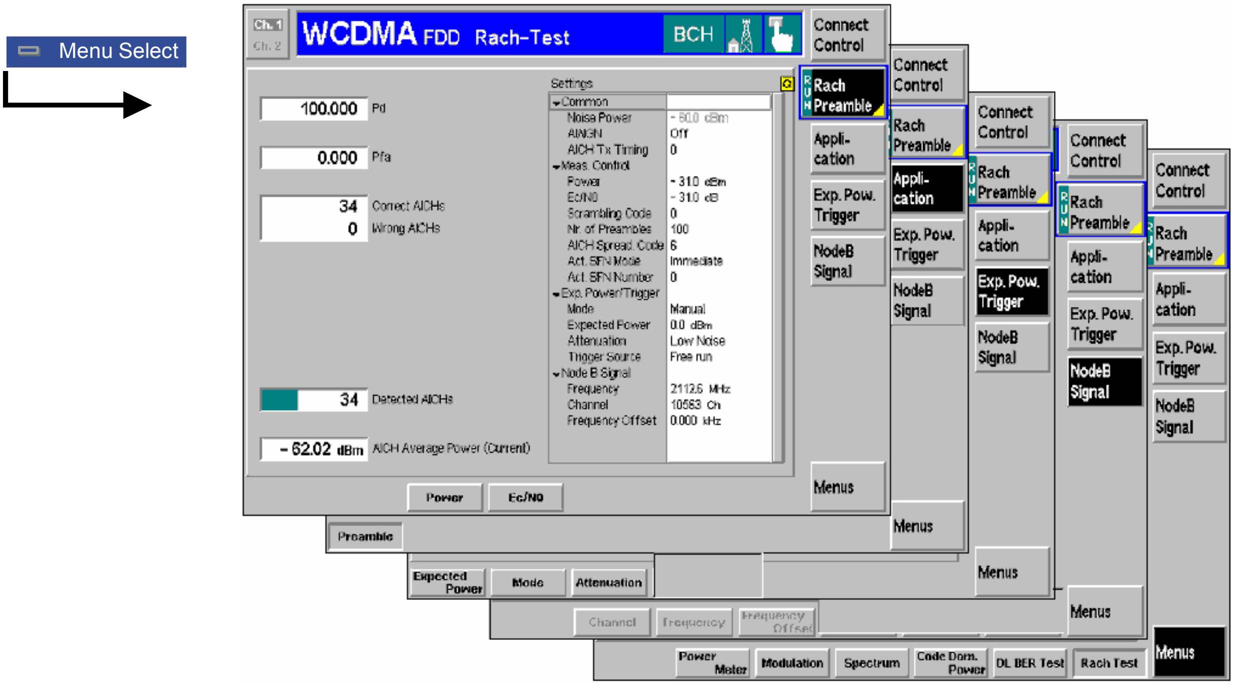


Fig. 4-46 RACH Test menu

Test Settings

The softkeys and hotkeys in the *RACH Test* menu provide the following settings.

Rach Preamble

The *Rach Preamble* softkey controls the measurement and indicates its status *(RUN | HLT | OFF*).

This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key.

Remote control

```
INITiate:RACH:PREamble
ABORt:RACH:PREamble
STOP:RACH:PREamble
CONTinue:RACH:PREamble
FETCh:RACH:PREamble:STATus?
```

Measurement configuration

Pressing the *Rach Preamble* softkey twice opens the popup menu *Rach Test Configuration*. Besides, the hotkeys *Power* and E_c/N_0 are associated with the *Rach Preamble* softkey. These hotkeys are also provided in the configuration menu; see section *Measurement Configurations (Rach Test Configuration)* on page 4.97.

Power

Specifies the preamble power for all RACH preambles that the R&S CMU transmits on the UL. The following formula describes the dependencies of the different Power settings for the RACH.

$$Power = E_c/N_0 + NoiseLevel$$

This means that if one of the values *Power* or *Noise Level* is changed, the other one is fixed and E_c/N_0 is automatically adapted according to the formula above. If the Signal to Noise ratio E_c/N_0 is changed explicitly, the *Noise Level* is kept constant and the *Power* is adapted automatically. The Power settings are described in more detail in sections *Measurement Control (Rach Test Configuration – Control)* see page 4.97.

Remote control
`CONFigure:RACH:PREamble:CONTrol:POWer <Level>`

E_c/N_0

Specifies the Signal to Noise Ratio that influences the RACH Signal the R&S CMU transmits on the UL. The Power settings are described in more detail in sections *Measurement Control (Rach Test Configuration – Control)* see page 4.97.

Remote control
`CONFigure:RACH:PREamble:CONTrol:ECN <Level>`

Application

The *Application* softkey selects the application of the *RACH Test*. At present only a single application *Rach Preamble* is available.

Exp. Pow. Trigger

The *Exp. Pow. Trigger* softkey controls the level in the RF input signal path for the measurement.

The expected power settings are general settings and therefore described in more detail in section *Connection Control (Non Signalling) – Analyzer Settings – Table-Oriented Version* and *Trigger (Connection Control – Trigger)* on p. 4.131.

Node B Signal

The *Node B Signal* softkey determines the center frequency of the RF analyzer. The frequency settings are general settings and therefore described in more detail in section *Downlink Signal (Connection Control – Node B Signal)* on p. 4.120.

Measurement Results

The *RACH Preamble* measurement results and the test settings are displayed in the measurement menu.

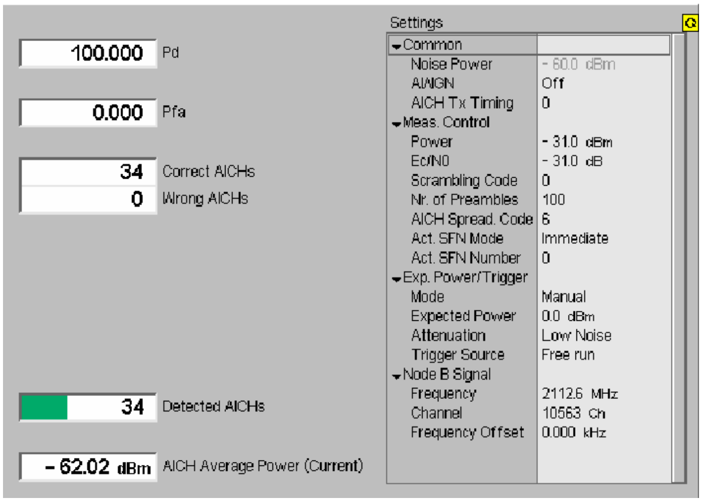


Fig. 4-47 Display of test settings and measurement results (RACH; Signalling)

Results

The output fields in the left half of the menu show the results of the *RACH Test*:

P_d	Probability of preamble detection, ratio of number of *Correct AICHs* to total number of preambles sent out so far.
P_{fa}	Probability of preamble false detection, ratio of *Wrong AICHs* to total number of *Access Slots* observed so far.
Correct AICHs	Number of received *AICHs* with correct *Signature* and correct timing.
Wrong AICHs$_a$	Number of received *AICHs* with wrong *Signature* or wrong timing.
Detected AICHs	Total number of received *AICHs*.
AICH Average Power	Ratio of *a*verage power of all received *AICHs* to total number of received *AICHs*.

A bar below the output tables indicates the relative measurement progress, i.e. the number of AICHs detected so far.

Settings

The *Settings* table gives an overview of the current measurement configuration. This includes the settings made via the softkeys and hotkeys of the *RACH Test* menu or in the *Control* tab of the configuration menu; see section *Measurement Configurations (Rach Test Configuration)* on page 4.97.

Remote control
See sections *Test Settings* on page 4.94 and *Measurement Configurations (Rach Test Configuration)* on page 4.97.

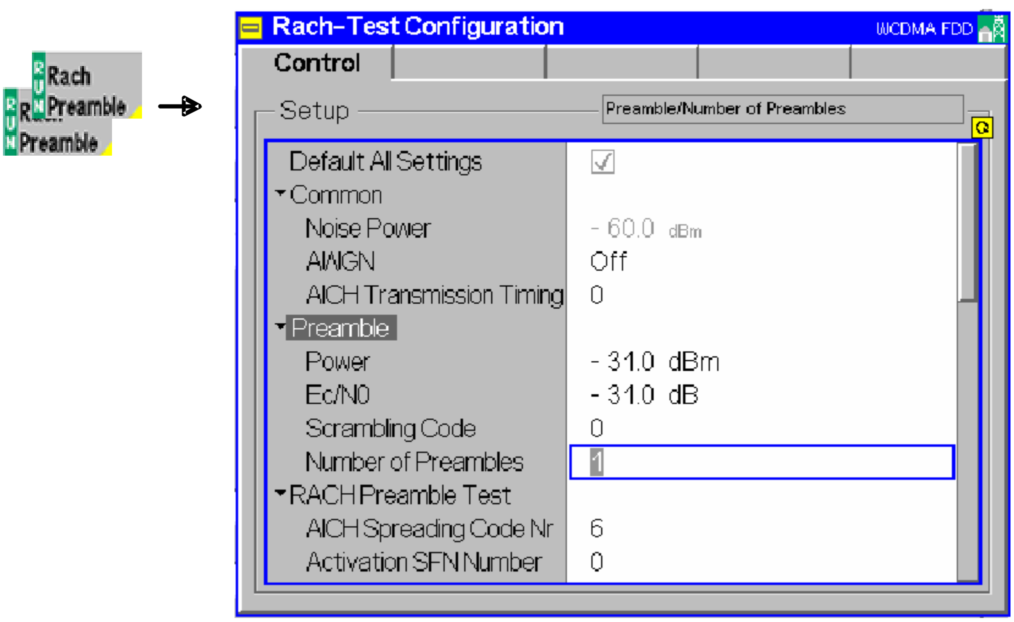
Measurement Configurations (Rach Test Configuration)

The popup menu *Rach Test Configuration* is opened by pressing the measurement control softkey *Rach Preamble* at the top right in the main menu *RACH Test* twice. It is possible to change between the two tabs in the menu by pressing the associated hotkeys.

Measurement Control (Rach Test Configuration – Control)

The *Control* tab controls the *RACH Test* by determining

- Common power settings *Noise Power, AWGN* and preamble-specific power settings *Power; Ec/N0;*
- The *AICH Transmission Timing*
- *Preamble*-specific settings; *Scrambling Code;* and *Number of Preambles*
- AICH-specific settings *AICH Spreading Code Nr.*
- Timing relevant parameters, start timing of transmission of first RACH preamble (*Activation SFN Number, Activation SFN Mode)*
- The *Nr .of Access Slots in List* together with the *Access Slots Table* which allows more detailed timing and Signature settings for an *AccessSlotList* sequence of preambles *(Access Frame No, Access Slot; Signature)*



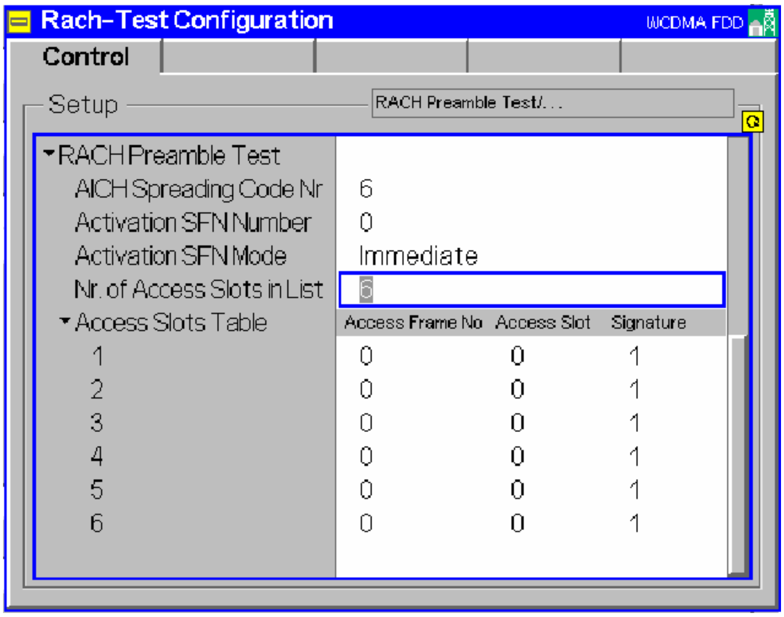


Fig. 4-48 RACH Test – Control (Signalling)

Default The *Default* switches overwrite all settings in the *Control* tab with default values. The default values are quoted in the command description in chapter 6 of this manual.

Remote control
–

Power settings The *Power settings* are necessary for the adjustment of different Power Levels and AWGN to the conditions of the *RACH preamble* test; see *RACH Preamble Test* on p. 4.92 ff:

Power Defines the transmit power of all RACH preambles (a possible AWGN contribution is not included).

E_c/N_0 Defines the ratio E_c/N_0 (energy per chip/Noise). This corresponds to the Signal to Noise Ratio. If *AWGN* is enabled this parameter is selectable by the user, otherwise the value of this parameter is equal to the *Preamble Power Level.*

AWGN Switches the Additional White Gaussian Noise contribution to the RACH signal on or off. The AWGN represents an interfering signal of variable level which impairs the RACH signal in a controlled way.

An AWGN contribution is required for several tests described in the conformance specification 3GPP TS 25.141.

Noise Level Determines the absolute AWGN level (if *AWGN* is switched *On)*.

The *Preamble Power,* the E_c/N_0 and the *Noise Level* depend on each other. On changing one value, the other one is automatically adapted. See description of the *Power* softkey on p. 4.94.

Remote control

```
CONFigure:RACH:COMMon:CONTrol:NPOWer <Level>
CONFigure:RACH:COMMon:CONTrol:AWGN ON| OFF
CONFigure:RACH:PREamble:CONTrol:POWer <Level>
CONFigure:RACH:PREamble:CONTrol:ECN <Level>
```

AICH Transmission Timing

The *AICH Transmission Timing* parameter defines the distance between preamble and message part. Possible values are 0 which corresponds to a value of 3 Access Slots (7680 chips) or 1 which corresponds to a value of 4 Access Slots (10240 chips) For the described RACH preamble test this parameter is not used, because no message part is transmitted.

Remote control
`CONFigure:RACH:COMMon:CONTrol:ATTiming 0|1`

AICH Spreading Code Nr.

The AICH Spreading Code Nr. parameter defines the Spreading code number for all expected AICHs.

Remote control
`CONFigure:RACH:PREamble:CONTrol:ASCNumber <SpreadingCodeNum>`

Preamble Scrambling Code

The *Preamble Scrambling Code* parameter defines the Scrambling Code for all RACH preambles that will be sent.

Remote control
`CONFigure:RACH:PREamble:CONTrol:SCODe <ScramblingCode>`

Number of Preambles

The *Number of Preambles* parameter defines the total number of RACH preambles that will be sent out.

Remote control
`CONFigure:RACH:PREamble:CONTrol:NRPReambles <Number>`

Activation SFN Activation SFN Mode

The *Activation SFN and Activation SFN Mode* parameters define the starting time of the first RACH preamble. The timing of all other preambles is defined by the *AccessSlotList.*

Activation SFN	Start SFN for first preamble. This SFN has to be a multiple of 8. It is valid *for Activation SFN Mode SFN Number*.
Activation SFN Mode	Settings *Immediate* and *SFN Number* are possible. *Immediate* means that the sending of the RACH preambles is started as soon as possible. *SFN Number* means that the sending is started at the SFN chosen for *Activation SFN*.

Remote control
`CONFigure:RACH:PREamble:CONTrol:SFNNumber 0|8|16|24|…|4092`
`CONFigure:RACH:PREamble:CONTrol:SFNMode SFNNr | IMMed`

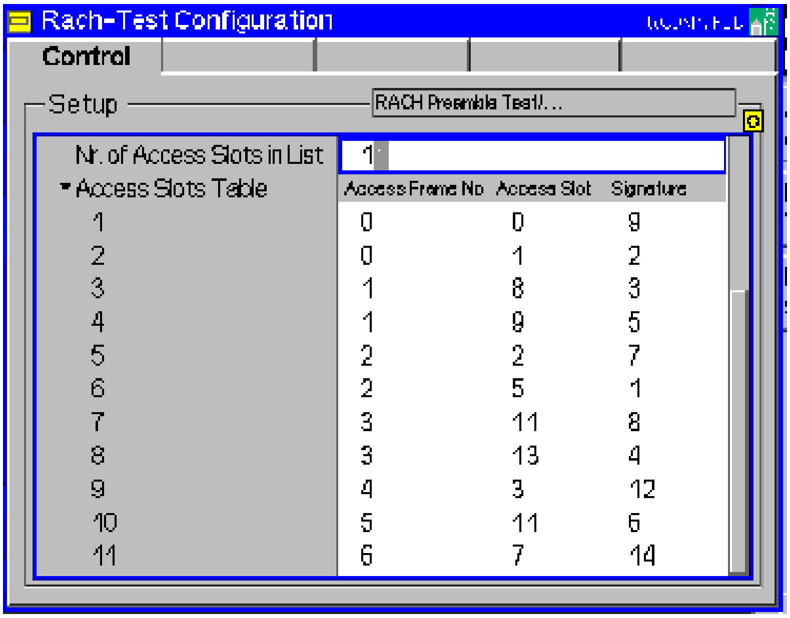
Access Slots Table

The *Access Slots Table* defines for a sequence of maximum 64 preambles the detailed timing and Signatures. The number of preambles in the sequence is defined by the parameter *Nr. of Access Slots in List.* The timing relevant parameters in the *Access Slots Table* are *Access Frame No*. and *Access Slot.* Detailed timing pattern see *RACH Preamble Test* on p. 4.92. The signature-specific parameter in the *Access Slots Table* is called *Signature.* It is possible to create a preamble sequence with up to 64 predefined preambles; this sequence will be repeated until the total amount of preambles to be transmitted is reached.

Access Frame No	Number of Access Frame for a preamble to be sent
Access Slot (AS)	Access Slot for a preamble to be sent
Signature	Signature for a preamble to be sent.

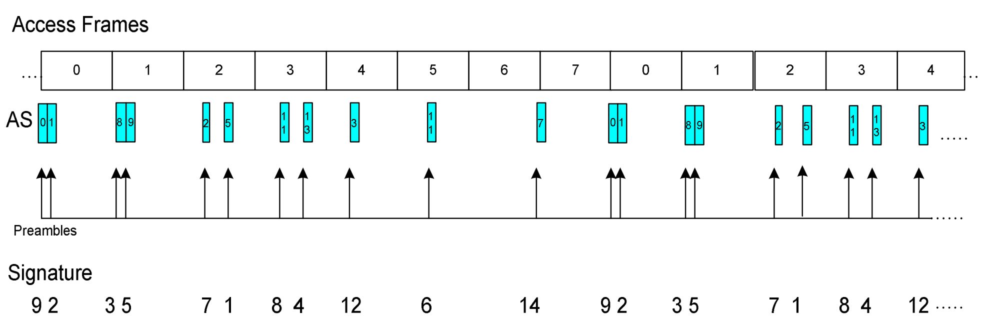
Example:

(1) For a total preamble number of 1000, a sequence of 11 preambles is defined as follows.



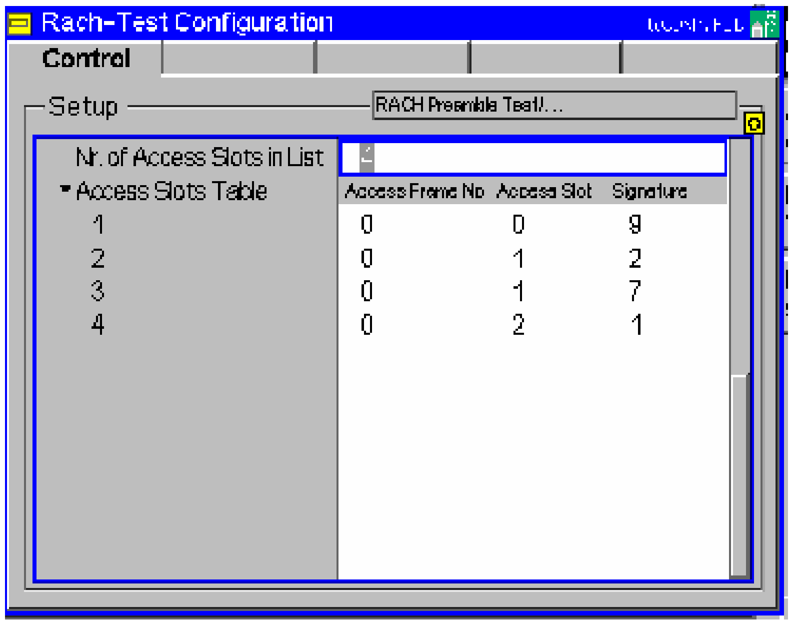
	Access Frame No	Access Slot	Signature
1	0	0	9
2	0	1	2
3	1	8	3
4	1	9	5
5	2	2	7
6	2	5	1
7	3	11	8
8	3	13	4
9	4	3	12
10	5	11	6
11	6	7	14

Consequently the timing for the preambles in this case looks like:

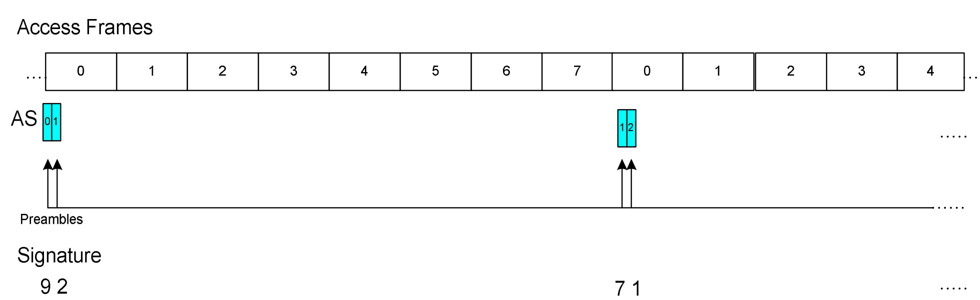


This sequence is repeated until 1000 RACH preambles have been sent.

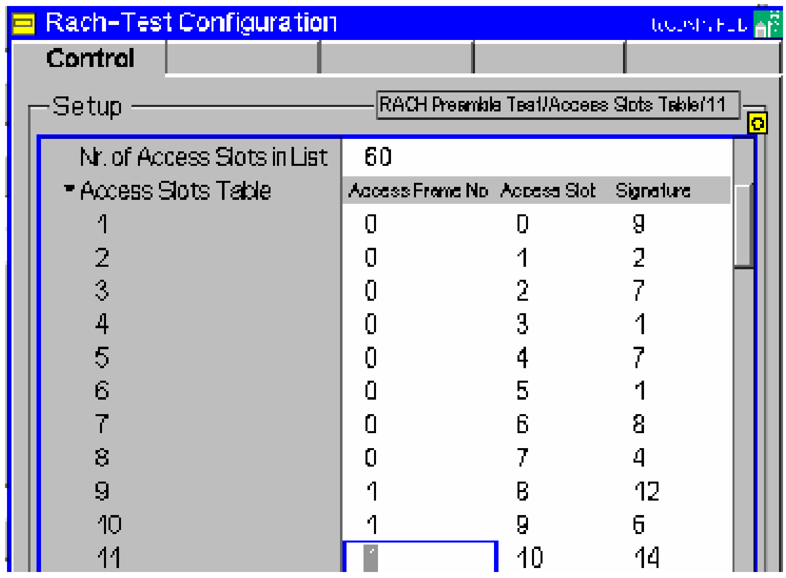
(2) Only one RACH preamble per Access Slot can be sent. If two or more preambles are configured to be sent at the same Access Frame No. and Access Slot, the second preamble is shifted about 8 frames to the first one, the next one further 8 frames, and so on.

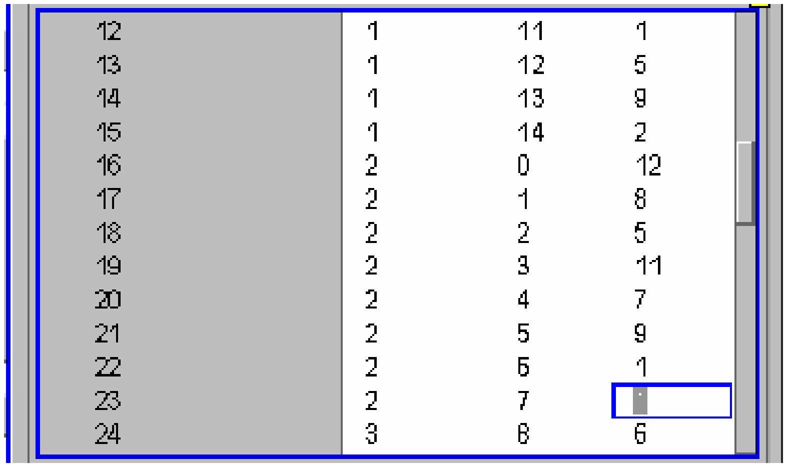


Consequently the timing for the preambles in this case looks like:

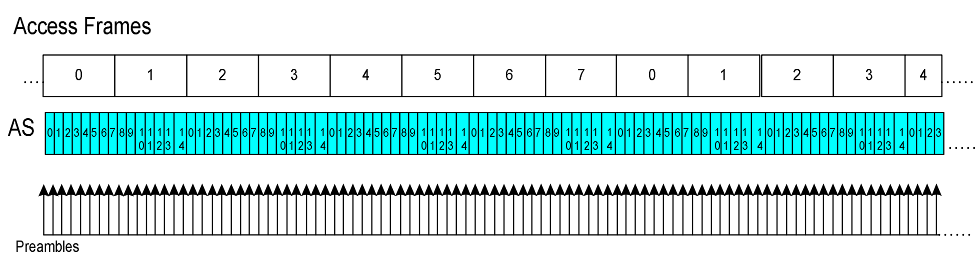


(3) Stress test for RACH (sending continuously a RACH preamble at each Access Slot for a large number of preambles)





12	1	11	1
13	1	12	5
14	1	13	9
15	1	14	2
16	2	0	12
17	2	1	8
18	2	2	5
19	2	3	11
20	2	4	7
21	2	5	9
22	2	6	1
23	2	7	
24	3	8	6



A lot of other different varieties to set up RACH preambles are possible.

Remote control

```
CONFigure:RACH:PREamble:CONTrol:NASList <Number>
CONFigure:RACH:PREamble:CONTrol:ASTable<Nr> <AccessFrame>,
<AccessSlot>, <Signature>
```

HSDPA Analyzer (Option R&S CMU-K72)

In the *HSDPA* test the CMU decodes the DL HS-SCCH channels, evaluates the decoded information, and calculates the data throughput of the associated HS-PDSCHs. The measurement is available with option R&S CMU-K72, *DL HSDPA Analyzer*. The HS-SCCH and HS-PDSCH information is displayed in two different applications.

The popup menu *HSDPA Configuration* is used to configure the measurement.

HS-SCCHs and HS-SCCH sets

The HS-SCCH is a downlink physical channel that carries signalling information related to HS-DSCH transmission. This includes the channelization code set, the modulation scheme, the transport block size, and H-ARQ related information (see standard 3GPP TS 25.308).

In each HSDPA subframe the HS-SCCH contains a UE-ID that identifies the UE for which it is carrying the information necessary for decoding the HS-PDSCH. If a UE detects that one of the monitored HS-SCCHs carries consistent control information, it starts receiving the HS-PDSCHs indicated by this control information.

A HS-SCCH set is a set of 1 to 4 HS-SCCHs which is allocated to a UE. There can be multiple HS-SCCH sets in one cell, however, only a single HS-SCCH set is allocated to the UE at a given time. The UE continuously monitors all the HS-SCCHs in the allocated set.

Principle of the measurement

The R&S CMU 300 monitors up to four HS-SCCHs in the DL signal for a configurable set of UE-IDs. HS-SCCHs with matching UE ID are decoded, and the signalling information for a sequence of consecutive HSDPA subframes is stored.

From the HS-SCCH signalling information the R&S CMU calculates the transport block size and the net data rate of the HS-PDSCHs associated with the HS-SCCHs:

<data rate> = <transport block size> in kbit / 2ms,

where 2 ms is the length of a HSDPA subframe. The signalling information also indicates whether a transport block contains new data or whether it is retransmitted. Retransmitted blocks contribute to the data rate but not to the throughput.

The R&S CMU shows a graphical overview of the data rates and throughputs for all selected UE IDs and performs a statistical evaluation. The sum of the individual throughputs represents the cell throughput for configurations with up to 4 HS-SCCHs.

Performing a HSDPA Test

A HSDPA Test must be performed in the *Synchronized* signalling state with a BCH/SFN synchronization established. BCH/SFN synchronization is a prerequisite for proper decoding of the received HS-SCCH.

The test can largely be performed with default settings. To establish BCH/SFN synchronization the Node B settings must be in accordance with the DL WCDMA signal.

TIP An example procedure for synchronization and Node B settings is reported on p. 4.115.

To prepare a HSDPA test proceed as follows:

1. Establish BCH/SFN synchronization; see above.
2. In the *Network* tab of the *Connection Control* menu, select *Node B Settings: – DL Operation Mode: HSDPA.*
3. In the *HSDPA Channels* section of the same tab, adjust the expected channelization codes of the HS-SCCHs to your DL signal configuration.
4. Close the *Connection Control* menu and press the *Menus* softkey twice to select the *HSDPA* menu group.

Measurement Menu (HSDPA)

The *HSDPA* measurement menu shows the results and the most important parameters of the HSDPA tests.

- The measurement control softkey *HS-SCCH Info* (which changes to *HS-PDSCH Throughput* if this application is active) controls the measurement, indicates its status *(RUN, HLT, OFF)* and opens the configuration menu *HSDPA Configuration*. The hotkeys associated with the measurement control softkey define the scope of the measurement.
- The softkeys *Application, Exp. Pow. Trigger, Node B Signal, UE Signal,* and *Menus* on the right softkey bar are combined with various hotkeys. When a softkey is selected and an associated hotkey is pressed, a popup window appears which indicates a setting or enables an entry.
- In the tables in the center of the menu, the test settings of the current HSDPA test and the results are displayed.

The *HSDPA* measurement menu is opened from the main menu *Menu Select* (with the associated key at the front of the instrument) or from the menu group *WCDMA NODE B TX Test (3GPP/FDD)* using the hotkey *HSDPA*.

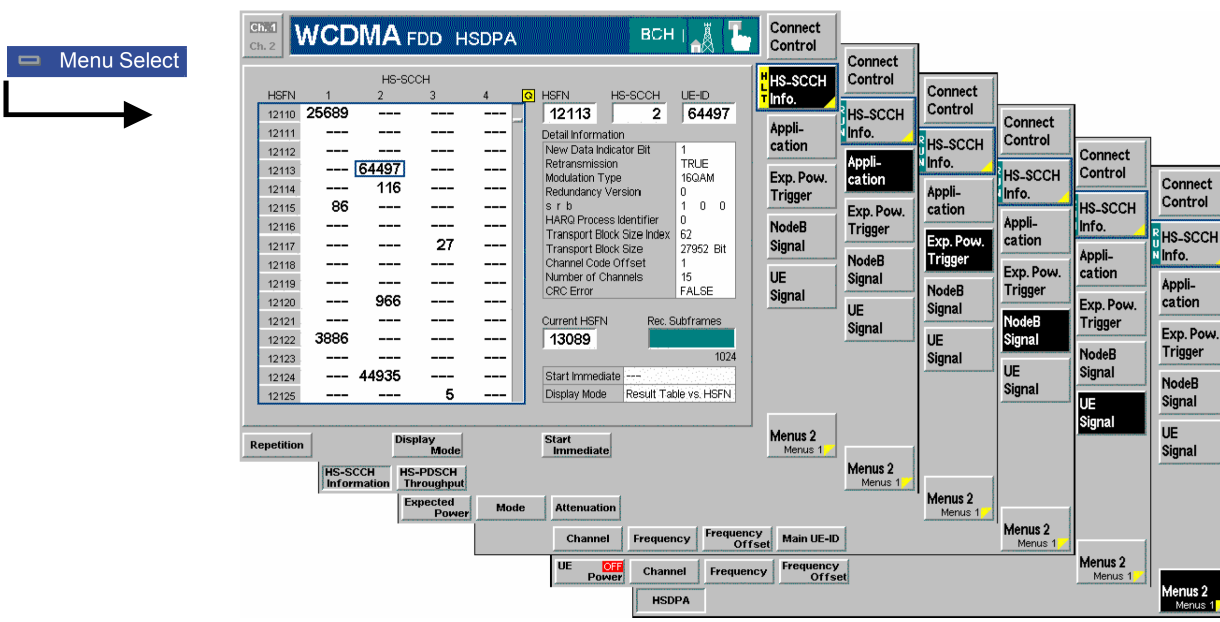


Fig. 4-49 HSDPA menu

Test Settings

The softkeys and hotkeys in the *HSDPA* menu provide the following settings.

HS-SCCH Info

The *HS-SCCH Info* softkey (which changes to *HS-PDSCH Throughput* if this application is active) controls the measurement and indicates its status *(RUN | HLT | OFF)*. This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The status can be set independently for all *HSDPA* applications.

The active application generally suspends the other applications. On switchover between different applications, the selected measurement status of each application is stored and will be put into effect as soon as the application is activated. In particular, an application in the status *RUN* is restarted each time it is activated.

Remote control
```
INITiate:HSDPa:<Application>
ABORt:HSDPa:<Application>
STOP:HSDPa:<Application>
FETCh:HSDPa:<Application>:STATus?
<Application> = HINFormation | HTHRoughput
```

Measurement configuration

Pressing the measurement control softkey twice opens the popup menu *HSDPA Configuration*. Besides, hotkeys defining the scope of the measurement are associated with the measurement control softkey. These hotkeys are also provided in the configuration menu; see section *Measurement Control (HSDPA Configuration – Control)* on p. 4.112.

Application

The *Application* softkey selects the HSDPA test application. Two different applications are available.

HS-SCCH Information

The *HS-SCCH Information* hotkey selects the application where the R&S CMU monitors the HS-SCCHs for a configurable set of UE-IDs and displays the decoded information.

Remote control:
The *HS-SCCH Information* application is selected by the keyword `:HINFormation` in the 3rd level of the `:HSDPa` commands, e.g. `CONFigure:HSDPa :HINFormation...`

HS-PDSCH Throughput

The *HS-PDSCH Throughput* hotkey selects the application where the R&S CMU analyzes the HS-SCCH information in order to calculate the HS-PDSCH data throughput for a configurable set of UE-IDs.

Remote control:
The *HS-PDSCH Throughput* application is selected by the keyword `:HTHRoughput` in the 3rd level of the `:HSDPa` commands, e.g. `CONFigure:HSDPa :HTHRoughput...`

Exp. Pow. Trigger

The *Exp. Pow. Trigger* softkey controls the level in the RF input signal path for the measurement.

The expected power settings are general settings and therefore described in more detail in section *Connection Control (Non Signalling) – Analyzer Settings – Table-Oriented Version* and *Trigger (Connection Control – Trigger)* on p. 4.131.

Node B Signal

The *Node B Signal* softkey determines the center frequency of the RF analyzer. The frequency settings are general settings and therefore described in more detail in section *Downlink Signal (Connection Control – Node B Signal)* on p. 4.120.

UE Signal

The *UE Signal* softkey controls the uplink WCDMA (UE) signal generator and sets the RF frequency. The settings are general and therefore also provided in the Connection Control menu. They are described in more detail in section *Uplink Signal (Connection Control – UE Signal)* on p. 4.125.

Display

The hotkeys associated with the *Display* softkey set the scale of the bar diagram in the *HS-PDSCH Throughput* application (see section *Measurement Control (HSDPA Configuration – Control)* on p. 4.112).

Measurement Results

The *HSDPA* menu group contains two separate measurement menus corresponding to the two applications *HS-SCCH Information* and *HS-PDSCH Throughput*.

HS-SCCH Information Results

The *HS-SCCH Information* measurement results are displayed in several output fields and tables.

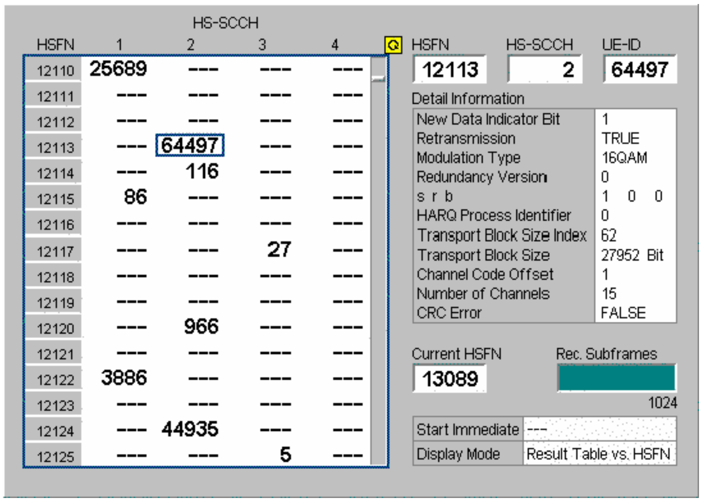


Fig. 4-50 Display of measurement results (HS-SCCH Information)

HS-SCCH Overview

The output table in the left half of the menu gives an overview of the detected UE-IDs in the HS-SCCHs. The channelization codes of the HS-SCCHs must comply with the settings in the *HSDPA Channels* section of the *Connection Control – Node B Signal* tab.

The UE-IDs carried by different HS-SCCHs are equal if the HS-SCCHs belong to the same HS-SCCH set (see background information in section *HSDPA Analyzer (Option R&S CMU-K72)* on p. 4.103). The UE-IDs are decoded in each HSDPA subframe, comprising 3 slots or 1/5 of a WCDMA frame. The HSDPA Subframe Number *(HSFN,* in the range 0 to 20479 corresponding to frame numbers 0 to 4095) appears in the first column of the table.

The following settings in the configuration menu (see section *Measurement Control (HSDPA Configuration – Control)* on p. 4.112) modify the contents of the table:

- To limit the number of detected UEs and pre-select a particular set of UE-IDs, it is possible to define a *UE-ID Index Table.* Only IDs in the table will be displayed.
- The *Display Mode* specifies whether the rows with invalid IDs are omitted.
- The *Start Mode* defines whether the table starts immediately, at a definite HSFN, or at a definite detected UE-ID.

It is possible to select a particular HSFN/HS-SCCH entry using the cursor keys or the rotary knob. The output fields in the right half on the table show the decoded HS-SCCH information of the selected entry. The information is updated every time the rotary knob is pressed.

Remote Control
`READ:ARRAY:HSDPa:HINFormation:ALL? etc.`
`READ:ARRAY:HSDPa:HINFormation:HSSCch<no>? etc.`

Detailed Information

The output fields labeled *HSFN, HS-SCCH,* and *UE-ID* in the right half of the table show the parameters of the entry selected in the HS-SCCH table. Below the decoded HS-SCCH information *(Detail Information)* is displayed (unless a CRC error is detected; see below).

New Data Indicator Bit	One-bit value, changes whenever a block containing new data is transmitted.
Retransmission	One-bit value *(TRUE* or *FALSE),* indicates initial transmissions and retransmissions. This information is derived from the *New Data Indicator Bit*.
Modulation Type	Modulation type of the HS-PDSCH, either QPSK or 16QAM modulation.
Redundancy Version	Redundancy version X_{rv}; see background information on RV coding sequences below.
s r b	Redundancy version parameters s and r and constellation version parameter b; see background information on RV coding sequences below.
HARQ Process Identifier	No. of the Hybrid ARQ (Automatic Repeat Request) process for retransmission in the range 1 to 8.
Transport Block Size Index	Value of the Transport Format and Resource Indicator (TFRI) in the range between 0 and 62; see background information below.
Transport Block Size	Number of bits per transports blocks, calculated from the transport block size index (see background information below). The data rate is equal to the transport block size times the duration of a HSDPA subframe.
Channel. Code Offset	HS-PDSCH start code. HS-PDSCH channelization codes are allocated contiguously from a signalled start code to a signalled stop code.
Number of Channels	Number of HS-PDSCH allocated to the UE; stop code minus start code plus 1.
CRC Error	Detection of a CRC error on the HS-SCCH (FALSE or TRUE). A UE decodes no data and sends no status report if it detects a CRC error. Consequently, if the CRC Error flag is TRUE, all other detailed information fields show invalid results (“---“).

Remote Control
`READ:ARRAY:HSDPa:HINFormation:ALL? DINFormation etc.`
`READ:ARRAY:HSDPa:HINFormation:HSSCch<no>? DINFormation etc.`

Measurement progress and settings

The output fields below the *Detail Information* show the measurement progress, i.e. the currently measured HSFN and the number of recorded (and decoded) subframes relative to the number of frames decoded in a single shot measurement (1024 frames; the single shot or continuous *Repetition Mode* can be set in the *HSDPA Configuration* menu).

The *Start Mode* and the *Display Mode* displayed below are also set in the *HSDPA Configuration* menu (see section *Measurement Control (HSDPA Configuration – Control)* on p. 4.112).

Remote Control
`READ[:SCALar]:Hsdpa:HINFormation:RSUBframes? etc.`

Transport Block Size Index (k_i)

The TFRI includes information about the dynamic part of the HS-DSCH transport format, including transport block size and modulation scheme. The TFRI also includes information about the set of physical channels (channelization codes) onto which HS-DSCH is mapped in the corresponding HS-DSCH TTI. The CMU uses the k_i value to calculate the *Transport Block Size* according to standard TS 25.321.

The same TFRI k_i can indicate different transport block sizes depending on the modulation scheme and the number of channelization codes used.

Table according to 3GPP TS 25.321, extract from QPSK section

Combination	*Mod. Scheme*	*No. of channelization codes*	$k_{0,i}$
0	*QPSK*	*1*	*1*
1		*2*	*40*
2		*3*	*63*
3		*4*	*79*
…		*…*	*…*

First step:

Modulation scheme and number of channelization codes as signalled on HS-SCCH determine value $k_{0,i}$.

Table according to 3GPP TS 25.321, 254 entries in total

Index k_t	*TB Size*	*Index* k_t	*TB Size*	*Index* k_t	*TB Size*
1	*137*	*86*	*1380*	*171*	*6324*
2	*149*	*87*	*1405*	*172*	*6438*
3	*161*	*88*	*1430*	*173*	*6554*
…	*…*	*…*	*…*	*…*	*…*

Second step:

Index $k_t = k_i + k_{0,i}$ determines HS-DSCH transport block size.

RV Coding Sequences

RV coding sequences define the retransmissions of the HSDPA packets. The format of the coding sequences is $\{X_{rv,0}, \ldots, X_{rv,N}\}$ where any of the X_{rv} values is a 3-bit number encoding the redundancy version (for QPSK and 16 QAM modulation) and the constellation version (for 16 QAM modulation only). N denotes the number of retransmissions and is (for real UTRANs) in the range between 0 (no transmission, as in {0}) and 3 (initial transmission and 3 retransmissions). The R&S CMU provides an *Edit Mode* with up to 7 retransmissions; see below.

According to standard 3GPP TS 25.222 the individual transmissions depend on the redundancy version parameters s and r and the constellation version parameter b where:

- s can take on the value 0 or 1 to distinguish whether systematic bits (s = 1) or non systematic bits (S = 0) are prioritized in the HARQ second rate matching stage.
- r (range 0 to 3 for QPSK, 0 to 1 for 16 QAM) changes the initial error variable in the case of puncturing and influences the repetition algorithm defined in standard 3GPP TS 25.212 (if repetition is used instead of puncturing).
- b (range 0 to 3) describes the constellation re-arrangement for 16 QAM.

Example 1: The RV coding sequence {0,2,5,6} for a QPSK-modulated Fixed Reference Channel (FRC) denotes one initial transmission and 3 retransmissions with different redundancy version parameters r and s.

	X_{rv}	s	r
Initial transmission ⇨	0	1	0
	1	0	0
First retransmission ⇨	2	1	1
	3	0	1
	4	1	2
Second retransmission ⇨	5	0	2
Third retransmission ⇨	6	1	3
	7	0	3

Example 2: The RV coding sequence {6,0,4,5} for a 16 QAM-modulated channel denotes one initial transmission and 3 retransmissions with 4 different constellation version parameters b. The redundancy version parameters r and s are equal for all transmissions (Chase combining).

	X_{rv}	s	r	b
First retransmission ⇨	0	1	0	0
	1	0	0	0
	2	1	1	1
	3	0	1	1
Second retransmission ⇨	4	1	0	1
Third retransmission ⇨	5	1	0	2
Initial transmission ⇨	6	1	0	3
	7	1	1	0

HS-PDSCH Throughput Results

The *HS-PDSCH Throughput* measurement results are displayed in a bar graph and several output fields and tables.

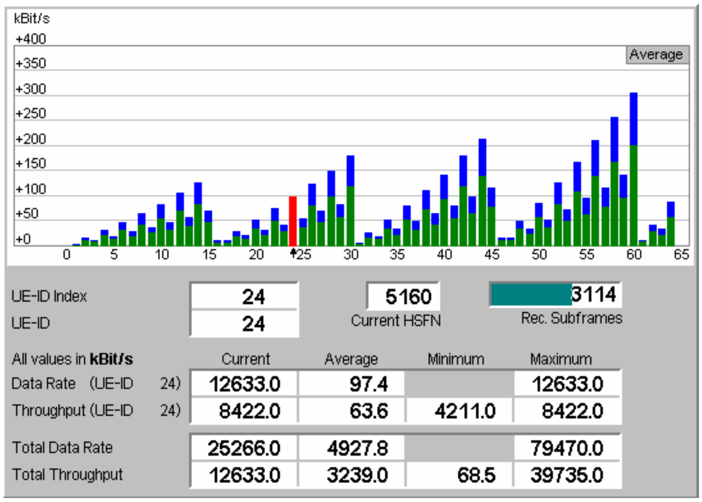


Fig. 4-51 Display of measurement results (HS-PDSCH Throughput)

Bar graph

The bar graph in the upper part of the menu gives an overview of the HS-PDSCH throughput and data rate for all detected UE-IDs. The throughput (i.e. the effective bit rate available to the user) and the data rate (the number of transmitted bits including retransmissions) are calculated from the decoded HS-SCCH parameters; see description in the introductory section *HSDPA Analyzer (Option R&S CMU-K72)* on p. 4.103. The throughput is always smaller than or equal to the data rate.

The colors of the bars have the following meaning:

- The green portion of each bar denotes the throughput.
- The blue portion denotes the data rate.
- The red bar denotes the selected *UE-ID Index* (see *HS-PDSCH Throughput – UE-ID Index* or configuration menu). The actual *UE-ID* corresponding to the *UE-ID Index* is read from the *UE-ID Index Table* in the configuration menu. The values in the *Throughput* table in the lower part of the diagram correspond to this actual *UE-ID.*

The following additional settings in the configuration menu (see section *Measurement Control (HSDPA Configuration – Control)* on p. 4.112) modify the contents of the table:

- To limit the number of detected UEs and pre-select a particular set of UE-IDs, it is possible to define a *UE-ID Index Table.* The number of bars is equal to the number of UE-IDs in the table.
- The *Display Mode* and the *Repetition Mode* specify the scope of the measurement. *Current* results correspond to a single HSFN, therefore the maximum number of bars is four.
- The *Start Mode* defines whether the display of results starts immediately, at a definite HSFN, or at a definite detected UE-ID.
- The *Grid* and *Scale* settings change the appearance of the diagram.

Remote Control

```
READ:ARRay:HSDPa:HTHRoughput:DRATe?  etc.
READ:ARRay:HSDPa:HTHRoughput:DRATe:CURRent?  etc.
READ:ARRay:HSDPa:HTHRoughput:DRATe:AVERage? etc.
READ:ARRay:HSDPa:HTHRoughput:THRoughput?  etc.
READ:ARRay:HSDPa:HTHRoughput:THRoughput:CURRent?  etc.
READ:ARRay:HSDPa:HTHRoughput:THRoughput:AVERage? etc.
```

Output fields

The output fields below the bar graph show the selected *UE-ID Index* (see *HS-PDSCH Throughput – UE-ID Index* or configuration menu), the actual *UE-ID* read from the *UE-ID Index Table* in the configuration menu, and the measurement progress.

The measurement progress is monitored by the currently measured HSFN and the number of recorded (and decoded) subframes relative to the number of frames decoded in a single shot measurement (the single shot or continuous *Repetition Mode* can be set in the *HSDPA Configuration* menu).

Remote Control
```
READ[:SCALar]:Hsdpa:HINFormation:RSUBframes? etc.
```

Output table

The output tables in the lower part of the menu present a statistical evaluation of the throughput and data rate for the selected UE-ID and for all decoded UE-IDs *(Total* results). *Current, Average, Minimum,* and *Maximum* values for a single UE-ID are calculated as follows:

- The *Current* results correspond to the sum of all HS-SCCHs with the selected UE ID in a subframe, i.e. to the sum of one to four different channels.
- The *Average* results correspond to the exact arithmetic mean value of the current results over a measurement cycle *(Rec. Subframes Single* or *Rec. Subframes Cont.,* depending on the *Repetition* mode).
- Minimum and Maximum are also referenced to the measurement cycle. The expected *Minimum* results are zero, therefore the *Minimum* column shows the measured non-zero minimum results. The minimum data rate is equal to the minimum throughput and therefore not displayed.

Single Shot measurement results are continuously updated until the *Rec. Subframes Single* have been measured; *Continuous* results are updated after each *Rec. Subframes Cont.* period.

The retransmission information is derived from the *New Data Indicator Bit* and therefore undetermined in the first decoded subframe. This introduces an uncertainty for the initial throughput value.

Remote Control
```
READ:ARRay:HSDPa:HTHRoughput:DRATe?  etc.
READ:ARRay:HSDPa:HTHRoughput:DRATe:CURRent?  etc.
READ:ARRay:HSDPa:HTHRoughput:DRATe:AVERage? etc.
READ:ARRay:HSDPa:HTHRoughput:THRoughput?  etc.
READ:ARRay:HSDPa:HTHRoughput:THRoughput:CURRent?  etc.
READ:ARRay:HSDPa:HTHRoughput:THRoughput:AVERage? etc.
READ[:SCALar]:HSDPa:HTHRoughput:TOTal? etc.
```

Measurement Configurations (HSDPA Configuration)

The popup menu *HSDPA Configuration* is opened by pressing the measurement control softkey in the *HSDPA* menu twice.

Measurement Control (HSDPA Configuration – Control)

The *Control* tab provides the following HSDPA test settings:

- The start condition for the measurement *(Start Mode)*
- The decoded UE-IDs *(Nr. of UE-IDs, UE-ID Index Table, UE-ID Index)*
- The scope of the measurement *(Repetition, Display Mode, Rec. Subframes…)*
- Display settings for the tables and diagrams *(Display Mode, Grid, Scale)*

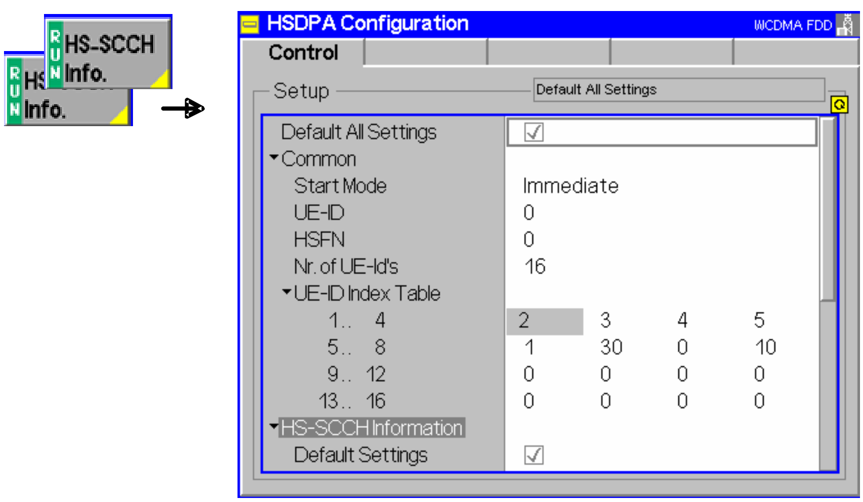


Fig. 4-52 HSDPA Test – Control (Signalling)

Default The *Default* switches overwrite all settings in the *Control* tab with default values. The default values are quoted in the command description in chapter 6 of this manual.

Remote control
–

Common Defines settings for both HSDPA applications.

Start Mode Defines whether the display of measurement results starts *Immediately* (irrespective of the HSFN or UE-ID), at a definite *HSFN*, or at a definite detected *UE-ID*. In the *UE-ID Scan,* the R&S CMU first detects the active UE-IDs in the cell and then starts the measurement on the detected UE-IDs (no remote control, see background information below).

UE-ID UE-ID for *Start Mode: UE-ID.*

HSFN HSDPA System Frame Number for *Start Mode: HSFN*.

Nr. of UE-IDs Total number of analyzed UE-IDs. This value determines the length of the *UE-ID Index Table.*

UE-ID Index Table Array of user-defined UE-ID values. The length of the array is given by the *Nr. of UE-IDs.* The first, non-editable value is equal to the *Main UE-ID (Node B Signal – Main UE-ID*; see p.

4.124). The remaining values can be changed. In the *HS-SCCH Information* application, all UE-IDs in the index table are evaluated. In the *HS-PDSCH Throughput* application, the number of bars corresponds to the *Nr. of UE-IDs;* the actual IDs are read from the index table.

NOTE

It is recommended to avoid multiple entries of the same UE-ID in the UE-ID index table. The HS-PDSCH Throughput *application will show results for the first entry only; the following bars with the same UE-ID will be empty.*

Remote control

```
CONFigure:HSDPa:CONTrol:SMODe
CONFigure:HSDPa:CONTrol:UEID
CONFigure:HSDPa:CONTrol:HSFN
CONFigure:HSDPa:CONTrol:NRUeid
CONFigure:HSDPa:CONTrol:UITable<no>
CONFigure:HSDPa:CONTrol:UITable:ALL
```

UE-ID Scan

The UE-ID scan is a special operating mode where the R&S CMU 300 can detect up to 128 active UE-IDs in the cell, provided that they are continuously scheduled for a duration of approx. 2 minutes. Each scan must be activated explicitly *(Start Mode – UE-ID Scan).* This triggers the following actions:

1. The R&S CMU 300 checks whether a specific UE-ID is active in the downlink, starting at the specified *UE-ID.* The scan is performed in ascending order and re-starts from zero after the largest possible UE-ID of 65 535 is reached. Each detected UE-ID is entered into the index table.
2. The scan is stopped as soon as the specified *Nr. of UE-IDs* have been found.
3. The CMU switches to *Start Mode – Immediate* and is ready to perform *HS-PDSCH Throughput* or *HS-SCCH* measurements on the detected UE IDs.

A complete scan over 65 536 UE-IDs takes approx. 2 minutes, however, it is possible to stop the scan any time by selecting another *Start Mode*. Due to the algorithm described above, an appropriate selection of the *UE-ID* and the *Nr. of UE-IDs* will speed up the scan. An application example is reported in Chapter 2.

HS-SCCH Information

Defines the scope of the *HS-SCCH Information* measurement and the displayed values.

Repetition — Selects a single shot or a continuous measurement (see Chapter 3). A single shot comprises 1024 HSDPA subframes.

Display Mode — If *Result Table vs. HSFN* is active, the output table in the *HS-SCCH Information* menu contains results for a series of consecutive HSDPA System Frame Numbers (HSFNs), irrespective of the decoded information. If *Result Table vs. UE-ID* is active, table rows with four invalid UE-IDs (i.e. UE-IDs not listed in the *UE-ID Index Table)* are omitted. This setting may extend the single shot measurement time.

Remote control

```
CONFigure:HSDPa:HINFormation:CONTrol:REPetition
CONFigure:HSDPa:HINFormation:CONTrol:DMODe
```

HS-PDSCH Throughput

Defines the scope of the *HS-PDSCH Throughput* measurement and configures the bar graph.

Repetition — Selects a single shot or a continuous measurement; see description of the Output table on p. 4.111. A single shot meas-

	urement extends over the *Rec. Subframes Single;* a continuous measurement is averaged over the *Rec. Subframes Cont.*
Display Mode	Selects the results in the bar graph *(Current, Average, Minimum,* or *Maximum* results; see description of the Output table on p. 4.111).
Rec. Subframes Single	Number of subframes recorded in a *Single Shot* measurement.
Rec. Subframes Cont.	Number of subframes averaged in a *Continuous* measurement.
UE-ID Index	Current number of the analyzed UE-ID in the *UE-ID Index Table.* The corresponding bar in the bar graph is red; the corresponding UE-ID is analyzed in the *Throughput* table.
Grid	Adds or removes the grid in the bar graph.
Scale Mode	Automatic scaling of the y-axis in the bar graph according to the measured data rates or fixed *(Manual)* scaling.
Scale Y	Upper edge of the bar graph with *Manual* scale mode; maximum data rate in kBit/s.

Remote control
`CONFigure:HSDPa:HTHRoughput:CONTrol:REPetition`
`CONFigure:HSDPa:HTHRoughput:CONTrol:RSFSingle`
`CONFigure:HSDPa:HTHRoughput:CONTrol:RSFCont`
The display mode is selected by the mnemonics `:CURRent, :AVERage, :MINimum`, or `:MAXimum` appended to the `READ::HSDPa:HTHRoughput…` commands. The commands return results for all UE-IDs in the index table.

Connection Control (Signalling)

The popup menu *Connection Control* controls the communication between the CMU and the UE (connection setup and release, UE and Node B signals, network parameters), configures the inputs and outputs with the external attenuation values and the reference frequency, and defines the trigger settings. Moreover the popup menu contains the *BCH Monitor.*

The term signalling denotes all procedures that are necessary for setup, control and release of a connection in the UTRAN. In the case of WCDMA Node B tests, a distinction is made between three different signalling states:

Unsynchronized	The R&S CMU is not synchronized to the Node B signal but can perform TX tests in analogy to the *Non Signalling* mode. Synchronization of the measurements to an external trigger signal is optional.
Synchronized (CPICH)	The R&S CMU has detected the Primary CPICH and determined the CPICH timing using the known CPICH scrambling code (SC). The CPICH SC must be set in the *Node B Signal* tab of the *Connection Control* menu in accordance with the actual SC of the Node B. According to standard 3GPP TS 25.211, the CPICH timing represents the common timing reference for all physical channels in the cell. The System Frame Number (SFN) is not known yet; the R&S CMU uses an internal frame counter. TX tests can be performed in this signalling state.
Synchronized (BCH/SFN)	In addition to the steps performed for CPICH synchronization, the R&S CMU has also decoded the BCH (mapped to the P-CCPCH) in order to obtain the SFN. In this state the R&S CMU can decode the data transmitted on a DL Reference Measurement Channel (RMC) in order to perform BER tests and evaluate the System Information Blocks broadcast by the Node B.

The *Connection* tab of the *Connection Control* menu is used to initiate or release the synchronization *(Start Sync./Stop Sync.)*. If possible the R&S CMU automatically enters the two *Synchronized* states in two consecutive steps.

The R&S CMU does not necessarily transmit an UL WCDMA signal *(UE Signal)* in either signaling state. If desired the *UE Signal* generator can be switched on explicitly.

Many actions in function group *WCDMA Node B Signalling (3GPP/FDD)* are only possible or useful in a particular signalling state; the functionality of the menus varies accordingly. For reference see the *Sig. State* field in the command tables in Chapter 6.

Connection Control

The purpose of the *Signalling* test mode is to perform transmitter and receiver tests while the R&S CMU is synchronized to the Node B signal. Therefore the tab controlling the synchronization (*Connection Control – Connection)* appears immediately after the *WCDMA Node B Signalling (3GPP/FDD)* mode is activated. It is closed automatically after *BCH/SFN* synchronization has been established. It is possible though to disable this mechanism; see section *Display Control (Connection Control – Misc)* on p. 4.140.

All the tabs in the *Connection Control* menu can be called up by pressing the *Connect. Control* softkey at the top right position in every measurement menu and the hotkeys across the lower edge of the screen. Pressing the *Escape* key closes the active *Connection Control* menu and re-activates the underlying measurement menu.

Synchronizing the R&S CMU

To perform measurements in synchronized mode,

1. Feed the Node B signal to one of the RF connectors of the R&S CMU, preferably to RF2 (default input/output connector).
2. Press *MENU SELECT* and select *3G UMTS Node B – WCDMA Node B – Signalling.* Press *ENTER.*

The *Connection Control* menu is opened automatically.

3. Press the *Connection* hotkey and select one of the UMTS operating bands I to VI *(Band Select).*

4. Press the *Node B Sig.* hotkey and adjust the R&S CMU to the basic characteristics of your Node B signal. In particular, select the proper analyzer frequency *(RF Channel Downlink)*.
5. To enable timing synchronization, set the *DL Scrambling Code (CPICH).* To make data decoding possible (e.g. for the *DL BER Test),* set the *DL Scrambling Code (DPCH).* Ensure that both scrambling codes are equal until synchronization has been achieved.
6. Press the *Connection* hotkey to access the *Connection* tab again and press *Start Sync.*

The R&S CMU enters the two *Synchronized* states in two consecutive steps.

If you only have to adjust the RF Channel Downlink*, there is no need to open the* Node B Sig. *tab. Simply press* Connection *again. In the second level of the* Connection *tab opened you can also adjust the analyzer to the* Expected Power *of your Node B signal.*

Connection Control – Connection

The *Connection* tab provides softkeys to select the UTRA FDD operating band *(Band Select)*, and to initiate or release the synchronization *(Start Sync/Stop Sync)*. Besides it shows the physical parameters of the detected Node B signal and the SFN *(Measurement Info)*.

The CMU provides a second level of the *Connection* tab where the info table in the left half is replaced by softkeys controlling the essential UL/DL signal and R&S CMU analyzer settings; see Fig. 4-54 on p. 4.119. The *Connection* hotkey toggles between the two versions of the tab if it is pressed repeatedly.

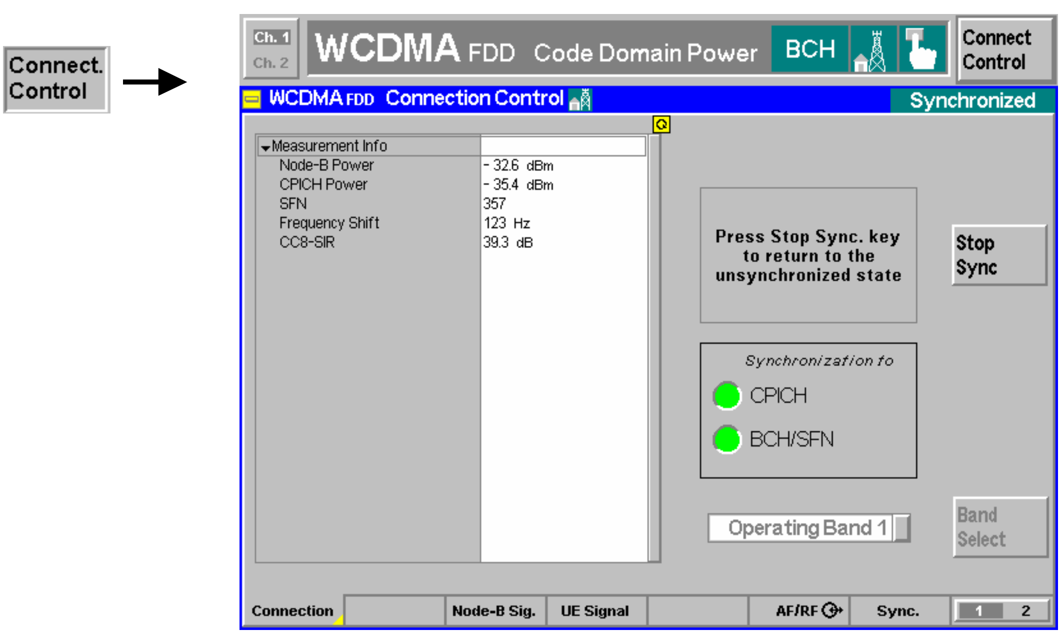


Fig. 4-53 Connection Control – Connection (Synchronization)

Measurement Info

Shows the essential parameters of the detected Node B signal.

Node B Power Average power of the detected total composite Node B signal in the current frame, measured with an RRC filter at the chip instants.

CPICH Power Average power of the P-CPICH in the current frame, measured with an RRC filter.

SFN System Frame Number of the UTRAN cell created by the Node B. This value is only available when the R&S CMU is *BCH/SFN* synchronized. With CPICH synchronization, an internal frame number is displayed instead of the SFN used by the Node B. The jump of the SFN indicates that the R&S CMU has accomplished BCH/SFN synchronization.

Frequency Shift Offset between the Node B signal frequency and the nominal UTRAN channel frequency specified in the second level of the *Connection* tab *(RF Channel Downlink).*

CC8-SIR Signal to Interference Ratio for one class 8 code channel

The *Measurement Info* can be used to check the progress of the synchronization. All results are available as soon as the R&S CMU is CPICH synchronized to the Node B signal.

Remote control

```
[SENSe:]SIGNalling:MINFo:NPOWer?
[SENSe:]SIGNalling:MINFo:CPOWer?
[SENSe:]SIGNalling:MINFo:SFN?
[SENSe:]SIGNalling:MINFo:FSHift?
[SENSe:]SIGNalling:MINFo:CSIR?
```

Message Box

A message box (here: *Press the Start Sync. key to start the timing synchronization)* next to the *Start Sync/Stop Sync* softkey informs on the current instrument state or indicates how to proceed to get to other signalling states.

Sync Monitor

The *CPICH* and *BCH/SFN* traffic signals turn green as soon as the R&S CMU has reached *CPICH* synchronization (first signal green) and *BCH/SFN* synchronization (both signals green).

The signalling states are described in section *Connection Control (Signalling)* on p. 4.115.

Remote control

```
[SENSe:]SIGNalling:STATe?
[SENSe:]SIGNalling:STO?
```

Start Sync

Stop Sync

The *Start Sync* initiates a synchronization to the Node B signal. If possible the R&S CMU automatically enters the two *Synchronized* states (CPICH and BCH/SFN) in two consecutive steps; see section *Connection Control (Signalling)* on p. 4.115. The synchronization progress is indicated by the two traffic signals of the sync monitor.

Start Sync is automatically replaced by *Stop Sync* as soon as the R&S CMU enters a *Synchronized State. Stop Sync* takes the R&S CMU back to the *Unsynchronized* state.

Remote control

```
PROCedure:SIGNalling:ACTion SRUN | SSTP
```

Band Select

The *Band Select* softkey selects the UTRA/FDD frequency band in which the Node B and the R&S CMU is designed to operate. Option R&S CMU-K78 provides the following operating bands.

- Operating Band I comprises uplink frequencies between 1920 MHz and 1980 MHz, and downlink frequencies between 2110 MHz and 2170 MHz.
- Operating Band II comprises uplink frequencies between 1850 MHz and 1910 MHz, and downlink frequencies between 1930 MHz and 1990 MHz.
- Operating Band III comprises uplink frequencies between 1710 MHz and 1785 MHz, and downlink frequencies between 1805 MHz and 1885 MHz.
- Operating Band IV comprises uplink frequencies between 1710 MHz and 1755 MHz, and downlink frequencies between 2110 MHz and 2155 MHz.
- Operating Band V comprises uplink frequencies between 824 MHz and 849 MHz, and downlink frequencies between 869 MHz and 894 MHz.
- Operating Band VI comprises uplink frequencies between 830 MHz and 840 MHz, and downlink frequencies between 875 MHz and 885 MHz.

All supported uplink and downlink channel numbers and frequencies are quoted in the tables below[1]. In the *RF Channel Uplink/Downlink* input fields (see Fig. 4-54 on p. 4.119) these channels must be selected with their channel numbers; it is not possible to enter frequencies off the 200 kHz raster.

Remote control

```
CONFigure:SIGNalling:SELect:BAND
      OPB1 | OPB2 | OPB3 | OPB4 | OPB5 | OPB6
```

Table 4-6 UTRA operating bands and channel numbers: Uplink

Operating Band	UL Frequency Band	Assigned Channels	Assigned Center Frequencies
I	1920 MHz to 1980 MHz	9612 to 9888	1922.4 MHz to 1977.6 MHz
II	1850 MHz to 1910 MHz	9262 to 9538	1852.4 MHz to 1907.6 MHz
III	1710 MHz to 1785 MHz	8562 to 8913	1712.4 MHz to 1782.6 MHz
IV	1710 MHz to 1755 MHz	8562 to 8736	1712.4 MHz to 1752.6 MHz
V	824 MHz to 849 MHz	4132 to 4233	826.4 MHz to 846.6 MHz
VI	830 MHz to 840 MHz	4162 to 4188	832.4 MHz to 837.6 MHz

Table 4-7 UTRA operating bands and channel numbers: Downlink

Operating Band	DL Frequency Band	Assigned Channels	Assigned Center Frequencies
I	2110 MHz to 2170 MHz	10562 to 10838	2112.4 MHz to 2167.6 MHz
II	1930 MHz to 1990 MHz	9662 to 9938	1932.4 MHz to 1987.6 MHz
III	1805 MHz to 1880 MHz	9037 to 9388	1807.4 MHz to 1877.6 MHz

1 In operating bands II, III, IV, and V, additional center frequencies are specified, which are shifted by 100 kHz relative to the normal raster. These channels are not supported in the current firmware version.

Operating Band	DL Frequency Band	Assigned Channels	Assigned Center Frequencies
IV	2110 MHz to 2155 MHz	10562 to 10736	2112.4 MHz to 2152.6 MHz
V	869 MHz to 894 MHz	4357 to 4458	871.4 MHz to 891.6 MHz
VI	875 MHz to 885 MHz	4387 to 4413	877.4 MHz to 882.6 MHz

The softkeys in the second level of the *Connection* tab control the essential UL/DL signal channels and expected power settings. The *Connection* hotkey toggles between the two versions of the tab if it is pressed repeatedly.

Note: *In Signalling mode the downlink and uplink signal frequencies are always coupled and separated by the RX-TX frequency separation of the selected band. Changing the DL signal frequency also changes the UL signal frequency and vice versa. Therefore, all frequency settings are only enabled in the unsynchronized signalling state.*

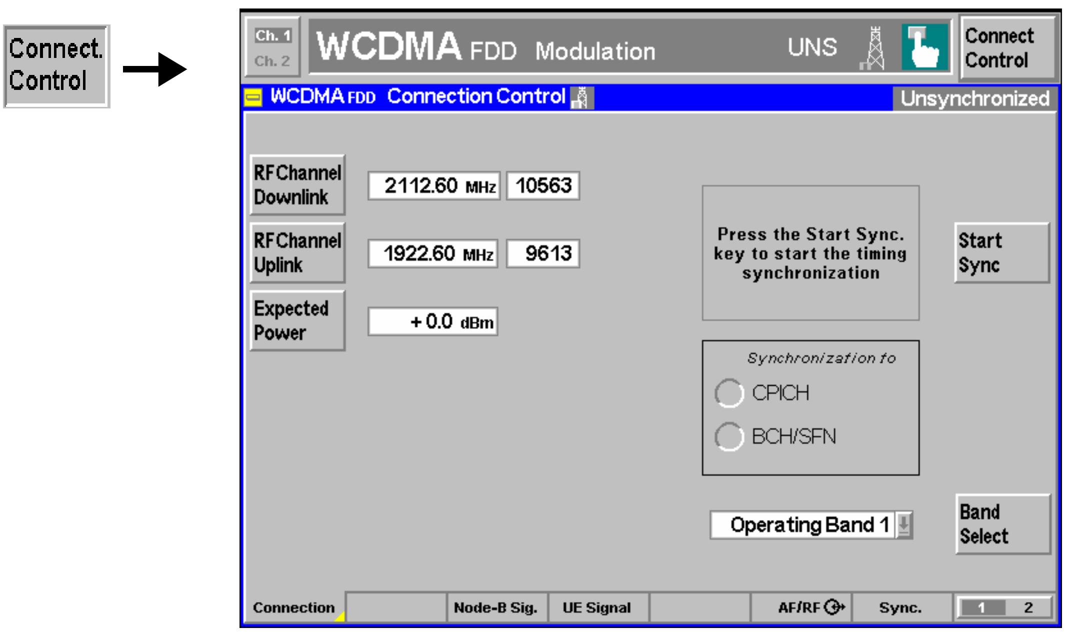


Fig. 4-54 Connection Control – Connection (channels and expected power)

RF Channel Downlink

The *RF Channel Downlink* softkey specifies the carrier frequency and channel number (UARFCN, UTRA Absolute Radio Frequency Channel Number) of the received Node B signal. This parameter must be set in accordance with the actual Node B signal. The assignment between channel numbers *N* and carrier frequencies *F* is defined in the 3GPP specification (TS 34.121). The following relation holds for both directions of transmission (uplink and downlink) and all operating bands (I to VI):

$$N = 5 \cdot (F / MHz), \quad 0.0\ MHz \le F \le 3276.6\ MHz$$

In operating bands II, IV, V, and VI, additional center frequencies are specified, which are shifted by 100 kHz relative to the normal raster, see Table 4-7 above. The CMU accepts the entry of frequency **or** channel number, provided that the channel number is assigned in the selected operating band *(Band Select)*.

Remote control
`CONFigure:NBSignal:CHANnel`
`UNIT:NBSignal:CHANnel`

RF Channel Uplink

The *RF Channel Uplink* softkey specifies the carrier frequency and channel number (UARFCN) of the generated UL WCDMA signal. UARFCNs are explained above; see *RF Channel Downlink* softkey and Table 4-6.

Remote control
```
CONFigure:UESignal:CHANnel
UNIT:UESignal:CHANnel
```

Expected Power

Specifies sets the expected input power (overload level). Input powers exceeding the *Expected Power* overdrive the input path and cause invalid results (“– – –“); see section *Analyzer Settings (Connection Control – Analyzer)* on p. 4.134.

Remote control
```
[SENSe]:NBANalyzer:EPOWer
```

Downlink Signal (Connection Control – Node B Signal)

The *Node B Signal* tab specifies the signal parameters that the R&S CMU must know in order to receive and decode the DL WCDMA transmitted by the Node B. This comprises:

- The frequency of the measured DL signal and the scrambling codes *(Node B Settings)*
- The *Downlink Dedicated Phys. Channel* settings, if the DL channel is configured as a physical channel.
- The *3GPP Reference Channel* settings, if the DL channel is configured as a reference measurement channel.
- The *HSDPA Channel* settings.

Some settings may not be available in all signalling states of the CMU. Exact description is provided in the remote control command description in Chapter 6.

TIP

An example procedure for synchronization and Node B settings is reported on p. 4.115.

Connect. Control →

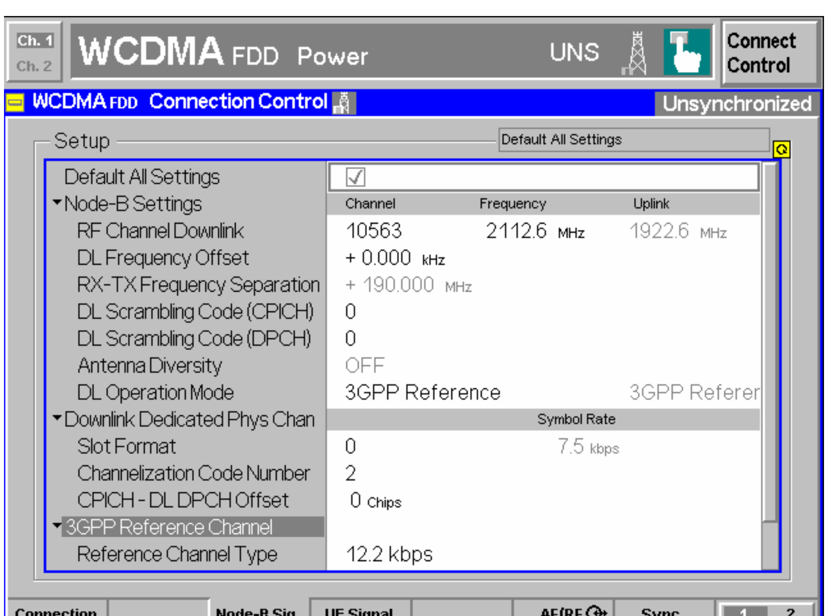


Fig. 4-55 Connection Control – Node B Signal

Default Settings

The *Default All Settings* switch assigns default values to all settings in the *UE Signal* tab (the default values are quoted in the command description in Chapter 6).

Remote control
```
DEFault:NBSignal
```

Node B Settings – Frequency

The *Node B Settings* section defines the carrier frequency and channel number (UARFCN, UTRA Absolute Radio Frequency Channel Number) of the measured signal and an offset to this carrier frequency. These frequency parameters determine the center frequency of the R&S CMU analyzer. The current *Uplink* frequency (see *RF Channel Uplink* on p. 4.120) is displayed for information; it is adjusted to the downlink frequency so that the *RX-TX Frequency Separation* of the selected band is maintained.

The DL RF channels depend on the selected operating band; see *Band Select* softkey on p. 4.118 and *RF Channel Downlink* softkey on p. 4.119. The same holds for the frequency gap between the downlink and uplink bands *(RX-TX Frequency Separation),* which is also displayed for information.

Note: *The selected Frequency Offset applies to all operating bands.*

Remote control
```
CONFigure:NBSignal:CHANnel <Channel>
UNIT:NBSignal:CHANnel <CHANnel>CONFigure:NBSignal:FOFFset
<Offset>
CONFigure:UESignal:CHANnel?
CONFigure:NBSignal:RTFSeparate?
```

Node B Settings – Scrambling Codes

Below the frequency parameters the DL scrambling codes are set; see background information below. In contrast to what is specified for real UTRANs, the CMU can analyze signals with arbitrary scrambling codes in the range 0 to 2^{18}-2 = 262 142.

DL Scrambling Code (CPICH) Scrambling code number used for the CPICH in the range 0 to 3FFFE (hex), corresponding to 0 to 262 142 decimal. The CPICH scrambling code must be known for CPICH and BCH/SFN synchronization and for all tests which require a synchronized signalling state; see section *Connection Control (Signalling)* on p. 4.115.

DL Scrambling Code (DPCH) Scrambling code number used for the DPCH in the range 0 to 3FFFE (hex), corresponding to 0 to 262 142 decimal. The DPCH scrambling code can be used to select a particular DPCH among several DPCHs that the Node B may generate. It must be known for all tests where the DPCHs is decoded, in particular the *DL BER Test.*

NOTE

To synchronize the R&S CMU 300 to the Node B signal (Start Sync.), the two DL scrambling codes must be equal.

Remote control
```
CONFigure:NBSignal:DLSCode:CPICh <Code>
CONFigure:NBSignal:DLSCode:DPCH <Code>
```

Downlink scrambling codes

Downlink scrambling codes are used to separate different cells and users. According to standard 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. The P-CPICH, P-CCPCH and PICH are always transmitted using the primary scrambling code. Other downlink physical channels, in particular the DPCH, 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.

Node B Settings – DL Operation Mode

Specifies whether the dedicated channel of the Node B signal is configured as a 3GPP downlink reference measurement channel *(3GPP Reference)* according to 3GPP TS 25.101, as a *Physical* channel, or as a *HSDPA Channel*. The parameters of all channel types are defined in the table sections below. The configuration of the uplink signal is displayed for information.

Some measurements require a particular channel configuration: The *DL BER Test* requires a *3GPP Reference* channel, HSDPA tests (with option R&S CMU-K72; see p. 4.103) requires a HSDPA channel.

Remote control
`CONFigure:NBSignal:DLOperation:MODE PHYS | GPPR |HSDPa`

Downlink Dedicated Phys. Chan.

The *Downlink Dedicated Physical Channel* section specifies the properties of the received physical channel (DPCH). The settings take effect if the Node B signal is configured as a physical channel *(DL Operating Mode: Physical).* The R&S CMU must know the following parameters:

Slot Format — Many properties of the DL physical channel are defined in terms of its slot format. The CMU supports all slot formats 0 to 16; the corresponding channel parameters are listed in *Table 4-8 below*. The symbol rate corresponding to the selected slot format is displayed for information.

Channelization Code Number — Channelization code (Orthogonal Variable Spreading Code, OVSC) number assigned to the DPCH. The channelization code numbers depend on the spreading factors SF; they range from 0 to SF – 1. The spreading factors are given by the slot format.

CPICH – DL DPCH Offset — Timing delay of the start of the DL DPCH relative to the P-CPICH timing.

Remote control
```
CONFigure:NBSignal:DDPChannel:SFORmat
CONFigure:NBSignal:DDPChannel:SRATe?
CONFigure:NBSignal:DDPChannel:CHCNumber
CONFigure:NBSignal:DDPChannel:DLDPoffset
```

Table 4-8 Downlink DPDCH and DPCCH slot formats

Slot Format #i	Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Slot	DPDCH Bits/Slot		DPCCH Bits/Slot			Transmitted slots per radio frame N_{Tr}
					N_{Data1}	N_{Data2}	N_{TPC}	N_{TFCI}	N_{Pilot}	
0	15	7.5	512	10	0	4	2	0	4	15
1	15	7.5	512	10	0	2	2	2	4	15
2	30	15	256	20	2	14	2	0	2	15
3	30	15	256	20	2	12	2	2	2	15
4	30	15	256	20	2	12	2	0	4	15
5	30	15	256	20	2	10	2	2	4	15
6	30	15	256	20	2	8	2	0	8	15
7	30	15	256	20	2	6	2	2	8	15
8	60	30	128	40	6	28	2	0	4	15
9	60	30	128	40	6	26	2	2	4	15
10	60	30	128	40	6	24	2	0	8	15
11	60	30	128	40	6	22	2	2	8	15
12	120	60	64	80	12	48	4	8	8	15
13	240	120	32	160	28	112	4	8	8	15
14	480	240	16	320	56	232	8	8	16	15
15	960	480	8	640	120	488	8	8	16	15
16	1920	960	4	1280	248	1000	8	8	16	15

3GPP Reference Channel

The *3GPP Reference Channel* section specifies the properties of the received 3GPP reference measurement channel. The settings take effect if the Node B signal is configured as a 3GPP reference channel *(DL Operating Mode: 3GPP Reference)*. The R&S CMU must know the following parameters:

Ref. Channel Type Information bit rate of the reference channel (12.2 kbps, 64 kbps, 144 kbps, or 384 kbps). Many physical channel parameters of the reference channel are defined in terms of the information bit rate.

Channelization Code Number Channelization code (Orthogonal Variable Spreading Code, OVSC) number assigned to the DPCH. The channelization code numbers depend on the spreading factors SF; they range from 0 to SF – 1. The spreading factors are given by the reference channel type.

CPICH – DL DPCH Offset Timing delay of the start of the DL DPCH relative to the P-CPICH timing.

Remote control

```
CONFigure:NBSignal:GPPReference:CTYPe
CONFigure:NBSignal:GPPReference:CHCNumber
CONFigure:NBSignal:GPPReference:DLDPoffset
```

HSDPA Channels

The *HSDPA Channels* section specifies the properties of the received HSDPA channels. The settings are relevant for the *HSDPA* tests described on p. 4.103.

Main UE-ID Selects the first UE-ID in the *UE-ID Index Table* (see section *Measurement Control (HSDPA Configuration – Control)* on p. 4.112). The main UE-ID is also used to generate the *HS-UE-ID Trigger* described on p. 4.132.

HS-SCCH Selects the channelization codes for up to four HS-SCCHs in the Node B signal that the R&S CMU300 is able to decode. Channels above the *Nr. of HS-SCCHs* are not decoded (grayed). The HS-SCCH is a fixed-rate channel with spreading factor 128 and channelization codes ranging from 1 to 127 ($c_{128,\,1}$ to $c_{128,\,127}$).

Nr. of HS-SCCHs Total number of decoded HS-SCCHs.

Remote control
```
CONFigure:NBSignal:HSDPa:MUID
CONFigure:NBSignal:HSDPa:HSSCch<nr>
CONFigure:NBSignal:HSDPa:HSSCch:NUMBer
```

Uplink Signal (Connection Control – UE Signal)

The *UE Signal* tab controls the R&S CMU's RF generator and configures the generated uplink WCDMA signal. It defines:

- The frequency of the generated signal, the scrambling code, and the timing *(UE Settings)*
- The uplink Transmit Power Control *(TPC)* settings
- The generator state *ON/OFF)*
- The levels in the uplink channels
- The *Downlink Dedicated Phys. Channel* settings, if the DL channel is configured as a physical channel.
- The *3GPP Reference Channel* settings, if the DL channel is configured as a reference measurement channel.
- An uplink HS-DPCCH that the R&S CMU 300 transmits in order to test the Node B's response in the DL HSDPA channels (with option R&S CMU-K73, *HSDPA Stimulate).* The HS-DPCCH configuration is described in section *HSDPA Stimulate (Option R&S CMU-K73)* on p. 4.128.

Many of the *UE Signal* settings are identical with the RF *Generator* settings in *Non Signalling* mode described in section *Generator Settings – Table-Oriented Version* on p. 4.60. Some settings may not be available in all signalling states of the CMU. Exact description is provided in the remote control command description in Chapter 6.

Note: *The UE Signal is only available while the R&S CMU is in the synchronized state. The UE Signal generator is automatically switched off when synchronization is lost. An unsynchronized uplink WCDMA signal is available in Non Signalling state.*

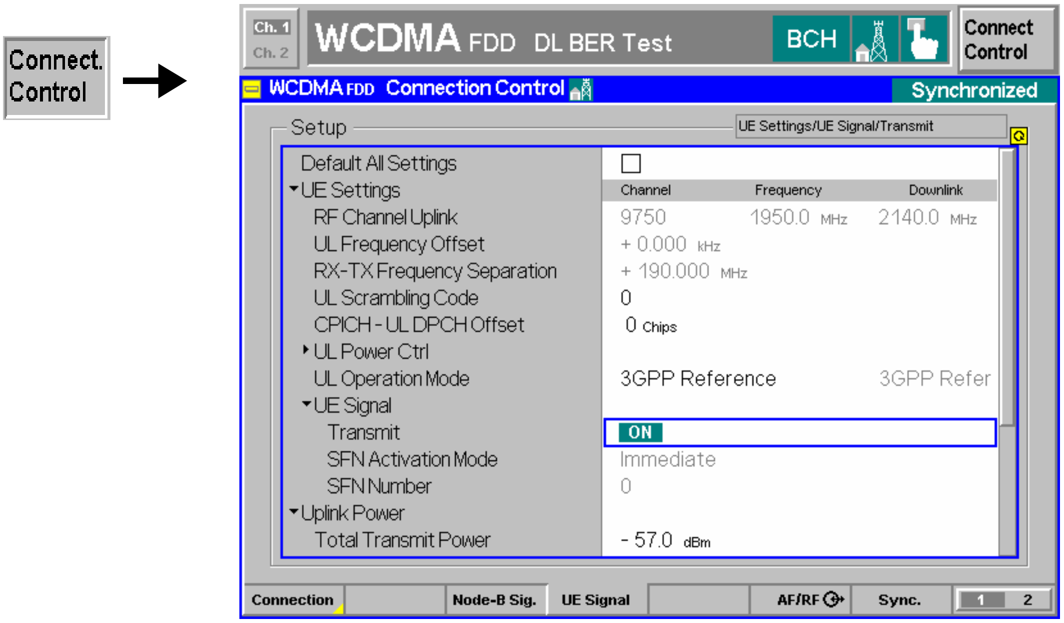


Fig. 4-56 Connection Control – UE Signal

Default Settings The *Default All Settings* switch assigns default values to all settings in the *UE Signal* tab (the default values are quoted in the command description in Chapter 6).

Remote control
`DEFault:UESignal`

UE Settings – Frequency The *UE Settings* section defines the carrier frequency and channel number (UARFCN, UTRA Absolute Radio Frequency Channel Number) of the generated signal and an offset to this carrier frequency. The current *Downlink* frequency (see *RF Channel Downlink* on p. 4.119) is displayed for information; it is adjusted to the uplink frequency so that the *RX-TX Frequency Separation* of the selected band is maintained.

The DL RF channels depend on the selected operating band; see *Band Select* softkey on p. 4.118 and *RF Channel Uplink* softkey on p. 4.120. The same holds for the *RX-TX Frequency Separation,* which is also displayed for information.

Note: *The selected Frequency Offset applies to all operating bands.*

Remote control
```
CONFigure:UESignal:CHANnel <Channel>
UNIT:UESignal:CHANnel <CHANnel>CONFigure:UESignal:FOFFset
<Offset>
CONFigure:NBSignal:CHANnel?
CONFigure:NBSignal:RTFSeparate?
```

UE Settings – UL Scrambling Code

Type and value of the scrambling code that is used to scramble the uplink WCDMA signal; see p. 4.63. The R&S CMU supports scrambling codes of long type. The scrambling code value must be in the range 0 to FFFFFF (hex).

Remote control
```
CONFigure:UESignal:ULSCode
```

UE Settings – CPICH – UL DPCH Offset

Timing delay of the start of the UL-DPCH relative to the CPICH; see description of *Frame Timing* on p. 4.63.

Remote control
```
CONFigure:UESignal:ULDPOffset
```

UE Settings – CPICH – UL Power Control

TPC Step size and uplink inner loop power control algorithm; see description of *Uplink Power Control* on p. 4.64.

Remote control
```
CONFigure:UESignal:ULPC:TPC
CONFigure:UESignal:ULPC:MODE
```

UE Settings – CPICH – UL Operation Mode

Configuration of the dedicated channel as a 3GPP uplink (UL) reference channel according to 3GPP TS 25.141 or as a physical channel. The parameters of both channel types are defined in the *Uplink Dedicated Physical Channel* and *3GPP Reference Channel* table sections, respectively.

Remote control
```
CONFigure:UESignal:ULOPeration:MODE
```

UE Settings – UE Signal

Controls the uplink generator and sets the internal System Frame Number (SFN), to be used while the R&S CMU is in the CPICH-synchronized state.

Transmit Switches the UL generator ON or OFF. The generator is switched off after a reset, irrespective of the signalling state. The *DL BER Test* menu provides an alternative hotkey to control the UL generator; see *BER Power* on p. 4.87.

The following instrument settings are displayed for information and cannot be changed.

SFN Activation Mode Shows *Immediate* means the data transfer on the UE signal always starts immediately after *BCH/SFN* synchronization is reached.

SFN Number The SFN value shown here is ignored.

Remote control
```
INITiate:UESignal
ABORt:UESignal
FETCh[:SCALar]:UESignal:STATus?
```

Uplink Power Defines the power of the generated uplink signal. The power settings are analogous to the *Non Signalling* mode; see section *Generator Settings – Table-Oriented Version* on p. 4.60.

Remote control
```
CONFigure:UESignal:UPOWer:TTPower
CONFigure:UESignal:UPOWer:DPCCh
CONFigure:UESignal:UPOWer:DPDCh?
CONFigure:UESignal:UPOWer:RCD:PHYSical
CONFigure:UESignal:UPOWer:AWGN
CONFigure:UESignal:UPOWer:NLEVel
```

Uplink Dedicated Physical Channel Defines the properties the DPCCH and the DPDCH part of the uplink physical channel. The settings are described on p. 4.68 and p. 4.69, respectively. They apply if the *Uplink Operation Mode* is set to *Physical*.

Remote control
```
CONFigure:UESignal:UDPChannel:DPCCh:SFORmat?
CONFigure:UESignal:UDPChannel:DPCCh:SRATe?
CONFigure:UESignal:UDPChannel:DPCCh:TFCI:CWORd
CONFigure:UESignal:UDPChannel:DPCCh:TPC:ROMode
CONFigure:UESignal:UDPChannel:DPCCh:TPC:PLENgth
CONFigure:UESignal:UDPChannel:DPCCh:TPC:PATTern
CONFigure:UESignal:UDPChannel:DPDCh:SFORmat
CONFigure:UESignal:UDPChannel:DPDCh:CCHNumber
CONFigure:UESignal:UDPChannel:DPDCh:SRATe?
CONFigure:UESignal:UDPChannel:DPDCh:CDSource
```

Uplink 3GPP Reference Channel Defines the properties of the generated 3GPP UL reference channel specified in standard 3GPP TS 25.141 including the *BER/BLER Verification* mode. The settings are described on p. 4.65 and 4.67, respectively. They apply if the *Uplink Operation Mode* is set to *3GPP Reference*.

In the *BER/BLER Verification* mode the uplink signal contains a definite number of bit or block errors. This mode is particularly suitable for BER tests; see section *DL BER Test* on p. 4.82. If the *BER Value* used in a loopback Node B receiver quality test exceeds a limit of approx. 10% then the R&S CMU can no longer synchronize to the returned bit sequence so that the *DL BER Test* fails.

Remote control
```
CONFigure:UESignal:GPPReference:CTYPe
CONFigure:UESignal:GPPReference:CDSource:DTCH
CONFigure:UESignal:GPPReference:TFCibits
CONFigure:UESignal:GPPReference:BVER:MODE
CONFigure:UESignal:GPPReference:BVER:BER
CONFigure:UESignal:GPPReference:BVER:BLER
```

HSDPA Stimulate (Option R&S CMU-K73)

With option R&S CMU-K73, *HSDPA Stimulate,* the R&S CMU is able to transmit an UL High Speed Dedicated Physical Control Channel (HS-DPCCH) carrying ACK/NACK messages and CQI values in order to check the response of the Node B under test. Transmission of the HS-DPCCH can be triggered by a definite UE ID transferred on a DL HS-SCCH. The *HSDPA Analyzer* (option R&S CMU-K72) described on p. 4.103 is the most convenient analysis tool for the DL HSDPA signal that the Node B transmits in response to the HS-DPCCH.

The HS-DPCCH is configured in the *HSDPA (HS-DPCCH)* section in the *UE Signal* tab of the *Connection Control* menu.

HS-DPCCH characteristics

The HS-DPCCH is a fixed rate (SF = 256) uplink physical channel used to indicate successful/unsuccessful reception of the data packets and to report the channel quality at the UE receiver.

The first slot of each UL HS-DPCCH subframe contains the ACK/NACK messages (indicating successful/unsuccessful CRC check of a received transmission packet); the following two slots carry the Channel Quality Indicator (CQI) in the range 0 to 30. The frame structure of the uplink HS-DPCCH is shown in the figure below.

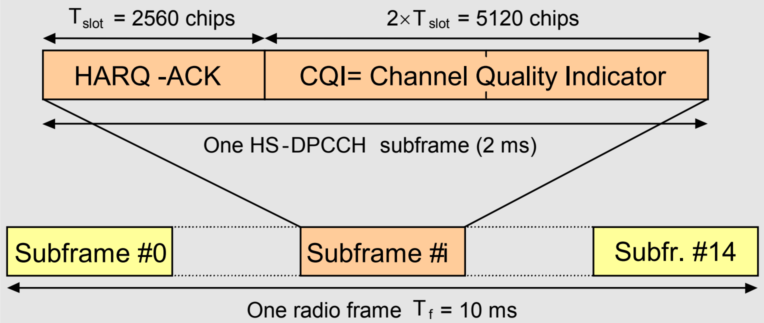


Fig. 4-57 Uplink HS-DPCCH structure

HS-DPCCH settings

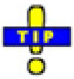
In the network, the ACK/NACK and CQI symbols are not necessarily transmitted in consecutive HSDPA subframes but can occur in each k^{th} subframe where k is the feedback cycle defined in standard 3GPP TS 25.214, section 6A. The UE transmits no ACK/NACK information if no consistent control information is detected on any of the HS-SCCHs in the UE's HS-SCCH set. Moreover, the standard specifies individual power offset parameters ∆ACK, ∆NACK, and ∆CQI for HS-DPCCH slots carrying ACK, NACK, and CQI messages, respectively (see standard TS 25.214).

In addition the R&S CMU 300 provides a special transmit mode where it generates an ACK/NACK slot each time after receiving a particular UE ID on a DL HS-SCCH.

Performing a stimulated HSDPA Test

The UL HSDPA signal must be switched on in the *Synchronized* signalling state with a BCH/SFN synchronization established. The UL WCDMA signal generator is automatically switched off when synchronization is lost; see note at the beginning of section *Uplink Signal (Connection Control – UE Signal)* on p. 4.125.

A stimulated HSDPA test can largely be performed with default settings. To establish BCH/SFN synchronization the Node B settings must be in accordance with the DL WCDMA signal.



An example procedure for synchronization and Node B settings is reported on p. 4.115.

To prepare a stimulated HSDPA test proceed as follows:

1. Establish BCH/SFN synchronization; see above.
2. In the *UE Signal* tab of the *Connection Control* menu, switch the UL generator off *(UE Settings – UE Signal – Transmit: Off).*
3. Select *UE Settings – UE Signal – HSDPA Signal: On.*

The R&S CMU generates an uplink physical or 3GPP reference channel signal with an additional HS-DPCCH channel contribution.

4. In the *HSDPA (HS-DPCCH)* section of the *UE Signal* tab, configure your UL HS-DPCCH according to your test requirements.
5. To make use of the *UE-ID Triggered* ACK transmit mode or of the HSDPA analyzer, open the *Node B Sig.* tab and select *Node B Settings: – DL Operation Mode: HSDPA.* In addition adjust the expected channelization codes of the HS-SCCHs to your DL signal configuration.

The use of the *HSDPA Analyzer* (option R&S CMU-K72) is described on p. 4.103.

UE Signal – HSDPA Signal

HSDPA Signal in the *UE Signal* section of the *UE Signal* tabswitches the HS-DPCCH channel in the UL WCDMA signal on or off. Enabling the HSDPA signal requires BCH/SFN synchronization. Moreover the UL generator must be switched off in order to enable the HSDPA contributions (see test procedure above).

Remote control
`CONFigure:UESignal:HSDPa:SIGNal:ENABle ON | OFF`

HSDPA (HS-DPCCH)

The *HSDPA (HS-DPCCH)* section in the *UE Signal* tab defines the properties of the generated UL HS-DPCCH. The ACK/NACK slots and the CQI slots are configured separately. The following settings are relevant for both slot types:

HS-DPCCH Configuration Type Activates both the *ACK/NACK & CQI* slots or one slot type only *(ACK/NACK* with DTX in the CQI slots or CQI with DTX in the ACK/NACK slots).

Remote control
`CONFigure:UESignal:HSDPa:CTYPe ANC | CQI | ANACk`

ACK/NACK

Configures the ACK/NACK slots in the HS-DPCCH (see Fig. 4-57 on p. 4.128).

ACK Transmit Mode ACK/NACK transmission every n^{th} HSDPA subframe where n is the *ACK Transmit Distance (Free Run* mode) or single ACK/NACK transmission each time the main UE-ID (see p. 4.124) is received on one of the DL HS-SCCHs *(UE-ID Triggered* mode). The *UE-ID Triggered* mode requires a HSDPA *DL Operation Mode* and correct HS-SCCH channelization code settings in the *Node B Sig.* tab.

ACK Transmit Distance Distance (in HSDPA subframes) between two active ACK/NACK slots. A value 1 means that every ACK/NACK slot is active. For a distance of n slots, ACK/NACK symbols are transmitted in every n^{th} subframe; the HS-DPCCH power in the remaining ACK/NACK slots is switched off (DTX). To prevent ACK/NACK transmission (see standard 3GPP TS TS 25.214, section 6A), set the entries in the *ACK Table* to OFF.

ACK Power Delta	Ratio between the HS-DPCCH gain factors β_{hs} for ACK slots and the gain factor β_c for the DPCCHs. According to standard TS 25.214, the ratio is equal to 20*log(ΔACK); the power offset parameter ΔACK is quantized to integer multiples of 1/15 (range: ΔACK = 1/15 to 30/15).
NACK Power Delta	Ratio between the HS-DPCCH gain factors β_{hs} for NACK slots and the gain factor β_c for the DPCCHs. Range of values as for *ACK Power Delta.*
Activation HSFN Mode	Defines whether HS-DPCCH generation starts immediately after the HSDPA signal is switched on or after a definite *HSFN Number.* The ACK/NACK slots of the generated HS-DPCCH are filled according to the *ACK Transmit Mode.*
Activation HSFN Number	HSDPA System Frame Number where the HS-DPCCH is switched on for *Activation HSFN Mode: HSFN Number.* The HSFN counts the HSDPA subframes. It is in the range 0 to 20479, corresponding to WCDMA frame numbers 0 to 4095.
No of ACKs in Table	Length of the *ACK Table.*
ACK Table	Array of user-defined ACK, NACK, or OFF entries. The length of the array is given by the *Nr. of ACKs in Table.* An entry OFF generates a DTX slot (no HS-DPCCH transmission). The UL generator cycles through the list according to the *ACK Transmit Mode,* the *ACK Transmit Distance,* and the *Activation HSFN Mode.*

Remote control

```
CONFigure:UESignal:HSDPa:ACK:TMODe FRUN | UITRiggered
CONFigure:UESignal:HSDPa:ACK:TDIStance
CONFigure:UESignal:HSDPa:ACK:PDELta
CONFigure:UESignal:HSDPa:NACK:PDELTa
CONFigure:UESignal:HSDPa:ACK:HSFN:MODE IMMediate | HNUMber
CONFigure:UESignal:HSDPa:ACK:HSFN:NUMBer
CONFigure:UESignal:HSDPa:ACK:NUMBer
CONFigure:UESignal:HSDPa:ACK:TABLe<nr> ACK | NACK | OFF
CONFigure:UESignal:HSDPa:ACK:TABLe:ALL
```

CQI Configures the CQI slots in the HS-DPCCH (see Fig. 4-57 on p. 4.128).

CQI Transmit Distance	Distance (in HSDPA subframes) between two active pairs of CQI slots. A value 1 means that every CQI slot is active. For a distance of n slots, CQI symbols are transmitted in every n^{th} subframe; the HS-DPCCH power in the remaining CQI slots is switched off (DTX).
CQI Power Delta	Ratio between the HS-DPCCH gain factors β_{hs} for CQI slots and the gain factor β_c for the DPCCHs. According to standard TS 25.214, the ratio is equal to 20*log(ΔCQI); the power offset parameter ΔCQI is quantized to integer multiples of 1/15 (range: ΔCQI = 1/15 to 30/15).
Activation HSFN Mode	Defines whether HS-DPCCH generation starts immediately after the HSDPA signal is switched on or after a definite *HSFN Number.*
Activation HSFN Number	HSDPA System Frame Number where the HS-DPCCH is switched on for *Activation HSFN Mode: HSFN Number.* The HSFN counts the HSDPA subframes. It is in the range 0 to 20479, corresponding to WCDMA frame num-

bers 0 to 4095.

No of CQIs in Table Length of the *CQI Table.*

CQI Table Array of user-defined CQI entries in the range 1 to 30. The length of the array is given by the *Nr. of CQIs in Table.* The UL generator cycles through the list according to the *CQI Transmit Distance* and the *Activation HSFN Mode.*

Remote control
```
CONFigure:UESignal:HSDPa:CQI:TDIStance
CONFigure:UESignal:HSDPa:CQI:PDELta
CONFigure:UESignal:HSDPa:CQI:HSFN:MODE IMMediate | HNUMber
CONFigure:UESignal:HSDPa:CQI:HSFN:NUMBer
CONFigure:UESignal:HSDPa:CQI:NUMBer
CONFigure:UESignal:HSDPa:CQI:TABLe<nr>
CONFigure:UESignal:HSDPa:CQI:TABLe:ALL
```

RF Connectors (Connection Control – AF/RF)

The *AF/RF* tab selects the connectors for RF signals. This includes the setting of

- The RF input and output at the CMU (RF Output, RF Input)
- An external attenuation at the connectors (Ext. Att. Output, Ext. Att. Input)

All functions of this menu are described in section *RF Connectors (Connection Control – AF/RF)* on p. 4.74.

Reference Frequency (Connection Control – Sync.)

The *Sync.* tab determines the reference signal for synchronization. This includes:

- The selection of internal or external *Reference Frequency*
- The output mode for the reference frequency *(REF OUT 2)*

The functions of this menu are described in section *Reference Frequency (Connection Control – Sync.)* on p. 4.76.

Trigger (Connection Control – Trigger)

The *Trigger* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Trigger* tab defines

- The timing of the *Int. Superframe Trigger* and of the *HS UE-ID Trigger*
- Polarity *(Slope)* and timing *(Chip Offset)* of the external measurement trigger
- The source of the *Measurement Trigger*
- Routing of the *Output Trigger* signals

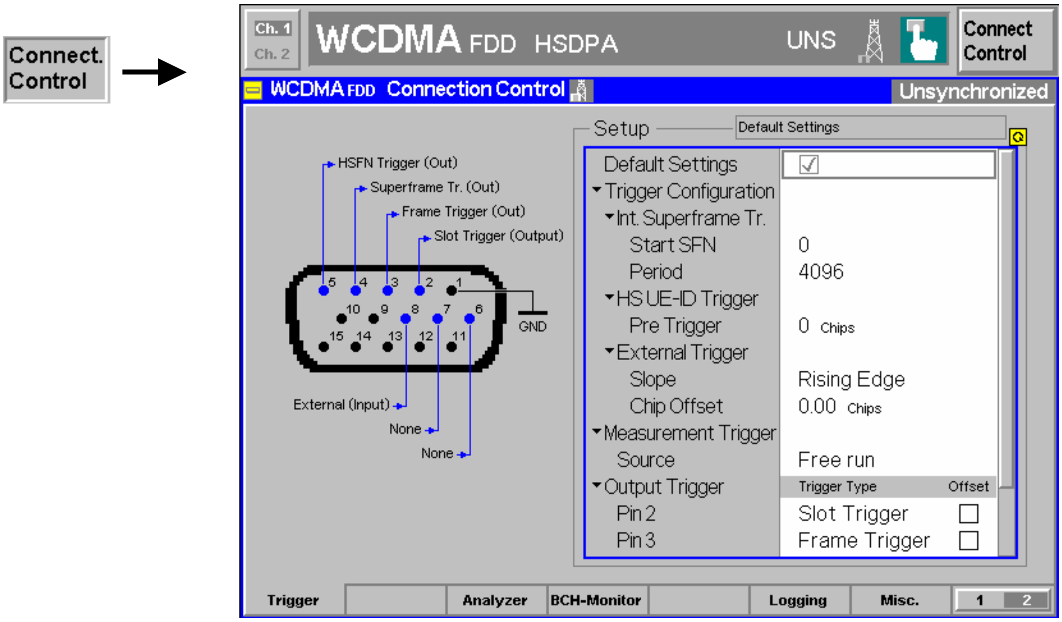


Fig. 4-1 Connection Control – Trigger

Trigger Types:

Free Run Trigger provided by the analyzed RF signal: The CMU decodes the RF signal to derive its slot timing.

External External trigger signal (TTL) fed in via connector AUX 3 (pin 8). The timing information for the measurement is provided by the rising or falling edge (see *Slope* setting above) of the external trigger[2)] signal to which a delay *(Chip Offset)* can be added.

Slot Output trigger at the beginning of each DL P-CPICH slot. To determine the P-CIPCH timing and generate the slot trigger output signal, the R&S CMU must be CPICH-synchronized.

Frame Trigger event at the beginning of each DL P-CPICH frame. To determine the P-CIPCH timing and use the frame trigger, the R&S CMU must be CPICH-synchronized.

Superframe Trigger with a period of 1 superframe or an integer fraction. See detailed description below.

HSFN Output trigger at the beginning of each DL HS-SCCH subframe. To determine the HS-SCCH timing and generate the HSFN trigger output signal, the R&S CMU must be BCH/SFN-synchronized. Moreover the trigger requires option R&S CMU-K72, *HSDPA Analyzer*.

HS UE-ID Output trigger at the beginning of each DL HS-PDSCH subframe following the transmission of the *Main UE-ID* (see p. 4.124). The HS-PDSCH subframe starts 1 slot after the associated HS-SCCH. To decode the HS-SCCH carrying the UE-IDs and generate the HS UE-ID trigger output signal, the R&S CMU must be BCH/SFN-synchronized. Moreover the trigger requires option R&S CMU-K72, *HSDPA Analyzer*.

Int. Superframe Trigger Defines the timing of the internal superframe trigger.

Start SFN System Frame Number for the first superframe trigger event. The trigger event occurs at the beginning of the frame with the selected SFN. The SFN corresponds to the internal SFN of the R&S CMU (signalling state *CPICH Synchronized)* or to the SFN of the Node B under test (signalling state *BCH/SFN Synchronized)*.

2 The external measurement trigger signal at AUX 3 must be a high or low pulse with the following characteristics: Rise/fall time <20 ns; minimum high or low time ≥ 200 ns. The impedance of the trigger source must be ≤ 50 Ω.

	Period	The default period of 4096 frames corresponds to one superframe (SFN period). Besides shorter periods of 2^n frames where n = 1 to 11 can be set.

Remote control
`TRIGger[:SEQuence]:ISTStartsfn`
`TRIGger[:SEQuence]:ISTPeriod`

HS UE-ID Trigger

Defines the timing of the HS UE-ID output trigger signals.

Pre Trigger — Pre-trigger time for the HS UE-ID trigger signals. The trigger signals can occur n chips **before** the beginning of the HS-PDSCH subframe where n is in the range 0 to 256 chips (1/10 slot). The pre-trigger time can compensate for a delay in the external setup if the HS UE-ID output trigger signal is used to synchronize other devices.

Remote control
`TRIGger[:SEQuence]:HUTPre`

External Trigger

Defines how the measurement trigger event is derived from an external trigger signal.

Slope — Qualifies whether the trigger event occurs on the *Rising Edge* or on the *Falling Edge* of the *External* TTL trigger signal.

Chip Offset — Corrects the *External* trigger time by a (positive) integer number of chips. With an offset setting of n chips the measurement is started n slots after the trigger event. The *Chip Delay* is added to the *Slot Delay*.

Remote control
`TRIGger[:SEQuence]:SLOPe`
`TRIGger[:SEQuence]:ETCoffset`

Measurement Trigger – Source

The following triggers can be used as measurement triggers:

Free Run, External, Frame, and *Superframe trigger.*

Note: *Some measurements require particular trigger settings. For a* DL BER Test *the R&S CMU synchronizes to the received bit pattern, no trigger is used. Also for a RACH Preamble Test no trigger is used.* Spectrum *measurements with* ACLR Scanning *on and* Spectrum Emission Mask *measurements cannot be performed with External trigger.*

Remote control
`TRIGger[:SEQuence]:SOURce FRUN | EXTern | FRAMe| SFRame`

Output Trigger

The following trigger signals described above can be routed to different pins of the AUX3 connector:

Slot Trigger, Frame Trigger, Superframe Trigger, HSFN Trigger, HS UE-ID Trigger.

An *Offset* delays the selected output trigger signal relative to the downlink slot/frame timing:

- The *Slot Trigger* can be set relative to the DL P-CPICH slot boundary with an offset in the range of 0 to 2559 chips, corresponding to 1 slot .
- The *Frame Trigger* and the *Superframe Trigger* can be set relative to the DL P-CPICH frame boundary with an offset in the range of 0 to 38399 chips, corre-

sponding to 1 frame.

- The *HSFN Trigger* can be set relative to the DL HS-SCCH subframe boundary with an offset in the range of 0 to 7679 chips, corresponding to 1 HSDPA subframe.
- The *HS UE-ID Trigger* is synchronized to the DL HS-PDSCH subframe. A pre-trigger offset must be defined in the *HS UE ID Trigger* section described above.

Remote control: –

Analyzer Settings (Connection Control – Analyzer)

The *Analyzer* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Analyzer* tab configures the RF input path of the CMU. This comprises the maximum expected input level, the way it is defined and the RF attenuation *(Analyzer Level).*

The functions of this menu are described in section *Analyzer Settings – Table-Oriented Version* on p. 4.55.

SIB Monitoring (Connection Control – BCH Monitor)

The *BCH Monitor* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *BCH Monitor* tab displays the System Information Blocks received from the Node B. This requires a BCH/SFN synchronization of the R&S CMU to the BCH from the Node B; see example procedure on p. 4.115. System Information Blocks are transferred on the BCH/P-CCPCH, so there is no need to know the *Scrambling Code (DPCH)* of the Node B signal.

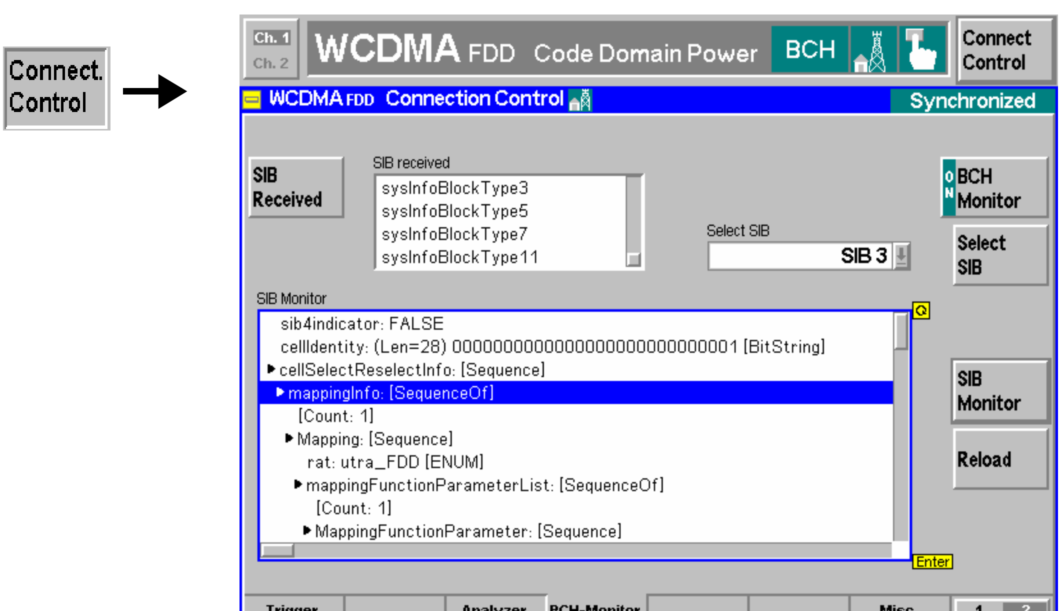


Fig. 4-58 Connection Control – Misc

BCH Monitor

The *BCH Monitor* softkey controls the BCH Monitor and indicates its status *(RUN | HLT | OFF*). This status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. While the monitor is running the received block types are displayed in the *SIB received* list.

The BCH Monitor can be run in parallel with the *DL BER Test* and all TX measurements.

Remote control
```
INITiate:BCHMonitor
ABORt:BCHMonitor
[SENSe:]BCHMonitor:STATus?
```

Select SIB

Selects one of the received SIB types for detailed analysis in the *SIB Monitor*. The monitor remains empty until a block of the selected type has been received. The contents of the System Information Blocks (SIB) no. 1 to 18, the Master Information Blocks (MIB), and the Scheduling Blocks (SB) 1 and 2 are specified in standard 3GPP TS 34.108. The R&S CMU can analyze the complete set of information blocks.

Remote control
```
[SENSe]:BCHMonitor:SIB? <Type>
```

Reload

Refreshes the contents of the *SIB Monitor,* loading the contents of the last received block of the selected type.

Remote control: –

SIB Received

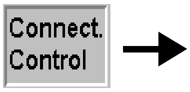
Activates the list of received block types for scrolling.

Remote control:
```
[SENSe]:BCHMonitor:SIBReceived?
```

Data Logging (Logging)

The *Logging* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Logging* tab selects the type and destination for the recorded information.



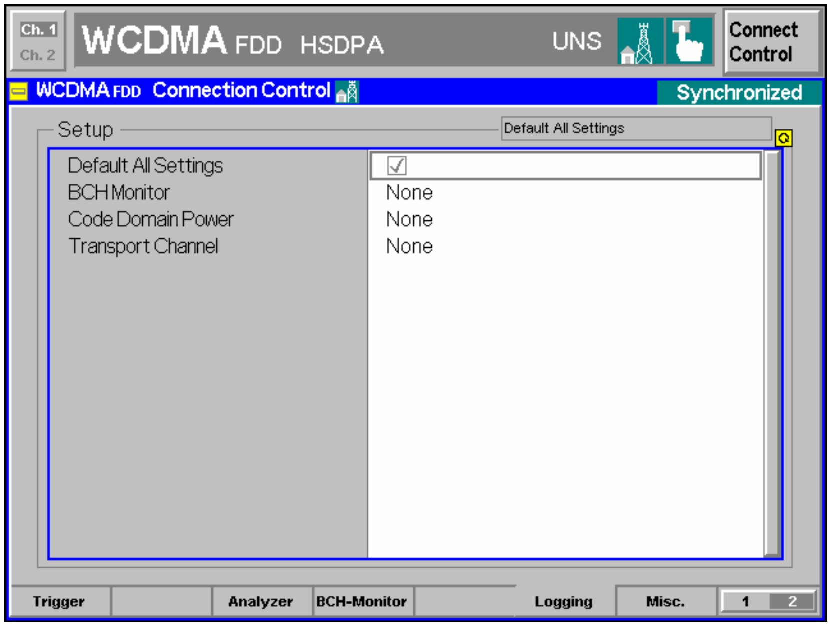


Fig. 4-59 Connection Control – Misc

Default Settings

The *Default All Settings* switch assigns default values to all settings in the *Logging* tab (the default values are quoted in the command description in Chapter 6).

Remote control
`DEFault:LOGging`

BCH Monitor / Code Domain Power / Transport Channel

BCH Monitor, Code Domain Power, and *Transport Channel* enable data logging and select a destination. The settings are identical for all three information types.

None	No information is recorded, nothing is stored or transferred.
File	The information is recorded and can be stored to a file using the *Data – Logging* menu; see section *Saving Log Files (Data – Logging)* on p. 4.138.
COM	The information is recorded and routed to the serial COM 1 interface on the rear panel of the R&S CMU 300. No additional configuration for the data transfer is required.

Only one message type can be recorded, the other two are automatically set to *None*. The *BCH Monitor, Code Domain Power,* and *Transport Channel* message contents are described below.

NOTE

Data transfer via COM interface

To use the COM 1 interface for data transfer, select the highest baud rate (115200 bps; to change the baud rate press the SETUP key and open the Comm. tab of the Setup menu). In addition make sure that COM 1 is not reserved for other connections, e.g. for remote control (Setup – Remote).

A utility for file transfer via COM interface is stored in the ***programs*** *directory of the R&S CMU200/300 documentation CD-ROM. To transfer logged BCH Monitor, Code Domain Power, or Transport Channel data, start the file on your PC using the DOS command line:*

`<path>\binlogs.exe <PC_comport> [Optional: b (BCH) or c (CDP) or t (TCH)]`, e.g.
`C:\CMU_Tools\binlogs.exe com1 b` for transfer of BCH Monitor information via COM1.

If the optional parameter is omitted, the R&S CMU 300 will auto-detect the logged information type.

Remote control

```
CONFigure:LOGGing:BCHMonitor NONE | FILE | COM
CONFigure:LOGGing:CDPower NONE | FILE | COM
CONFigure:LOGGing:TCHannel NONE | FILE | COM
```

BCH Monitor information

Contains the name of the system information block, the elements with their names, values, types, and (indented) sub-elements. The type is not shown for integers and Booleans. Integers are printed as decimal values.

If an optional element is not present in the data, then a message indicates that the element is not present. Repeated system information blocks are not shown again, unless at least one element value has changed.

Example:

```
 ###################################
     systemInformationBlockType3
 ###################################

sib4indicator: FALSE
cellIdentity: (Len=28) 0000000000000000000000000001 [BitString]
cellSelectReselectInfo: [Sequence]
 mappingInfo: [SequenceOf]
  [Count: 1]
  Mapping: [Sequence]
   rat: utra_FDD [ENUM]
   mappingFunctionParameterList: [SequenceOf]
    [Count: 1]
    MappingFunctionParameter: [Sequence]
     functionType: linear [ENUM]
     mapParameter1: 1
     mapParameter2: 1
     upperLimit: 1
 cellSelectQualityMeasure: [Choice]
  cpich-Ec-N0: [Sequence]
   q-HYST-2-S: 0
 modeSpecificInfo: [Choice]
  fdd: [Sequence]
   s-Intrasearch: -16
…
  AccessClassBarred: notBarred [ENUM]
```

Code Domain Power information

Contains the System Frame Number (SFN) plus 15 columns with one CDP value in dBm and one TCP value for each slot.

Example:

```
0074 -14.5#0 -14.5#1 -14.5#1 -14.5#? -14.5#0 -14.6#0 -14.5#0 -14.6#0 -14.5#0
-14.5#0 -14.5#0 -14.5#0 -14.5#0 -14.6#0 -14.5#0

0075 -14.5#0 -14.5#0 -14.6#0 -14.5#0 -14.5#1 -14.5#0 -14.5#0 -14.5#0 -14.4#0
-14.5#0 -14.5#0 -14.5#0 -14.5#0 -14.5#0 -14.5#1

...
```

where:	0074 / 0075 /…:	SFN
	–14.5 / –14.5 / …	CDP in dBm
	#	Separator CDP / TCP
	0 or 1 or ?	TCP (0 or 1 or undefined, i.e. not decoded or unavailable, e.g. for HSDPA channels)

Transport Channel information

Contains the transport block size in bits (decimal value), followed by the raw data in each transport block.

Example:

```
244: a3cf9b15 238dab89 88804230 9cab0de9 b9142b4f d925bf26 a6603194 697f4000
244: 58eb2cf1 f741adbb 05afaa81 4af2ee07 3a4f5d44 8670bdb3 43bc3fe0 f7c5c000
244: c8253b47 9f362a47 1b571311 00846139 561bd372 28569fb2 4b7e4d4c c0632000
244: 8d2fe8b1 d659e3ee 835b760b 5f550295 e5dc0e74 9eba890c e17b6687 787fc000
244: 1ef8b990 4a768f3e 6c548e36 ae262201 08c272ac 37a6e450 ad3f6496 fc9a9000
244: 980c651a 5fd163ac b3c7dd06 b6ec16be aa052bcb b81ce93d 751219c2 f6cd0000
244: ef0ff83d f1732094 ed1e7cd8 a91c6d5c 4c440211 84e5586f 4dc8a15a 7ec92000
…
```

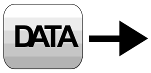
The order of the bits in the transport block remains unchanged, however, each byte is converted into a pair of hex numbers. In the example above, the first 244-bit transport block starts with 1010 0011 1100 1111 …, which reads a3cf … in hexadecimal representation.

The hex numbers are arranged in blocks of 8 for better readability. If the transport block size is different from a integer multiple of 8 * 4 = 32, the last block is filled with zeroes. In the example above, 244 = 8 * 32 – 3 * 4, so the data part consists of 8 blocks, and the last three hex numbers of the 8th block are always zero.

Saving Log Files (Data – Logging)

The *Logging* tab in the *Data* popup menu (see operating manual for the R&S CMU200/300 base unit) activates recording of the information type recorded during a WCDMA Node B test session and selects a destination file for this information.

The recorded information must be selected in the Logging *tab of the* Connection Control *menu; see section* Data Logging (Logging) on p. 4.135. *The Data – Logging* dialog is not relevant for logged information transferred via COM interface.



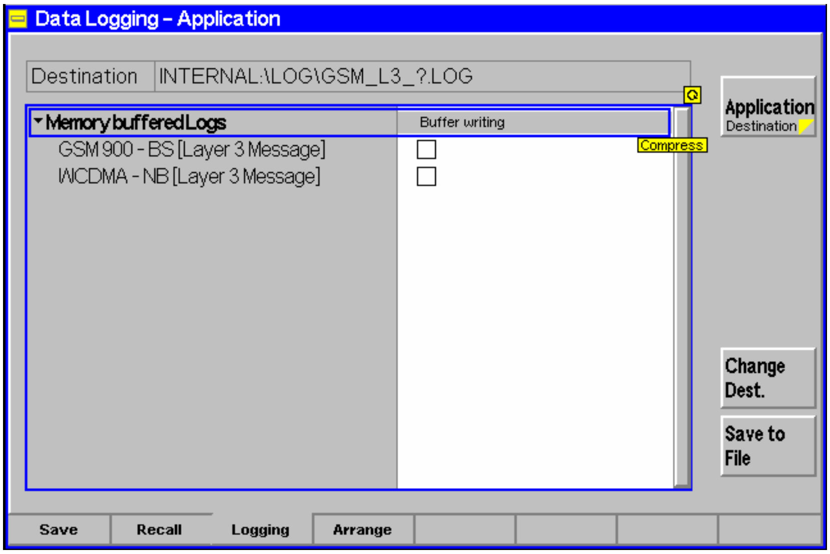


Fig. 4-60 Data – Logging menu

Buffer writing

Buffer writing controls data recording and indicates the current status of buffer writing/data recording in the selected network *(ON/OFF)*.

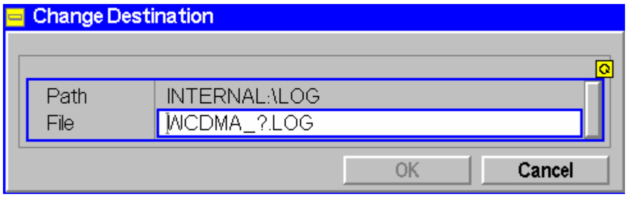
If buffer writing is enabled *(ON),* the information recorded during a WCDMA Signalling test session is stored in a ring buffer. The buffer size corresponds to approx. 3200 messages. The SIB data is coded into a special format to save memory and time. It can easily be decoded, using the file \tools\sibdec.exe.

The contents of the ring buffer can be written to a binary file any time (even while *Buffer Writing* is enabled); see *Save to File* softkey below. Saving the buffer contents clears the buffer. On the other hand the buffer is not cleared when *Buffer Writing* is enabled.

Remote control:
The command for the data log belongs to the *WCDMA Signalling* function group:
`MMEMory:L3MSg:BWRiting OFF | ON`

Change Dest.

The *Change Dest.* softkey opens a dialog to specify the name and path of the created log file.



Editing the *Change Destination* dialog is optional: By default, the CMU stores log files to the directory *INTERNAL\LOG* and uses the file names WCDMA_?.LOG where the question mark is replaced by current numbers that are automatically incremented, starting with zero (auto-increment function). To create more than 10 different log files, another name or destination must be specified.

Selecting *OK to Save* closes the dialog window and stores the inputs made. Pressing *Cancel* or *Change Dest.* again without selecting *OK to Rename* closes the dialog box, discarding all inputs made.

Remote control
The command for the data log belongs to the *WCDMA Signalling* function group:
`MMEMory:L3MSg:CDEStination <FileName>`

Save to File

Save to File saves the current ring buffer content to the log file specified via *Change Dest.* and clears the ring buffer.

Note: *The contents of the ring buffer are also saved when the instrument is shut down, i.e. after pressing Alt+F4 on instruments equipped with a FMR 5 or during the normal shutdown process (ON/STANDBY key; "Shutdown in progress...") on instruments equipped with a FMR 6. To distinguish files created during shutdown from ordinary log files they are named WCDMA_?.SAV where the ? is auto-incremented.*

Remote control
The command for the data log belongs to the *WCDMA Signalling* function group:
```
MMEMory:L3MSg:SAVE <FileName> [,<msus>]
MMEMory:L3MSg:BEMPty?
```

Display Control (Connection Control – Misc)

The *Misc.* tab is part of the second group of tabs in the *Connection Control* menu. It is accessible after pressing the *1 / 2* toggle hotkey once. Pressing *1 / 2* again switches back to the first group of tabs described above.

The *Misc.* tab defines in what instances the *Connection Control* popup menu is automatically opened or closed *(Connect. Control Guidance)*.

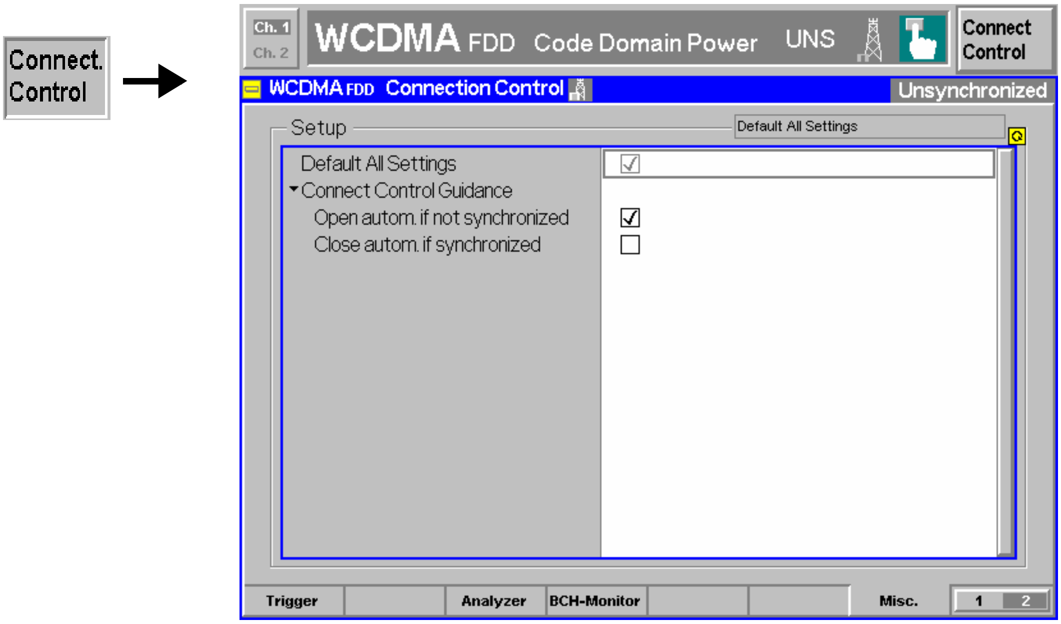


Fig. 4-61 Connection Control – Misc

Default Settings The *Default All Settings* switch sets all parameters of the *Misc* tab to their default values (see command description in Chapter 6).

Remote control –

Connect. Control Guidance Defines in what instances the *Connection Control* popup menu is automatically opened or closed:

Open autom. if not synchronized

In the *Open automatically* mode, the *Connection Control* menu is automatically opened each time the WCDMA function group is accessed in *Signalling* test mode, each time a measurement menu is opened while the DUT is not synchronized and each time synchronization is lost. Otherwise the menu must be opened manually.

Close autom. if synchronized

In the *Close automatically* mode, the *Connection Control* menu is automatically closed as soon as the CMU reaches the *BCH/SFN Synchronized* state. Otherwise the menu must be closed manually.

Remote control No command; screen configuration only.

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5 Remote Control – Basics

This chapter gives a survey of the basic features and concepts of WCDMA Node B remote control commands. Remote control can be described in terms analogous to the ones used in Chapter 3 for the classification of measurement and configuration menus. In the following, we will particularly point out the similarities and differences between manual and remote control.

Structure of WCDMA Node B Function Group

Chapter 6 of this manual lists gives a description of all WCDMA remote control commands, including their parameters, as well as the default values and ranges of all numerical parameters.

Function groups and test modes

The WCDMA Node B test options provide the two test modes *Signalling* and *Non Signalling*. Many commands in the two test modes have the same syntax.

Addressing

The CMU uses extended addressing: The instrument is assigned a primary address while the WCDMA function groups are identified via secondary addresses. In principle, this concept allows the same remote commands and program parts to be used in WCDMA and in function groups and test modes from other networks:

```
ibwrt(h_WCDMA19NBFDD_NSig,"INITiate:RFGenerator")
ibwrt(h_GSM1800MS_NSig, "INITiate:RFGenerator")
```

provided that the variables `h_WCDMA19NBFDD_NSig` etc. have been appropriately defined, see program examples in Chapter 7 of the CMU operating manual.

The remote control commands for first `(SYST:COMM:GPIB:ADDR)` and secondary `(SYST:REM:ADDR:SEC)` addressing are described in the CMU operating manual. The `SYST:REM:ADDR:SEC` command uses the following name to address the WCDMA Node B function groups:

`WCDMA1900NBFDD_Nsig` *`WCDMA1900NBFDD_Sig`*

Order of commands

The commands are arranged to form groups belonging to the same measurement or to the same type of configurations. These command groups are identified by the second-level keyword (as in `POWer`). Applications belonging to a measurement group (see Chapter 5 of the CMU operating manual) are identified by the lower-level keywords of each command (as in `MODulation:EVMagnitude:WCDMa`). Chapter 6 is organized as follows:

General Configurations/Connection Control (Non Signalling):

Second-level keywords `EPOWer, RFANalyzer, RFGenerator, EXTernal:TRIGger, INPut, OUTPut, CORRection:LOSS, DM:CLOCk, UECode`

Measurement groups (Non Signalling and/or Signalling):

`CDPower` (including the applications `CDPower and PCDError`), `MODulation` (including the applications `OVERview, EVMagnitude, PERRor, MERRor`), `POWer` (including the applications `WBANd` and `FSELective`), `SPECtrum` (including the applications `ACLR` and `OBW`), `DLBer:BER, RACH:PREamble`, `HSDPa` (including the applications `HINFormation` and `HTHRoughput`).

General Configurations/Connection Control (Signalling): Second-level keywords `SIGNalling, NBSignal, UESignal, EPOWer, TRIG-`

`ger, INPut, OUTPut, CORRection:LOSS, BCHMonitor, L3MSg`).

The structure of chapter 6 differs from chapter 4 *(Functions and their Application)* where the measurements are presented first and configurations pertaining to the whole function group and test mode are reported at the end of each section.

The menu of the graphical user interface corresponding to a group of commands is quoted at the beginning of each section. Alphabetical lists of all commands are annexed to chapter 6.

SCPI Conformity

In view of the particular requirements of WCDMA measurements not all commands could be taken from the SCPI standard. However, the syntax and structure of all commands is based on SCPI rules. For a detailed description of the SCPI standard refer to chapter 5 of the CMU operating manual.

SCPI confirmed and SPCI approved commands are explicitly marked throughout chapter 6.

Remote Control

All commands may be used for control of the CMU via GPIB interface or serial (RS-232) interface.

Measurement Control

The commands in the measurement groups quoted above (`POWer...`, `MODulation...`, `SPECtrum...`, `CDPower...`) have an analogous structure and syntax. The measurements are controlled according to the common concepts outlined in Chapter 5 of the CMU operating manual. The following sections show how the general concepts are applied to WCDMA measurements.

Measurement Groups

The command groups for all measurements have the same structure. The WCDMA Node B function groups provide the following measurements:

Table 5-1 List of measurement objects

Measurement Object	Applications	Functionality
POWer **(Non Signalling and Signalling)**	**WPOWer**	Peak transmitter output power of the UE, measured with a wide-band filter.
	FSELective	Peak and RMS-averaged transmitter output power of the UE, measured with frequency-selective filters, including limit check and statistical evaluation.
CDPower **(Non Signalling and Signalling)**	**CDPower**	Code domain power in all code domain channels of the downlink WCDMA signal. Scalar modulation quantities such as the carrier frequency error, average and RMS phase error, I/Q imbalance, I/Q origin offset, as well as statistical results (peak and RMS values) and the results of the limit check are indicated in addition.
	PCDError	Peak code domain error of the downlink WCDMA signal. Scalar modulation quantities such as the carrier frequency error, average and RMS phase error, I/Q imbalance, I/Q origin offset, as well as statistical results (peak and RMS values) and the results of the limit check are indicated in addition.
MODulation... **(Non Signalling and Signalling)**	**OVERview**	Scalar parameters characterizing the modulation accuracy of the Node B transmitter including limit check and statistical evaluation.
	EVMagnitude	Error vector magnitude plotted over one slot, including limit check and statistical evaluation.
	MERRor	Magnitude error plotted over one slot, including limit check and statistical evaluation.
	PERRor	Phase error plotted over one slot, including limit check and statistical evaluation.
SPECtrum **(Non Signalling and Signalling)**	**ACLR**	Adjacent Channel Leakage power Ratio (ACLR) at definite off-carrier frequencies, including limit check and statistical evaluation.
	OBW	ACLR as a continuous function of the frequency, calculated by means of a Fast Fourier Transform. The Occupied Bandwidth (OBW) is derived from the FFT curve. A limit check and a statistical evaluation is provided in addition.
DLBER **(Signalling)**	**BER**	Bit Error Rate and Block Error Rate tests on a WCDMA DL signal, in particular for Node B receiver quality tests in loopback mode.

Measurement Object	Applications	Functionality
RACH (R&S CMU-K71)	PREamble	Configuration of a sequence of RACH preambles and analysis all received AICHs with regard to correct timing and signature.
HSDPa (R&S CMU-K72)	HINFormation	Decoding of the DL HS-SCCH channels and evaluation of the decoded information.
	HTHRoughput	Calculation of the data throughput of the HS-PDSCHs associated to the decoded HS-SCCHs. With option R&S CMU-K73, *HSDPA Stimulate,* the R&S CMU is able to transmit an UL High Speed Dedicated Physical Control Channel (HS-DPCCH) carrying ACK/NACK messages and CQI values in order to check the response of the Node B under test.

Configuration of a sequence of RACH preambles and analysis all received AICHs with regard to correct timing and signature. In addition to the measurements in Table 5-1 the following results are available in *Signalling* mode:

- Node B signal parameters during synchronization (…MINFo…)
- System Information Blocks transmitted on the BCH (…BCHMonitor…)
- *BCH Monitor, Code Domain Power,* and *Transport Channel* information recorded during the test session (…L3MSg…)

For a complete overview of all commands, see the lists of remote control commands at the end of Chapter 6.

Measurement Statistics

In the WCDMA network, the (modulated) RF signal is divided into periodic slots serving as basic evaluation periods for the measurement and for the calculation of statistical results.

Together with the *Statistic Count*, the *Repetition Mode* defines how many evaluation periods are measured if the measurement is not stopped explicitly (measurement control commands STOP..., ABORT...) or by a limit failure. With remote control the three repetition modes *Single Shot, Continuous* and *Counting* are available (*Counting* is not available in manual control, see chapter 3).

In MODulation and CDPower measurements, different traces corresponding to the result in the current evaluation period, the maximum, minimum, extreme value, or average over a set of evaluation periods (bursts) are determined. These results can be queried independently.

Note: *The statistical settings for the DL BER Test (…DLBer…) differ from the settings for TX tests; refer to the command description in Chapter 6.*

Table 5-2 Repetition mode in remote control

Setting	Description	Command
Statistic Count	Integer number of evaluation periods forming one statistics cycle. An evaluation period is equal to a slot. The statistic count is set together with the measured quantity.	CONFigure:<meas_obj>:CONTrol:STATistics 1 ... 1000 | NONE (<meas_obj> = POWer:FSELective | MODulation... | SPECtrum..., CDPower...; see Table 5-1 on p. 5.3)
Repetition mode Single Shot	The measurement is stopped after one statistics cycle.	CONFigure:<meas_obj>:CONTrol:REPetition **SINGleshot**, <StopCondition>, <Stepmode> (<meas_obj> = POWer... | MODulation... | SPECtrum..., CDPower...see Table 5-1 on p. 5.3

Setting	Description	Command
Continuous	The measurement is continued until stopped explicitly or by a limit failure. Average results are calculated according to the rules given in chapter 3.	`CONFigure:<meas_obj>:CONTrol:REPetition` **`CONTinuous`**`, <StopCondition>, <Stepmode>` `(<meas_obj> = POWer... | MODulation... | SPECtrum..., CDPower...;` see Table 5-1 on p. 5.3)
Counting	Repeated single shot measurement with configured statistics cycles.	`CONFigure:<meas_obj>:CONTrol:REPetition` **`1 ... 10000`**`, <StopCondition>, <Stepmode>` `(<meas_obj> = POWer... | MODulation... | SPECtrum..., CDPower...;` see Table 5-1 on p. 5.3) A counting measurement with 1 evaluation period is equivalent to a single shot measurement..

Measurement Curves	The specifiers `CURRent, MAXimum, MINimum, MMAX,` and `AVERage` denote the traces for the current evaluation period, the maximum, minimum, extreme value, or average of a set of evaluation periods. They correspond to the *Display Mode* set in the measurement configuration menus.
	In general several traces are evaluated during the measurement. They are selected via the specifiers used as last keywords in the `READ..., FETCh...` or `SAMPle...` queries.
		Measurement results:
		`READ:ARRay:MODulation:EVMagnitude...<disp>?`
		`READ:SUBarrays:MODulation:EVM...<disp>?`
		`...`
		`<disp> = :CURRent | :AVERage | :MMAX`
		Limit matching:
		`CALCULATE:ARRay:CDPower...<disp>: MATChing:LIMit?`
		`....`
		`<disp> = :CURRent | :AVERage | :MAXimum`
		Analogous commands for other `MODulation` and `CDPower` applications and for `<meas_obj> = SPECtrum:OBW`

Specifying Limits

The following table gives an overview of the types of limits and possible results of the limit check.

Table 5-3 Limits and limit check

Type	Description	Command

Scalar limits	Limit values for a single (scalar) measured quantity. Depending on the measured quantity, either an upper limit or upper and lower limits can be defined.	`CONFigure:<meas_obj>:<disp>:LIMit [SCALar]:<Spec.>:VALue`
		`<disp> = :CMMax | :AVERage | :CMAX` for display modes Current & Max./Min. or Average or Current & Maximum
		`<meas_obj> = MODulation... | SPECtrum..., CDPower..., DLBer`
		`<Spec.> = ASYMmetric:UPPer | ASYMmetric:LOWer | SYMMetric[:COMBined]` for upper limits, lower limits, or combined upper and lower limits.

Limit check	All scalar limits belonging to the same measurement group are read out together with the command on the right side.	`CALCulate[:SCALar]:<meas_obj.> ...:MATChing:LIMit?`
	Possible results of the scalar limit check are listed on the right side. Further messages assessing, e.g., the power ramp or the result of the BER test in general, may be issued in particular cases (see detailed command description in chapter 6).	`NMAU` not matching, upper `NMAL` not matching, lower `INV` measured value invalid `OK` no limit failure

Status Reporting System

A general description of SCPI status registers and of the status reporting system is given in chapter 5 of the CMU operating manual. At present, the WCDMA Node B function group does not use any specific status registers.

Special Terms and Notation

Below we list some particular features in the syntax of the WCDMA commands. The general description of the SCPI command syntax can be found in chapter 5 of the CMU operating manual, section *"Structure and Syntax of Device Messages".*

Description of commands

The commands are arranged in tables. From top to bottom, the table rows contain the following entries:

1. Complete command syntax including the parameter list and a short description of the command
2. List and description of the parameters with their default values and the units
3. Detailed description of the command, required firmware version

To make it clear how the commands are structured and related to each other, groups of analogous commands are described in common tables.

Order of commands

The commands are arranged according to their function specified by the keyword in the second level or in the second/third level combined. Lower-level keywords define the command in more detail. This means that commands with the same second-level, third-level etc. keywords are generally grouped together in the same sections.

Example: `CONFigure:POWer:FSELective:CONTrol:REPetition`

Commands with the keyword *POWer* in the second level belong to the power measurement. The keyword in the third level denotes the application (frequency-selective measurement filter). The keywords in the fourth and fifth level indicate that the command controls the repetition mode of the power measurement.

Scalar results and arrays

To limit the number of remote control commands, scalar results are always measured together and output in lists. Arrays (e.g. the traces for `MODulation` measurements) are output as lists of values separated by commas; it is possible to retrieve either the whole list (see commands `READ:ARRay...` etc.) or the values located in a number of subranges that are part of the total measurement range (see commands `READ:SUBarrays...;` the subarrays are defined via `CONFigure:SUBarrays...`).

Parameters

Setting commands are usually supplemented by a parameter or a list of several parameters. Parameters either provide alternative options (setting a or setting b or setting c ..., see special character "|"), or they form a list separated by commas (setting x,y).

<Par_Name> In the command tables and lists, parameters are generally described by a name (literal) written in angle brackets (<>). This literal merely serves as a parameter description; in an application program it must be replaced by one of the possible settings reported in the detailed parameter description.

Example:
```
CONFigure:POWer:FSELective:CONTrol:REPetition
        <Repetition>, <StopCond>,...
with    <Repetition>    = CONTinuous | SINGleshot |…
        <StopCond>      = SONerror | NONE
        ...
```

possible command syntax: `CONF:POW:OFF:CONT:REP CONT,NONE,..`

NAN NAN (not a number) is generally used to represent missing data, e.g. if a portion of a trace has not been acquired yet. It is also returned after invalid mathematical operations such as division by zero. As defined in the SCPI standard, NAN is represented as 9.91 E 37.

INV INV (invalid) is returned if a limit check is performed without defining the appropriate tolerance values.

Upper / lower case Upper/lower case characters characterize the long and short form of the keywords in a command. The short form consists of all upper-case characters, the long form of all upper case plus all lower case characters. On the CMU, either the short form or the long form are allowed; mixed forms will generally not be recognized. Note that the instrument itself does not distinguish upper case and lower case characters.

Special characters

| A vertical stroke in the parameter list characterizes alternative parameter settings. Only one of the parameters separated by **|** must be selected.

Example: The following command has two alternative settings:

`DEFault:POWer:CONTrol ON | OFF`

[ ] *Key words* in square brackets can be omitted when composing the command header (see chapter 5 of the CMU manual, section "Structure of a Command"). The complete command must be recognized by the instrument for reasons of compatibility with the SCPI standard.

Parameters in square brackets are optional as well. They may be entered in the command or omitted.

{ } Braces or curly brackets enclose one or more parameters that may be included zero or more times.

<nr> This symbol denotes a numeric suffix, e.g. an enumeration index for input and output connectors.

Lists of commands

Command: The *Command* column of the table contains all remote control commands arranged according to their function (configurations or measurement objects). Within a section, the commands are listed in alphabetical order.

Parameters: The *Parameter* column lists the parameters of the commands.

Remarks: The *Remarks* column gives additional information about the commands which

- Have no query form *(no query)*
- Have only a query form *(query only)*
- Can be used both as setting commands and as queries (*with query*, this applies to all commands belonging to none of the two preceding categories)

Alphabetical Lists Chapter 6 concludes with alphabetical command lists for both test modes.

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6 Remote Control – Commands

In the following, all remote-control commands for the WCDMA Node B test options are listed in tabular form with their parameters and the ranges of values. The chapter is organized in analogy to the reference part for manual operation (Chapter 4):

- The measurement modes *Non Signalling* and *Signalling* are presented separately.
- Within the measurement modes, general configurations *(Connection Control)* and the individual measurement groups are described separately.
- Command and measurement groups that are identical or almost identical in both test modes *(MODulation...,CDPower..., IQIF*, symbolic status register evaluation etc.) are presented in a separate section between the two test modes.

General notes on remote control in the WCDMA node B function groups can be found in Chapter 5. An introduction to remote control according to the IEEE 488.2/SCPI standard and to the general concepts applied in the R&S CMU is given in Chapter 5 of the R&S CMU200/300 operating manual.

Connection Control (Non Signalling)

The remote-control commands in this section configure the measurements in the WCDMA node B function group globally, i.e., they provide settings that are valid for all measurements. They correspond to the settings in the *Connection Control* popup menu.

Subsystem EPOWer (Expected Power)

The subsystem *EPOWer* controls the level in the RF input signal path. It corresponds to the table section *Analyzer Level* in the *Analyzer* tab of the *Connection Control* menu.

[SENSe:]EPOWer:MODE <*Mode*>				Analyzer Level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
MANual | **AUTomatic**	Manual setting Automatic setting corresponding to average power of signal applied	AUT	–	V3.22
Description of command				
This command defines how the RF analyzer is adapted to the expected input power.				

[SENSe:]EPOWer:VALue <*Level*>				Expected Power
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–42 dBm to +53 dBm **–56 dBm to +39 dBm** **–79 dBm to 0 dBm**	Maximum input level for RF 1 Maximum input level for RF 2 Maximum input level for RF 4 IN	+30.0 +30.0 0.0	dBm dBm dBm	V3.22
Description of command				
This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command). Some measurements are restricted to a narrower input level range; see data sheet.				

[SENSe:]EPOWer:ATTenuation <*Mode*>				Attenuation
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NORMal | **LNOise |** **LDIStortion**	Mixer level in normal range Low noise (mixer level 10 dB higher than in normal setting) Low distortion (mixer level 10 dB lower than in normal setting)	LNOise	–	V3.22
Description of command				
This command tunes the RF analyzer for normal setting, low noise level (full dynamic range), or low distortion (high intermodulation spacing).				

DEFault:EPOWer <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Subsystem RFANalyzer (Analyzed Input Signals)

The subsystem *RFANalyzer* sets the center frequency of the RF analyzer. It corresponds to the *Analyzer Settings* section in the *Analyzer* tab of the popup menu *Connection Control*.

[SENSe:]RFANalyzer:FREQuency <*Number*>				RF Channel
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
15 MHz to 2 700 MHz **(see also data sheet)**	Input frequency (in multiples of 200 kHz)	2140.0 (channel no. 10700)	MHz	V3.22
Description of command				
This command defines the frequency of the RF signal analyzed. With the command `[SENSe:]RFANalyzer:FREQuency:UNIT`, the default frequency unit can be changed, and UARFCN (UTRA Absolute Radio Frequency Channel Numbers) can be entered instead of frequencies. The assignment of channel numbers and frequencies is in accordance with 3GPP specifications.				

[SENSe:]RFANalyzer:FREQuency:UNIT <*Unit*>				Frequency Unit
<Unit>	Description of parameters	Def. value	Def. unit	FW vers.
HZ | KHZ | MHZ | GHZ | **CH**	Frequency unit Channel number (UARFCN)	MHz	MHz	V3.22
Description of command				
This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as an UARFCN. Frequency units must be used to select input signals that are outside the designated channel range.				

[SENSe:]RFANalyzer:FOFFset *<FreqOffset>*				Frequency Offset
<FreqOffset>	Description of parameters	Def. value	Def. unit	FW vers.
–100.000 kHz to +100.000 kHz	Offset for channel frequency	0	Hz	V3.22
Description of command				
This command defines an offset for the RF analyzer frequency set with the command `[SENSe:]RFANalyzer:FREQuency <Number>`. The offset frequency must be in multiples of 1 Hz.				

DEFault:RFANalyzer *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Subsystem RFGenerator (Generator control)

The subsystem *RFGenerator* configures the RF signals generated by the R&S CMU. It corresponds to the softkey *RF Generator* in the *Generator* tab in the popup menu *Connection Control*.

INITiate:RFGenerator **ABORt:RFGenerator**	Start RF generator, reserve resources ⇒ *RUN* Switch off RF generator, release resources ⇒ *OFF*
Description of command	FW vers.
These commands have no query form. They start and stop the RF generator, setting it to the status indicated in the top right column.	V3.06

FETCh:RFGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	V3.06
Description of command				
This command is always a query. It returns the current generator status.				

DEFault:RFGenerator				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.06
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the `RFGenerator` subsystem (including the commands in the following sub-sections) to default values. The setting *OFF* results in an error message. If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Generator Level

The following commands define the level in the different channels of the uplink signal. They correspond to the *Generator Level* section in the *Generator* tab of the popup menu *Connection Control*.

SOURce:RFGenerator:LEVel:TTPower *<Level>*				Total Transmit Power
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –40 dBm **–137 dBm to –23 dBm** **–90 dBm to 0.0 dBm**	Total generator output power at RF 1 Total generator output power at RF 2 Total generator output power at RF 3 OUT	–80.0 –80.0 –80.0	dBm dBm dBm	V3.06
Description of command				
This command sets the Total TX Power in absolute units. The DPCCH/DPDCH power ratio and the number of DPDCHs is considered to be fixed for all channel configurations, so the command overwrites the value of `SOURce:RFGenerator:LEVel:DPCCh` and vice versa (see description of manual control).				

SOURce:RFGenerator:LEVel:DPCCh *<Level>*				DPCCH Level
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –10 dBm*	DPCCH level	–84.6	dBm	V3.06

Description of command

This command sets the level of the Dedicated Physical Control Channel (DPCCH). The DPCCH/DPDCH power ratio and the number of DPDCHs is considered to be fixed for all channel configurations, so the command overwrites the value of `SOURce:RFGenerator:LEVel:TTPower` and vice versa (see description of manual control).

*) The level range depends on the *DPDCH Level* and the *Power Ratio DPCCH/DPDCH*. It is such that the allowed range of the *Total TX Power* is not exceeded. The value quoted above holds for output connector RF2 and a *Power Ratio DPCCH/DPDCH* of INF where the DPDCH is effectively switched off.

SOURce:RFGenerator:LEVel:DPDCh?				DPDCH Level
Returned value	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –10 dBm*	DPDCH level	–81.9	dBm	V3.06

Description of command

This command is always a query and returns the level of the Dedicated Physical Data Channel (DPDCH). The DPDCH power depends on the channel configuration and the *Total TX Power;* see description of manual control.

*) The level range depends on the *DPCCH Level* and the *Power Ratio DPCCH/DPDCH*. It is such that the allowed range of the *Total TX Power* is not exceeded. The value quoted above approximately holds for output connector RF2 and a very small *Power Ratio DPCCH/DPDCH* so that the DPCCH contribution is negligible.

SOURce:RFGenerator:LEVel:RCD:GPPReference?				Power Ratio DPCCH/DPDCH
<Ratio>	Description of parameters	Def. value	Def. unit	FW vers.
(According to the standard)	Fixed power ratio DPCCH/DPDCH for 3GPP reference meas. channels	–	dB	V3.06

Description of command

This command is always a query and returns the DPCCH/DPDCH power ratio for 3GPP reference measurement channels in the uplink WCDMA signal. This ratio is as specified in the standard for each reference channel.

SOURce:RFGenerator:LEVel:RCD:PHYSical *<Ratio>*				Power Ratio DPCCH/DPDCH
<Ratio>	Description of parameters	Def. value	Def. unit	FW vers.
±23.52 dB | ± 17.5 dB | ±13.98 dB | ±11.48 dB | ±9.54 dB | ± 7.96 dB | ±6.62 dB | ±5.46 dB | ±4.44 dB | ±3.52 dB | ±2.69 dB | ±1.94 dB | ±1.24 dB | ±0.60 dB | 0.0 dB	Finite power ratio DPCCH/DPDCH for physical channels	–2.69	dB	V3.06
INF	DPDCH switched off			

Description of command

This command sets the DPCCH/DPDCH power ratio for physical channels in the uplink WCDMA signal; see command `SOURce:RFGenerator:DCHannel:MODE`.

SOURCe:RFGenerator:LEVel:AWGN *<Enable>*				AWGN
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch AWGN contribution to the RF generator signal on or off	OFF	–	V3.25
Description of command				
This command switches the Additional White Gaussian Noise contribution to the RF generator signal on or off. The AWGN level is defined separately (`SOURCe:RFGenerator:LEVel:NLEVel`). This command is available with option R&S CMU-K77, *AWGN and BER Simulation.*				

SOURCe:RFGenerator:LEVel:NLEVel *<Level>*				Noise Level
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137.0 dBm to –23 dBm*)	Noise level	–84.0	dBm	V3.25
Description of command				
This command defines the level of the Additional White Gaussian Noise contribution to the RF generator signal. The setting takes effect if the AWGN is enabled only (`SOURCe:RFGenerator:LEVel:AWGN ON`). This command is available with option R&S CMU-K77, *AWGN and BER Simulation.* *) The 3GPP standard stipulates that the *Noise Level* must not be smaller than the *DPCCH Level* minus a variable margin depending on the actual *DPCCH Level* and the *Power Ratio DPCCH/DPDCH*. The range and default value quoted above holds for the default configuration of the *DPCCH Level* and the *Power Ratio DPCCH/DPDCH* and can vary if one of these parameters is changed. The *Noise Level* and the *DPCCH Level* overwrite each other as soon as their difference exceeds the margin defined in the standard.				

DEFault:RFGenerator:LEVel *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.06
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Channel-Independent Generator Settings

The following commands define channel-independent properties of the RF signal. They correspond to the *Generator Settings* section in the *Generator* tab of the popup menu *Connection Control*.

SOURce:RFGenerator:FREQuency *<Number>*				RF Channel
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
0.2 MHz to 2 700.0 MHz (see also data sheet)	Generator frequency (in multiples of 10 kHz)	1950.0	MHz	V3.06
Description of command				
This command defines the frequency of the RF signal generated. The default frequency unit can be changed with the command *`UNIT:RFGenerator:FREQuency`*, and even channel numbers (UARFCNs) can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the 3GPP specification. The generator frequency range corresponds to a channel range between 1 and 13500. The default channel number is 9750.				

UNIT:RFGenerator:FREQuency *<Unit>*				Frequency Unit
<Unit>	Description of parameters	Def. value	Def. unit	FW vers.
Hz | KHz | MHz | GHz | CH	Frequency unit | Channel number	MHz	MHz	V3.06
Description of command				
This command defines whether the frequency of the RF signal generated is specified in frequency units or as a channel number.				

SOURce:RFGenerator:FOFFset *<FrequencyOffset>*				Frequency Offset
<FrequencyOffset>>	Description of parameters	Def. value	Def. unit	FW vers.
–100.000 kHz to +100.000 kHz	Frequency offset	0	Hz	V3.06
Description of command				
This command defines an offset for the RF generator frequency set with the command `SOURce:RFGenerator:FREQuency`. The offset frequency must be in multiples of 1 Hz.				

DEFault:RFGenerator:SETTings *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.06
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Subsystem RFGenerator:DCHannel (Dedicated Channels)

The subsystem *RFGenerator:DCHannel* defines the dedicated channel settings. It corresponds to the *Dedicated Channel* section in the *Generator* tab of the popup menu *Connection Control*.

SOURce:RFGenerator:DCHannel:MODE *<Mode>*				Dedicated Channel Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
GPPR | PHYS	3GPP UL reference channel Physical channel	GPPR	–	V3.06
Description of command				
This command defines whether the dedicated channel is configured as a uplink reference channel according to 3GPP TS 25.141 (see section *Subsystem RFGenerator:GPPReference (Reference Channel)* on p. 6.10 ff.) or as a physical channel (see section *Subsystem RFGenerator:PCHannel (Physical Channel)* on p. 6.12 ff.).				

SOURce:RFGenerator:DCHannel:SCODe:VALue <*Value*>				Value
***<Value>*>**	Description of parameters	Def. value	Def. unit	FW vers.
"<6-digit hex value>"	Scrambling code	"0"	–	V3.06
Description of command				
This command selects the (long or short) scrambling code for the uplink RF generator signal. The range of scrambling code numbers corresponds to 0 to FFFFFF hexadecimal or 0 to $2^{24} – 1$ = 16777215 decimal. The value must be formatted as a string variable, i.e. a hex value enclosed in single or double quotes. The output is also a hex value formatted as a string.				

SOURce:RFGenerator:DCHannel:ULDPoffset <*Offset*>				CPICH – UL DPCH Offset
<Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 39424	CPICH – UL DPCH offset in chip periods	0	(chip periods)	V3.25
Description of command				
This command defines the timing delay of the start of the UL DPCH relative to the CPICH.				

SOURce:RFGenerator:DCHannel:ULPControl:TPCSsize <*Size*>				TPC Step Size
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
1 dB | 2 dB	TPC step size (absolute value)	1	dB	V3.06
Description of command				
This command defines the power difference between two consecutive slots where the R&S CMU is commanded to change its output power.				

SOURce:RFGenerator:DCHannel:ULPControl:MODE <*Mode*>				Mode
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
ALG1 | **ALG2**	UL power control algorithm 1: generator power toggles up and down by the TPCstep size UL power control algorithm 2: constant generator power	ALG1	–	V3.06
Description of command				
This command the algorithm for uplink power control.				

Subsystem RFGenerator:GPPReference (Reference Channel)

The subsystem *RFGenerator:GPPReference* defines the reference channel. It corresponds to the *3GPP UL Reference Channel* section in the *RF Generator* tab of the popup menu *Connection Control*.

SOURce:RFGenerator:GPPReference:CTYPe <*Bit_Rate*>				Reference Channel Type
<Bit_Rate>	Description of parameters	Def. value	Def. unit	FW vers.
12.2 kbps | 64 kbps | **144 kbps | 384 kbps | 2048 kbps**	Information bit rate	12.2	kbps	V3.06
Description of command				
This command sets the information bit rate of the 3GPP UL reference channel.				

SOURce:RFGenerator:GPPReference:CDSource:DTCH <*Sequence*>		Channel Data Source DTCH		
<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
ALL0 | **ALL1 |** **ALT |** **PR9 | PR11 | PR15 | PR16**	Bit sequence consisting of zeros Bit sequence consisting of ones 010101... bit sequence Pseudo-random bit sequences	PR9	–	V3.06
Description of command				
This command defines the bit pattern transmitted on the Dedicated Traffic Channel part of the 3GPP UL reference channel.				

SOURce:RFGenerator:GPPReference:TFCibits <*Bits*>		TFCI Bits		
<Bits>	Description of parameters	Def. value	Def. unit	FW vers.
"<10-digit binary value>"	TFCI bits	"0000000000"	–	V3.06
Description of command				
This command defines the Transport Format Combination Indicator (TFCI) bits to be transmitted on the 3GPP UL reference channel. The value is entered as a string parameter.				

SOURCe:RFGenerator:GPPReference:BBVermode <*Enable*>		BER/BLER Verification – Mode		
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **BER |** **BLER**	Uplink signal with no bit errors or block errors Uplink signal with definite bit error rate Uplink signal with definite block error rate	OFF	–	V3.25
Description of command				
This command enables or disables the BER or BLER verification mode. The BER or BLER of the signal is defined separately (`SOURCe:RFGenerator:LEVel:GPPReference:BERValue`, `SOURCe:RFGenerator:LEVel:GPPReference:BLERvalue`).				

SOURCe:RFGenerator:GPPReference:BERValue<*Rate*> **SOURCe:RFGenerator:GPPReference:BLERvalue<*Rate*>**		BER Value BLER Value		
<Rate>	Description of parameters	Def. value	Def. unit	FW vers.
0.00 % to 100.00 %	B(L)ER value in multiples of 0.01 dB	0.01	%	V3.25
Description of command				
These commands define the Bit Error Rate (BER) or Block Error Rate (BLER) of the uplink signal that the CMU generates if the BER or BLER verification mode is enabled (`SOURCe:RFGenerator:LEVel:GPPReference:BBVermode BER | BLER`).				

Subsystem RFGenerator:PCHannel (Physical Channel)

The subsystem *RFGenerator:PCHannel* defines the physical channel. It corresponds to the *UL Physical Channel* section in the *RF Generator* tab of the popup menu *Connection Control*.

SOURce:RFGenerator:PCHannel:DPCCh:TFCI:CWORd <*Code*>				TFCI Code Word
<Code>	Description of parameters	Def. value	Def. unit	FW vers.
"<8-digit hex value>" (≤3FFFFFFF)	TFCI code word	"3FFFFFFF"	–	V3.06
Description of command				
This command defines the Transport Format Combination Indicator (TFCI) code word to be transmitted on the uplink physical channel. The value of the TFCI code word must be formatted as a string variable, i.e. a hex value enclosed in single or double quotes. The output is also a hex value formatted as a string.				

SOURce:RFGenerator:PCHannel:DPCCh:TPC:ROMode <*Mode*>				Read Out Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
CPATtern | **AL01 |** **AL10 |** **ALL0 |** **ALL1 |** **SPA0 |** **SPA1 |** **SPALternate**	Continuous pattern Alternating starting 01 Alternating starting10 All 0 All 1 Single Pattern + All 0 Single Pattern + All 1 Single Pattern + Alternating	CPAT	–	V3.06
Description of command				
This command defines the rule for constructing a TPC pattern of infinite length to be transferred to Node B. The actual pattern transferred depends on the finite single pattern defined via `SOURce:RFGenerator:PCHannel:DPCCh:TPC:PATTern` and the read out mode.				

SOURce:RFGenerator:PCHannel:DPCCh:TPC:PLENgth <*Length*>				Pattern Length
<Length>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 32	Length of a single finite TPC pattern	32	–	V3.06
Description of command				
This command defines the length (number of bits) of the finite TPC command pattern that is used to construct the TPC pattern transmitted to Node B.				

SOURce:RFGenerator:PCHannel:DPCCh:TPC:PATTern <*Sequence*>				Data Source
<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
"<32-digit binary value>"	Single TPC pattern	"0101..." (32 digits)	–	V3.06
Description of command				
This command defines the single TPC bit pattern transmitted on the uplink physical channel. The value is entered as a string parameter.				

SOURce:RFGenerator:PChannel:DPDCh:CDSource <*Sequence*>	Channel Data Source DPDCH			
<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
ALL0 | **ALL1 |** **ALT |** **PR9 | PR11 | PR15 | PR16**	Bit sequence consisting of zeros Bit sequence consisting of ones 010101... bit sequence Pseudo-random bit sequences	PR9	–	V3.06
Description of command				
This command defines the bit pattern transmitted on the downlink physical channel.				

SOURce:RFGenerator:PChannel:DPDCh:TOTal:SRATe <*Rate*>	Symbol Rate			
<Rate>	Description of parameters	Def. value	Def. unit	FW vers.
15 | 30 | 60 | 120 | 240 | 480 | **960 | 1920 | 2880 |** **3840 | 4800 | 5760**	Total symbol rate for 1 DPDCH Total symbol rate for channel symbol rate 960 ksps and 1 to 6 DPDCHs	60	ksps	V3.06
Description of command				
This command defines the symbol rate and number of DPDCHs determining the properties of the UL physical channel. The default symbol rate is equal to the symbol rate transmitted on the DPDCH of a 12.2 kbps 3GPP UL reference channel. A symbol rate that differs from the allowed values is not rounded but causes an SCPI error message –221, "Settings conflict".				

Subsystem NB (Node B Settings)

The commands in this section describe the Node B configuration. They correspond to the *Node B* tab in the popup menu *Connection Control*.

CONFigure:NB:ADIVersity <*Antenna*>	Antenna Diversity			
<Antenna>	Description of parameters	Def. value	Def. unit	FW vers.
A1 | **A1 |** **OFF**	Antenna 1 Antenna 2 Off	OFF	–	V3.22
Description of command				
This command defines the antenna diversity of the Node B.				

CONFigure:NB:DCHannel:SCODe:PRIMary <*Value*>	Scrambling Code – Primary			
<Value>>	Description of parameters	Def. value	Def. unit	FW vers.
"000" to "1FF"	Primary scrambling code	"000"	–	V3.22
Description of command				
This command defines the primary scrambling code of the Node B signal. The range of scrambling code numbers corresponds to 0 to 511 decimal. Scrambling code numbers must be entered as string parameters containing the code number in hexadecimal representation.				

CONFigure:NB:DCHannel:SCODe:SECondary <*Value*>		Scrambling Code – Secondary		
<Value>>	Description of parameters	Def. value	Def. unit	FW vers.
"0" to "F"	Secondary scrambling code	"0"	–	V3.22
Description of command				
This command defines the secondary scrambling code of the Node B signal. Scrambling code numbers must be entered as string parameters containing the code number in hexadecimal representation.				

Trigger Settings

The commands in this section configure the measurement trigger and the *Wired Sync.* trigger. They correspond to the *Trigger* tab in the popup menu *Connection Control*.

CONFigure:MEAS:TRIGger:SOURce <*Source*>Source				
<Source>	Description of parameters	Def. value	Def. unit	FW vers.
FRUN | **EXTern**	Trigger provided by analyzed RF signal External trigger signal	FRUN	–	V3.25
Description of command				
This command selects the source of the trigger events. All `CONFigure:MEAS:TRIGer…` settings are valid for the external trigger source.				

CONFigure:MEAS:TRIGger:POLarity <*Polarity*>Polarity				
<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
RISing | **FALLing**	Trigger on rising edge of external trigger signal Trigger on falling edge of external trigger signal	RIS	–	V3.25
Description of command				
This command qualifies whether the trigger event occurs on the rising edge or on the falling edge of the external meas. trigger signal.				

CONFigure:MEAS:TRIGger:SOFFset <*Slots*>Slot Offset				
<Slots>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 14	Slot offset	0	(slots)	V3.25
Description of command				
This command defines an integer number of slots between the external meas. trigger time and the start of the measurement. The slot offset is added to the chip delay; see below.				

CONFigure:MEAS:TRIGger:CDELay <*Chips*>Chip Delay				
<Chips>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 10239	Chip delay	0	(¼ chips)	V3.25
Description of command				
This command defines an integer number of ¼ chip periods between the external meas. trigger time and the start of the measurement. The chip delay is added to the slot offset; see above.				

CONFigure:EXTernal:TRIGger:SYNC:POLarity <*Polarity*>Polarity				
<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
RISing | **FALLing**	Trigger on rising edge of wired sync. trigger signal Trigger on falling edge of wired sync. trigger signal	RIS	–	V3.06
Description of command				
This command qualifies whether the trigger event occurs on the rising edge or on the falling edge of the wired sync. trigger signal.				

CONFigure:EXTernal:TRIGger:SYNC:SOFFset <*Slots*>Slot Offset				
<Slots>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 61440	Slot offset	0	(slots)	V3.06
Description of command				
This command defines an integer number of slots between the beginning of the Node B Transmission Time Interval (TTI) and the trigger time. The slot offset is added to the chip delay; see below.				

CONFigure:EXTernal:TRIGger:SYNC:CDELay <*Slots*>Chip Delay				
<Slots>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 10239	Chip delay	0	(¼ chips)	V3.06
Description of command				
This command defines an integer number of ¼ chip periods between the beginning of the Node B Transmission Time Interval (TTI) and the trigger time. The chip delay is added to the slot offset; see above.				

Inputs and Outputs (External Attenuation)

The commands in this section configure the input and output connectors. They correspond to the *RF* , tab in the popup menu *Connection Control*.

INPut[:STATe] <*State*>				RF Input
<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 | **RF2 |** **RF4**	Connector RF 1 used as input Connector RF 2 used as input Connector RF 4 IN used as input	RF2	–	V3.06
Description of command				
This command determines the connector to be used for RF input signals. The bidirectional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.				

OUTPut[:STATe] <*State*>				RF Output
<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 | **RF2 |** **RF3**	Connector RF 1 used as output Connector RF 2 used as output Connector RF 3 OUT used as output	RF2	–	V3.06
Description of command				
This command determines the connector to be used for RF output signals. The bidirectional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.				

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*> **SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*>**				Ext. Att. Input
<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Value for external attenuation at the input <nr>, where <nr> = 1,2,4	0.0	dB	V3.06
Description of command				
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.				

[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude] <*Attenuation*> **SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude] <*Attenuation*>**				Ext. Att. Output
<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1,2,3	0.0	dB	V3.06
Description of command				
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.				

Subsystem DM:CLOCk (Synchronization)

The subsystem *DM:CLOCk* sets a system clock specific to the network. This frequency is set in the tab *Synch.* in the popup menu *Connection Control*.

SOURce:DM:CLOCk:STATe <*Mode*>				REF OUT 2 on/off
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch on/off system clock	OFF	–	V3.06
Description of command				
This commands switches the system clock specific to the network at the *REF OUT 2* connector on or off.				

SOURce:DM:CLOCk:FREQuency <Frequency>				REF OUT 2
<Frequency>	Description of parameters	Def. value	Def. unit	FW vers.
0.960 MHz to 30.720 MHz	System clock frequency	30.720	MHz	V3.06

Description of command

This command determines the system clock frequency applied to *REF OUT 2*. The frequency entered is internally rounded to one of the following discrete values:

0.960	0.991	1.024	1.059	1.097	1.138	1.181	1.229	1.335	1.396	
1.463	1.536	1.617	1.706	1.807	1.920	2.028	2.194	2.363	2.560	
2.793	3.072	3.143	3.840	4.388	5.120	6.144	7.680	10.240	15.360	30.720

Common Measurements and Command Groups

The commands for the measurement groups in this section are identical in both test modes.

Note: ***Firmware versions and signalling states***

In Signalling mode the `MODulation` and `SPECtrum` measurements reported in this section can be performed in the unsynchronized state (`UNS`) or in any of the synchronized states (`SYN` with CPICH or BCH/SFN synchronization). The same holds for the `MMEMory…`, `OPTions…`, and `RESet…` commands reported in this section.

The firmware versions quoted in the command tables are valid for the Non Signalling mode. The Signalling mode requires a firmware version V3.62 or higher.

POWer Measurements

The subsystem *POWer* measures the peak and RMS-averaged power of the received RF carrier signal. The subsystem corresponds to the measurement menu *Power* and the associated popup menu *Power Configuration.*

The power can be measured with different filter settings. In manual control, these filter settings correspond to the different applications of the *Power* measurement. In remote control, the applications are distinguished by the third-level keywords in the `POWer` commands:

- The third-level keyword `WBANd` denotes the *Pow. Meter Wideband* application.
- The third-level keyword `FSELective` denotes the *Pow. Meter Freq. Sel.* application.

The command syntax is similar for the two applications, so they will be described in common sections.

Control of Measurement – Subsystems POWer...

The subsystems *POWer:...* controls the power measurement.

INITiate:POWer:WBANd	Start new measurement	*⇒ RUN*
ABORt:POWer:WBANd	Abort running measurement and switch off	*⇒ OFF*
STOP:POWer:WBANd	Stop measurement after current stat. cycle	*⇒ STOP*
CONTinue:POWer:WBANd	Next measurement step (only *stepping mode*)	*⇒ RUN*
INITiate:POWer:FSELective	Start new measurement	*⇒ RUN*
ABORt:POWer:FSELective	Abort running measurement and switch off	*⇒ OFF*
STOP:POWer:FSELective	Stop measurement after current stat. cycle	*⇒ STOP*
CONTinue:POWer:FSELective	Next measurement step (only *stepping mode*)	*⇒ RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the power measurement with a particular application, setting it to the status indicated in the top right column.		V3.22

CONFigure:POWer:WBANd:EREPorting <*Mode*>
CONFigure:POWer:FSELective:EREPorting <*Mode*> — Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22

Description of command

This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).

FETCh:POWer:WBANd:STATus? — Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	

Description of command

These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).

FETCh:POWer: FSELective:STATus? — Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	

Description of command

These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).

Test Configuration

The subsystem *POWer:...CONTrol* defines the repetition mode, statistic count, and stop condition of the *Power* measurement. These settings are provided in the *Control* tab in the popup menu *Power Configuration.*

CONFigure:POWer:FSELective:CONTrol:STATistics <*Statistics*> — Measurement Statistics

<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	1	–	V3.22

Description of command

This command defines the number of slots forming a statistics cycle.

Test Cycles

CONFigure:POWer:WBANd:CONTrol:REPetition <*Repetition*>,<*StopCond*>,<*Stepmode*>
CONFigure:POWer:FSELective:CONTrol:REPetition <*Repetition*>,<*StopCond*>,<*Stepmode*>

<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22

Description of command

This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement.

Note: In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.

[SENSe:]POWer:FSELective:CONTrol:BWIDth[:RESolution] <*Bandwidth*> Resolution Bandwidth

<Bandwidth>	Parameter description	Def. value	Default unit	FW vers.
MHZ5 | MHZ7 | **WRRC**	Bandpass filter with 5 MHz or 7 MHz bandwidth WCDMA filter (3.84 MHz RRC)	WRRC	–	V3.22

Command description

This command defines the bandwidth of the analyzer in the *Power Meter Freq. Sel.* application.

DEFault:POWer:WBANd:CONTrol <*Enable*> **DEFault:POWer:FSELective:CONTrol <*Enable*>**				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

DEFault:POWer:CONTrol <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the `POWer...:CONTrol` subsystem including all applications to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Measured Values – Subsystem POWer...?

The subsystem *POWer...?* measures and returns the results of the signal power measurement. They correspond to the measurement menu *Power* with its various display elements.

READ[:SCALar]:POWer:WBANd? **FETCh[:SCALar]:POWer:WBANd?** **SAMPle[:SCALar]:POWer:WBANd?**	Measurement results: Start single shot measurement and return results Read out measurement results (unsynchronized) Read out measurement results (synchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
Peak power (current)	–100.0 dBm to +60.0 dBm	NAN	dBm	V3.22
Description of command				
These commands are always queries. They start a `POWer:WBANd…` measurement and/or return the peak power of the RF signal in a wide frequency range (see also description of measurement control in Chapter 5 of the CMU200/300 manual).				

	Measurement results:
READ[:SCALar]:POWer:FSELective?	Start single shot measurement and return results
FETCh[:SCALar]:POWer:FSELective?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:FSELective?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Average power (current),	–100.0 dBm to +60.0 dBm	NAN	dBm	V3.22
Minimum power (current),	–100.0 dBm to +60.0 dBm	NAN	dBm	
Maximum power (current),	–100.0 dBm to +60.0 dBm	NAN	dBm	
Average power (avg.),	–100.0 dBm to +60.0 dBm	NAN	dBm	
Minimum power (avg.),	–100.0 dBm to +60.0 dBm	NAN	dBm	
Maximum power (avg.)	–100.0 dBm to +60.0 dBm	NAN	dBm	

Description of command

These commands are always queries. They start a `POWer:FSELective`… measurement and/or return all scalar measurement results (see also description of measurement control in Chapter 5 of the CMU200/300 manual). The calculation of results is described in section *Averaging and Statistical Evaluation* in Chapter 3.

SPECtrum Measurements

The subsystem *SPECtrum* measures the output RF spectrum emissions (off-carrier power) and returns them as a function of the frequency. The subsystem corresponds to the measurement menu *Spectrum* with its various applications and the associated popup menu *Spectrum Configuration.*

The off-carrier power can be assessed with different measurement methods. In manual control, these operating conditions correspond to the different applications of the *Spectrum* measurement. In remote control, the applications are distinguished by the third-level keywords in the `SPECtrum` commands:

- The third-level keyword `MFILter` denotes the *ACLR Filter* application.
- The third-level keyword `OBW` denotes the *OBW* application.
- The third-level keyword `EMASk` denotes the *Emission Mask* application.

The three applications will be described in separate sections.

SPECtrum:ACLR

The subsystem *`SPECtrum:ACLR`* measures the Adjacent Channel Leakage power Ratio (ACLR) using an RRC filter and returns the result at the carrier frequency plus four different off-carrier frequencies. The subsystem corresponds to the measurement menu *Spectrum,* application *ACLR Filter,* and the sections in the popup menu *Spectrum Configuration* that are related to the *ACLR Filter* application*.*

Control of Measurement – Subsystem SPECtrum:ACLR

The subsystem *`SPECtrum:ACLR`* controls the *Spectrum* measurement. It corresponds to the *ACLR Filter* softkey in the measurement menu *Spectrum*.

INITiate:SPECtrum:ACLR	Start new measurement	⇒	*RUN*
ABORt:SPECtrum:ACLR	Abort running measurement and switch off	⇒	*OFF*
STOP:SPECtrum:ACLR	Stop measurement after current stat. cycle	⇒	*STOP*
CONTinue:SPECtrum:ACLR	Next measurement step (only *stepping mode*)	⇒	*RUN*
Description of command			FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status indicated in the top right column.			V3.22

CONFigure:SPECtrum:ACLR:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:SPECtrum:ACLR:STATus?				Measurement Status
Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Spectrum* measurement. They correspond to the sections in the popup menu *Spectrum Configuration* that are related to the *ACLR Filter* application..

Subsystem SPECtrum:ACLR:CONTrol

The subsystem *SPECtrum:ACLR:CONTrol* configures the scope of the measurement. It corresponds to the *Control* tab in the popup menu *Spectrum Configuration*.

CONFigure:SPECtrum:ACLR:CONTrol:STATistics <*Statistics*>				Measurement Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:SPECtrum:ACLR:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22

Description of command

This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement.

Note: In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.

CONFigure:SPECtrum:ACLR:CONTrol:MLENgth *<Length>*				Measurement Length
<Length>	Description of parameters	Def. value	Def. unit	FW vers.
320 | 640 | 1280 | 2560	Number of chip periods measured	2560	(chips)	V3.22

Description of command

This command selects the time interval to be measured. A small measurement length accelerates the measurement but does not change the format or length of the output.

CONFigure:SPECtrum:ACLR:SCANning *<Enable>*				ACLR Scanning
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Enable or disable ACLR Scanning	ON	–	–

Description of command

This command enables or disables the ACLR scanning mode. ACLR scanning extends the dynamic range of the instrument.

Subsystem SPECtrum:ACLR:...LIMit

The subsystem *SPECtrum:ACLR:...LIMit* defines the limits for the *ACLR Filter* measurement. The subsystem corresponds to the *ACLR Filter* section in the *Limits* tab of the popup menu *Spectrum Configuration.*

CONFigure:SPECtrum:ACLR:LEVel:CMAX:LIMit[:SCALar]:
ASYMmetric:UPPer:CHANnel<nr>:VALue <*ACLR_Limit*> — Limits: Current & Max.
CONFigure:SPECtrum:ACLR:LEVel:AVERage:LIMit[:SCALar]:
ASYMmetric:UPPer:CHANnel<nr>:VALue <*ACLR_Limit*> — Limits: Average

<nr>	Description of parameters	Def. value	Def. unit	
1 | 2 | 3 | 4	Channel number;	–	–	
<ACLR_Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–80.0 dB to 0.0 dB **–80.0 dB to 0.0 dB**	Upper limit for the ACLR if <nr> = ±2 Upper limit for the ACLR if <nr> = ±1	–50.0 –45.0	dBc dBc	V3.22

Description of command

These commands define upper limits for the ACLR measured with the direct filter method. The numeric suffix <nr> = 1, 2, 3, 4 denotes the channel numbers –2, –1, 1, 2. The channel frequency is the channel number times 5 MHz from the carrier frequency.

CONFigure:SPECtrum:ACLR:LEVel:CMAX:LIMit[:SCALar]:
ASYMmetric:UPPer:CHANnel<nr>:ENABle <*Enable*> — Enable limit check: Current & Max.
CONFigure:SPECtrum:ACLR:LEVel:AVERage:LIMit[:SCALar]:
ASYMmetric:UPPer:CHANnel<nr>:ENABle <*Enable*> — Enable limit check: Average

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Enable or disable relative limit check in channel <nr>	ON	–	V3.22

Description of command

These commands switch the limit check in a particular channel <nr> on or off. The numeric suffix <nr> = 1, 2, 3, 4 denotes the channel numbers –2, –1, 1, 2.

Measured Values – Subsystem SPECtrum:ACLR?

The subsystem *SPECtrum:ACLR* measures and returns the ACLR and compares it with tolerance values. The subsystem corresponds to the graphical measurement menu *Spectrum.*

				Scalar Results
READ[:SCALar]:SPECtrum:ACLR:ABSolute?				Start single shot measurement and return results
FETCh[:SCALar]:SPECtrum:ACLR:ABSolute?				Read measurement results (unsynchronized)
SAMPle[:SCALar]:SPECtrum:ACLR:ABSolute?				Read measurement results (synchronized)
READ[:SCALar]:SPECtrum:ACLR:RELative?				Start single shot measurement and return results
FETCh[:SCALar]:SPECtrum:ACLR:RELative?				Read measurement results (unsynchronized)
SAMPle[:SCALar]:SPECtrum:ACLR:RELative?				Read measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
Carrier Power (RMS): Current, **ACLR (RMS): Current (x4),** **ACLR (RMS): Average (x4),** **ACLR (RMS): Maximum (x4),** **Out of Tolerance**	–100.0 dBm to +60.0 dBm –100.0 dB to 0.0 dB –100.0 dB to 0.0 dB –100.0 dB to 0.0 dB 0% to +100.0%	NAN NAN NAN NAN NAN	dBm dB dB dB %	V3.22
Description of command				
These commands are always queries. They start a `SPECtrum:ACLR` measurement (`READ...`) and/or return all (scalar) measurement results. The symbol (x4) behind a value indicates that the list contains four results corresponding to the channel nos. –2, –1, +1, +2 (<nr> = 1, 2, 3, 4). The keywords `ABSolute` and `RELative` in the commands distinguish whether the ACLR results are expressed in absolute units (adjacent channels powers in dBm with a value range between –100.0 dBm and +60.0 dBm) or in relative units (ACLR in dB in the value range oted above).				

CALCulate[:SCALar]:SPECtrum:ACLR:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
ACLR (RMS): Current (x4), **ACLR (RMS): Average (x4),** **ACLR (RMS): Maximum (x4)**	For all measured values: NMAU | NMAL | INV | OK	INV INV INV	– – –	V3.22
Description of command				

This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see commands above) are exceeded. The symbol (x4) behind a value indicates that the list contains four results corresponding to the channel nos. –2, –1, +1, +2 (<nr> = 1, 2, 3, 4).

The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

SPECtrum:OBW

The subsystem *SPECtrum:OBW* determines the Adjacent Channel Leakage power Ratio (ACLR) in frequency domain using a Fast Fourier Transform (FFT) and derives the Occupied Bandwidth (OBW). The subsystem corresponds to the measurement menu *Spectrum,* application *OBW,* and the sections in the popup menu *Spectrum Configuration* that are related to the *OBW* application*.*

Control of Measurement – Subsystem SPECtrum:OBW

The subsystem *SPECtrum:OBW* controls the *Spectrum* measurement. It corresponds to the *OBW* softkey in the measurement menu *Spectrum*.

INITiate:SPECtrum:OBW	Start new measurement	⇒ *RUN*
ABORt:SPECtrum:OBW	Abort running measurement and switch off	⇒ *OFF*
STOP:SPECtrum:OBW	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:SPECtrum:OBW	Next measurement step (only *stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status indicated in the top right column.		V3.22

CONFigure:SPECtrum:OBW:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:SPECtrum:OBW:STATus?				Measurement Status
Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Spectrum* measurement. They correspond to the sections in the popup menu *Spectrum Configuration* that are related to the *OBW* application..

Subsystem SPECTrum:OBW:CONTrol

The subsystem *SPECtrum:OBW:CONTrol* configures the scope of the measurement. It corresponds to the *Control* tab in the popup menu *Spectrum Configuration*.

CONFigure:SPECtrum:OBW:CONTrol:RMODe *<Mode>*				Result Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | **ARRay,**	Scalar values only (incl. limit matching) Scalar measured values and arrays	ARR	–	V3.22
Description of command				
This command specifies the type of measured values.				

CONFigure:SPECtrum:OBW:CONTrol:STATistics *<Statistics>*				Measurement Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:SPECtrum:OBW:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.				

DEFault:SPECtrum:OBW:CONTrol <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Subsystem SPECTrum:OBW:...LIMit

The subsystem *SPECtrum:OBW:...LIMit* defines the limits for the *OBW* measurement. The subsystem corresponds to the *OBW* section in the *Limits* tab of the popup menu *Spectrum Configuration.*

CONFigure:SPECtrum:OBW:OBANdwidth:CMAX:LIMit[:SCALar]: ASYMmetric:UPPer:VALue <*OBW_Limit*> CONFigure:SPECtrum:OBW:OBANdwidth:AVERage:LIMit[:SCALar]: ASYMmetric:UPPer:VALue <*OBW_Limit*>				OBW Limits
<OBW_Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.00 MHz to 10.00 MHz	Upper limit for the OBW	5.00	MHz	V3.22
Description of command				
These commands define upper limits for the OBW determined via FFT. The 5th-level keywords distinguish the limits for the *Current* and *Maximum* display modes `(CMAX)` and for the *Average* display mode `(AVERage)`.				

CONFigure:SPECtrum:OBW:OBANdwidth:CMAX:LIMit[:SCALar]: ASYMmetric:UPPer:Enable <*Enable* CONFigure:SPECtrum:OBW:OBANdwidth:AVERage:LIMit[:SCALar]: ASYMmetric:UPPer:Enable <*Enable*				Enable OBW Limits
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Enable or disable relative limit check in channel <nr>	ON	–	V3.22
Description of command				
This command switches the OBW limit check on or off. The relative limits are defined by the `CONFig-ure:SPECtrum:OBW:OBANdwidth...VALue` commands; see above.				

Subsystem SUBarrays:SPECtrum

The subsystem *SUBarrays:SPECtrum* defines the measurement range and the type of output values.

CONFigure:SUBarrays:SPECtrum:OBW Definition of Subarrays
<Mode>,<Start_WFSS>,<Samples_WFSS>{,<Start_WFSS>,<Samples_WFSS>}

<Mode>	Description of parameters	Def. value	Def. unit	
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start_WFSS>	Description of parameters	Def. value	Def. unit	
–12.5 MHz to +12.48 MHz,	Start frequency for the FFT curve	–12.5	MHz	
<Samples_WFSS>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1250	Number of samples in current range	1250	–	V3.22

Description of command

These commands configure the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:SPECtrum...` commands. They restrict the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start frequency and the number of test points which are located on a fixed, equidistant grid with a step width of 20 kHz.

The subranges may overlap but must be within the total display range of the two measurement curves. Test points outside this range are not measured (result *NAN)* and do not enter into the `ARIThmetical`, `MINimum` and `MAXimum` values.

By default, only one range corresponding to the total display range is used and all measurement values are returned.

Measured Values – Subsystem SPECtrum:OBW?

The subsystem *SPECtrum:OBW...?* measures and returns the results and compares them with tolerance values. The subsystem corresponds to the graphical measurement menu *Spectrum,* application *OBW.*

				Scalar Results
READ[:SCALar]:SPECtrum:OBW?				Start single shot measurement and return results
FETCh[:SCALar]:SPECtrum:OBW?				Read measurement results (unsynchronized)
SAMPle[:SCALar]:SPECtrum:OBW?				Read measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
OBW Current,	0.00 MHz to 10.00 MHz	NAN	Hz	V3.22
OBW Average,	0.00 MHz to 10.00 MHz	NAN	Hz	
OBW Maximum,	0.00 MHz to 10.00 MHz	NAN	Hz	
OBW left,	–5.00 MHz to +5.00 MHz	NAN	Hz	
OBW right,	–5.00 MHz to +5.00 MHz	NAN	Hz	
Power (RMS): Current,	–100.0 dBm to +60.0 dBm	NAN	dBm	
Out of Tolerance	0% to +100.0%	NAN	%	

Description of command

These commands are always queries. They start a `SPECtrum:OBW` measurement (`READ...`) and/or return all (scalar) measurement results. The symbol (x4) behind a value indicates that the list contains four results corresponding to the channel nos. –2, –1, +1, +2 (<nr> = 1, 2, 3, 4). The keywords ABSolute and RELative in the commands distinguish whether the ACLR results are expressed in absolute units (adjacent channels powers in dBm with a value range between –100.0 dBm and +60.0 dBm) or in relative units (ACLR in dB in the value range quoted above). All frequency (OBW) values are expressed in Hz and in exponential representation, e.g. `4.060000E+006`.

CALCulate[:SCALar]:SPECtrum:OBW:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
OBW Current,	For all measured values:	INV	–	V3.22
OBW Average,		INV	–	
OBW Maximum	NMAU | NMAL | INV | OK	INV	–	

Description of command

This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see commands above) are exceeded. The symbol (x4) behind a value indicates that the list contains four results corresponding to the channel nos. –2, –1, +1, +2 (<nr> = 1, 2, 3, 4).

The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

ACLR Curve

READ:ARRay:SPECtrum:OBW:CURRent? Start single shot measurement and return results ⇒ *RUN*
FETCh:ARRay:SPECtrum:OBW:CURRent? Read measurement results (unsynchronized) ⇒ *RUN*
SAMPle:ARRay:SPECtrum:OBW:CURRent? Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dB to 0.0 dB, **...,** **–100.0 dB to 0.0 dB**	1st value for ACLR ... nth value for ACLR	NAN ... NAN	dB ... dB	V3.22

Description of command

These commands are always queries. They return the ACLR at fixed, equidistant test points with a 20 kHz raster. The number n of measured values is n = 1250, corresponding to a frequency range from –12.50 MHz to + 12.48 MHz.

Subarray Results

READ:SUBarrays:SPECtrum:OBW:CURRent? Start single shot measurement and return results ⇒ *RUN*
FETCh:SUBarrays:SPECtrum:OBW:CURRent? Read meas. results (unsynchronized) ⇒ *RUN*
SAMPle:SUBarrays:SPECtrum:OBW:CURRent? Read results (synchronized) ⇒ *RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dB to 0.0 dB, **... ,** **–100.0 dB to 0.0 dB**	1st value for ACLR ... nth value for ACLR	NAN ... NAN	dB ... dB	V3.22

Description of command

These commands are always queries. They measure and return the ACLR in the subranges defined by means of the `CONFigure:SUBarrays:SPECtrum:OBW...` commands. In the default setting of the configuration command the `READ:SUBarrays..., FETCh:SUBarrays..., and SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay..., FETCh:ARRay..., and SAMPle:ARRay...` command group described above.

The `CONFigure:SUBarrays:SPECtrum:OBW...` commands define a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned per subrange.

The calculation of *Current, Average, and MMAX* (Max./Min.) results is explained in Chapter 3 (see *display mode*).

SPECtrum:EMASk

The subsystem *`SPECtrum:EMASk`* determines the spectrum emissions outside the operating band and performs a limit check. The subsystem corresponds to the measurement menu *Spectrum,* application *Emission Mask,* and the sections in the popup menu *Spectrum Configuration* that are related to the *Emission Mask* application*.*

Control of Measurement – Subsystem SPECtrum:EMASk

The subsystem *SPECtrum:EMASk* controls the *Spectrum* measurement. It corresponds to the *Emission Mask* softkey in the measurement menu *Spectrum*.

INITiate:SPECtrum:EMASk **ABORt:SPECtrum:EMASk** **STOP:SPECtrum:EMASk** **CONTinue:SPECtrum:EMASk**	Start new measurement Abort running measurement and switch off Stop measurement after current stat. cycle Next measurement step (only *stepping mode*)	⇒ *RUN* ⇒ *OFF* ⇒ *STOP* ⇒ *RUN*	
Description of command			FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status indicated in the top right column.			V3.25

CONFigure:SPECtrum:EMASk:EREPorting *<Mode>*				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.25
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:SPECtrum:EMASk:STATus?				Measurement Status
Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate`, `CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.25
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	–
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	V3.25
Description of command				
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Spectrum – Emission Mask* measurement. They correspond to the sections in the popup menu *Spectrum Configuration* that are related to the *Emission Mask* application.

Subsystem SPECTrum:EMASk:CONTrol

The subsystem *SPECtrum:EMASk:CONTrol* configures the scope of the measurement. It corresponds to the *Control* tab in the popup menu *Spectrum Configuration*.

CONFigure:SPECtrum:EMASk:CONTrol:RMODe *<Mode>*				Result Mode
<Mode>	Desciption of parameters	Def. value	Def. unit	FW vers.
SCALar | **ARRay,**	Scalar values only (incl. limit matching) Scalar measured values and arrays	ARR	–	V3.25
Description of command				
This command specifies the type of measured values.				

CONFigure:SPECtrum:EMASk:CONTrol:STATistics *<Statistics>*				Measurement Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.25
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:SPECtrum:EMASk:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.25
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.				

Subsystem SPECTrum:EMASk:...LIMit

The subsystem *SPECtrum:EMASk:...LIMit…* defines tolerance values for the *Emission Mask* measurement. The subsystem corresponds to the *Emission Mask* section in the *Limits* tab of the popup menu *Spectrum Configuration.*

CONFigure:SPECtrum:EMASk:LIMit:SELect ***<Class>*** — Emission Mask – Select

<Class>	Description of parameters	Def. value	Def. unit	FW vers.
AUTO	Limit line setting according to the measured *Node B Power* (one of the CL1, CL2, CL3 or CL4 masks)	AUTO	–	V3.25
CL1	Emission mask for P_{max} > 43 dBm			
CL2	Emission mask for 39 < P_{max} < 43 dBm			
CL3	Emission mask for 31 < P_{max} < 39 dBm			
CL4	Emission mask for P_{max} < 31 dBm			
USER	User-defined emission mask			

Description of command

This command selects the type of spectrum emission mask to be applied. The emission masks CL1 to CL4 are defined in standard 3GPP 25.106 (see also Chapter 4 in this manual), the user-defined emission mask is defined by means of the remaining commands in this section.

In the *Emission Mask* measurement according to 3GPP test specifications, the Node B transmits at its maximum output power P_{max}, so the measured *Node B Power* can serve as a criterion for selecting the emission mask *(Auto* setting).

CONFigure:SPECtrum:EMASk:CMAX:LIMit:LINE:ASYMmetric:UPPer *<Limit>* Current & Max Limit Lines
CONFigure:SPECtrum:EMASk:AVERage:LIMit:LINE:ASYMmetric:UPPer *<Limit>* Average Limit Lines

<Limit>	Description of parameters	Def. value	Def. unit	FW vers.
ABS | REL,	Switch for absolute/relative limit at point A	ABS	–	V3.25
–80 dBm to +53 dBm |	Absolute limit at point A	–25	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point A	–55	dB	
ABS | REL,	Switch for absolute/relative limit at point B	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point B	–25	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point B	–55	dB	
ABS | REL,	Switch for absolute/relative limit at point C	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point C	–21	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point C	–51	dB	
ABS | REL,	Switch for absolute/relative limit at point D	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point D	–21	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point D	–51	dB	
ABS | REL,	Switch for absolute/relative limit at point E	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point E	–34	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point E	–64	dB	
ABS | REL,	Switch for absolute/relative limit at point F	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point F	–34	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point F	–64	dB	
ABS | REL,	Switch for absolute/relative limit at point G	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point G	–34	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point G	–64	dB	
ABS | REL,	Switch for absolute/relative limit at point H	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point H	–22	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point H	–52	dB	
ABS | REL,	Switch for absolute/relative limit at point I	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point I	–22	dBm	
–90.0 dB to 0.0 dB | OFF,	Relative limit at point I	–52	dB	
ABS | REL,	Switch for absolute/relative limit at point J	ABS	–	
–80 dBm to +53 dBm |	Absolute limit at point J	–22	dBm	
–90.0 dB to 0.0 dB | OFF	Relative limit at point J	–52	dB	

Description of command

These commands define and select the values for the *Current* and *Max.* (keyword `CMAX`) and for the *Average* (keyword `AVERage`) spectrum emission mask, respectively. Each limit value at the points A to J of the emission mask is defined either as an absolute level (setting `ABS`, values in dBm) or relative to the maximum output power of the Node B (setting `REL`, values in dB). Besides, setting two consecutive points to OFF disables the limit check in the section confined by these points.

DEFault:SPECtrum:EMASk:LIMit:LINE *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.25

Description of command

If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.

Note: The default limit line configuration corresponds to `CONFigure:SPECtrum:EMASk:LIMit:SELect AUTO`. The CMU measures the Node B Power and sets the limit lines according to the standard.

Measured Values – Subsystem SPECtrum:EMASk?

The subsystem *SPECtrum:EMASk...?* measures and returns the results and compares them with tolerance values. The subsystem corresponds to the graphical measurement menu *Spectrum,* application *Emission Mask.*

				Scalar Results
READ[:SCALar]:SPECtrum:EMASk?				Start single shot measurement and return results
FETCh[:SCALar]:SPECtrum:EMASk?				Read measurement results (unsynchronized)
SAMPle[:SCALar]:SPECtrum:EMASk?				Read measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
Ref. Power Current, **Ref. Power Average,** **Ref. Power Maximum,** **Node B Power,** **Out of Tolerance**	–100.0 dBm to +60.0 dBm –100.0 dBm to +60.0 dBm –100.0 dBm to +60.0 dBm –100.0 dBm to +60.0 dBm 0% to +100.0%	NAN NAN NAN NAN NAN	dBm dBm dBm dBm %	V3.25
Description of command				
These commands are always queries. They start a `SPECtrum:EMASk` measurement (`READ...`) and/or return all (scalar) measurement results.				

READ:ARRay:SPECtrum:EMASk:CURRent? Spectrum Emission Curves
READ:ARRay:SPECtrum:EMASk:AVERage?
READ:ARRay:SPECtrum:EMASk:MAXimum?

Start single shot measurement and return results ⇒ *RUN*

FETCh:ARRay:SPECtrum:EMASk:CURRent?
FETCh:ARRay:SPECtrum:EMASk:AVERage?
FETCh:ARRay:SPECtrum:EMASk:MAXimum?

Read measurement results (unsynchronized) ⇒ *RUN*

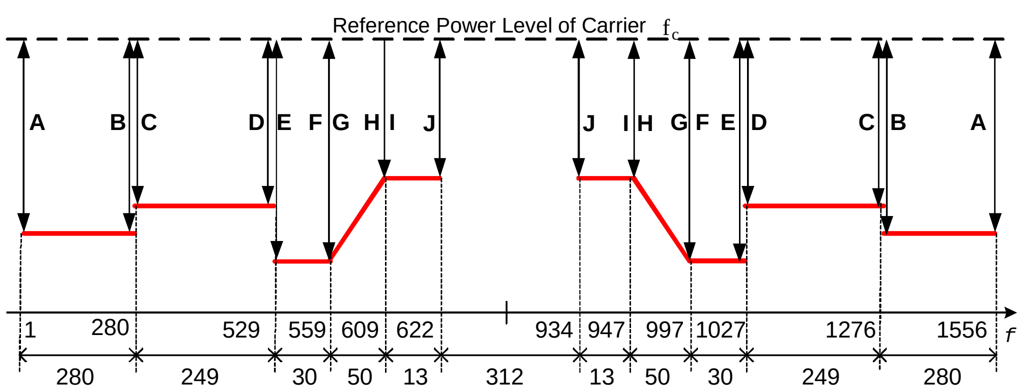
SAMPle:ARRay:SPECtrum:EMASk:CURRent?
SAMPle:ARRay:SPECtrum:EMASk:AVERage?
SAMPle:ARRay:SPECtrum:EMASk:MAXimum?

Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dB to 0.0 dB, **... ,** **–100.0 dB to 0.0 dB**	1st value for spectrum emission ... nth value for spectrum emission	NAN ... NAN	dB ... dB	V3.25

Description of command

These commands are always queries. They return the spectrum emission at fixed test points. The array contains a total of 1556 values which are distributed over the 11 sections of the emission mask as shown below:



Within each section the test points are equidistant.

The calculation of *Current, Average, and Maximum* results is explained in Chapter 3 (see *display mode*).

CDPower Measurements

The subsystem *CDPower* measures the power and the modulation accuracy of a downlink WCDMA signal and of its individual code channels. The subsystem corresponds to the measurement menu *Code Domain Power* with its applications and the associated popup menu *Code Domain Power Configuration.*

- The third-level keyword `CDPower` denotes the *Code Domain Power* application.
- The third-level keyword `PCDerror` denotes the *Peak Code Dom. Error* application.

The applications will be described in separate sections.

Common Settings

The following commands affect all *CDPower* applications.

CONFigure:CDPower:TMODel *<Model>*				Select Test Model
<Model>	Description of parameters	Def. value	Def. unit	FW vers.
M116 | M132 | M164 | **M2 |** **M316 | M332 |** **M4 |** **M562 |** **M5144 |** **M5308 |** **USR1 | USR2 |** **ACD**	Test model 1 with 16, 32 or 64 DPCHs Test model 2 Test model 3 with 16 or 32 DPCHs Test model 4 Test model 5 with 6 DPCHs and 2 HS-PDSCHs Test model 5 with 14 DPCHs and 4 HS-PDSCHs Test model 5 with 30 DPCHs and 8 HS-PDSCHs User test models 1 or 2 Automatic channel detection	M316	–	V3.22 V3.26 V3.26 V3.62
Description of command				
This command selects the test model for all *CDPower* applications. Test models 5 are available with option R&S® CMU-K79 only. The two user test models are configured via `CONFigure:U1TM:LINE<nr>` and `CONFigure:U2TM:LINE<nr>`.				

CONFigure:CDPower:FCHDetection *<Model>*				Fast Channel Detection
<Model>	Description of parameters	Def. value	Def. unit	FW vers.
USR1 | USR2	User test models 1 or 2	USR1	–	V3.62
Description of command				
This command activates automatic channel detection, stores the detected DL channel configuration to the selected user test model and activates the user test model (see also `CONFigure:CDPower:TMODel`).				

CONFigure:U<mod_nr>TM:CLEar	Reset User Test Model
Description of command	FW vers.
These commands reset the user test models <mod_nr> (<mod_nr> = 1, 2) by switching off all code channels no. 1 to 134. This configuration differs from the default configuration in manual control (model 1 with 16 DPCHs).	V3.26

CONFigure:U<mod_nr>TM:LINE<l_nr> ***<Channel>,<Sym_Rate>,<Code>,<Timing_Offset>,<Pilot_bits>,<Status>***				User Test Model
<Channel>	Description of parameters	Def. value	Def. unit	FW vers.
PICH | CPIC | PCCP | SCCP | PDSC | HSSC | HS16 | HSQP | DPCH,	Channel type, with the restrictions: <l_nr> = 1: CPIC, <l_nr> = 2: PICH <l_nr> = 3: PCCP, <l_nr> = 4: SCCP <l_nr> = 5, 6: PDSC | HSSC	Acc. to fixed test model 1 (16 DPCHs)	–	V3.26
<Sym_Rate>	Description of parameters	Def. value	Def. unit	FW vers.
S75 | S15 | S30 | S60 | S120 | S240 | S480 | S960,	Symbol rate, with the restrictions: <l_nr> = 1, …, 4: S15 must be compatible with the channel type	Acc. to fixed test model 1 (16 DPCHs)	–	V3.26
<Code>	Description of parameters	Def. value	Def. unit	FW vers.
MAXimum | MINimum | 0 to 511,	Channelization code, with the restrictions: <l_nr> = 1: 0, <l_nr> = 2: 2, …, 255 <l_nr> = 3: 1, <l_nr> = 4: 2, …, 255 codes must be compatible with each other and with the symbol rate for each channel	Acc. to fixed test model 1 (16 DPCHs)	–	V3.26
<Timing_Offset>	Description of parameters	Def. value	Def. unit	FW vers.
MAXimum | MINimum | 0 to 150 | INV,	Timing offset, with the restrictions: <l_nr> = 1: INV, <l_nr> = 2: 120 <l_nr> = 3: INV, <l_nr> = 4: 150 <l_nr> = 5, 6: INV	Acc. to fixed test model 1 (16 DPCHs)	256 chip periods	V3.26
<Pilot_bits>	Description of parameters	Def. value	Def. unit	FW vers.
PB0 | PB2 | PB4 | PB8 | PB16 | INV,	No. of pilot bits, with the restrictions: <l_nr> = 1, 2, 3: INV, <l_nr> = 4: 8 <l_nr> = 5, 6: INV must be compatible with the channel type	Acc. to fixed test model 1 (16 DPCHs)	–	V3.26
<Status>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Channel status, with the restrictions: <l_nr> = 1, 2, 3, 4: ON	Acc. to fixed test model 1 (16 DPCHs)	–	V3.26
Description of command				
These commands define the user test models <mod_nr> where <mod_nr> = 1, 2. The second numeric suffix <l_nr> numbers the line in the *Test Model Configuration* dialog. If the settings are inconsistent (e.g. if the channelization code is incompatible with the symbol rate or with a channelization code assigned before), the R&S CMU generates an error message. Odd timing offset values for channels with a symbol rate of 7.5 kbps (S75) are not allowed and automatically rounded up.				

Tolerance values – Subsystem CDPower:...:LIMit

The subsystem *CDPower:...:LIMit* defines tolerance values for the *Code Domain Power* measurement in all applications. The subsystem corresponds to the *Limits* tab in the popup menu *Code Domain Power Configuration.*

Limits: Current & Max/Min

CONFigure:CDPower:EVMagnitude:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Error Vector Magn. (Peak)>
CONFigure:CDPower:PCDerror:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Peak Code Domain Error>
CONFigure:CDPower:IQOoffset:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Origin Offset>
CONFigure:CDPower:IQIMbalance:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Imbalance>
CONFigure:CDPower:CFERror:CMMax:LIMit[:SCALar]:SYMMetric:VALue
<Carrier Frequency Error>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	Error Vector Magnitude	+17.5	%	V3.22
–80.00 dB to 0.00 dB,	Peak Code Domain Error	–33.0	dB	
–80.00 dB to 0.00 dB,	I/Q Origin Offset	–30.0	dB	
–80.00 dB to 0.00 dB,	I/Q Imbalance	–30.0	dB	
–4000 Hz to +4000 Hz	Carrier Frequency Error	±100	Hz	

Description of commands

These commands define upper *Current & Min/Max* limits for the the scalar results of the *Code Domain Power* measurement. For parameters with symmetric ranges of limits (e.g. the Frequency), the entry of positive or negative values (say +x or –x) is equivalent: The limit will be interpreted in such a way that the parameter must be confined in the range [–x,+x].

Enable limit check: Current & Max/Min

CONFigure:CDPower:EVMagnitude:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:PCDerror:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:IQOoffset:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:IQIMbalance:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:CFERror:CMMax:LIMit[:SCALar]:SYMMetric:ENABle
<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	Limit check on Limit check off	ON	–	V3.22

Description of commands

These commands switch the limit check for the individual scalar *Current* and *Max./Min*. parameters on or off.

Limits: Average

CONFigure:CDPower:EVMagnitude:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Error Vector Magn. (Peak)>
CONFigure:CDPower:PCDerror:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Peak Code Domain Error>
CONFigure:CDPower:IQOoffset:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Origin Offset>
CONFigure:CDPower:IQIMbalance:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Imbalance>
CONFigure:CDPower:CFERror:AVERage:LIMit[:SCALar]:SYMMetric:VALue
<Carrier Frequency Error>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %, **–80.00 dB to 0.00 dB,** **–80.00 dB to 0.00 dB,** **–80.00 dB to 0.00 dB,** **–4000 Hz to +4000 Hz**	Error Vector Magnitude Peak Code Domain Error I/Q Origin Offset I/Q Imbalance Carrier Frequency Error	+17.5 –33.0 –30.0 –30.0 ±100	% dB dB dB Hz	V3.22

Description of commands

These commands define upper *Average* limits for the the scalar results of the *Code Domain Power* measurement. For parameters with symmetric ranges of limits (e.g. the Frequency), the entry of positive or negative values (say +x or –x) is equivalent: The limit will be interpreted in such a way that the parameter must be confined in the range [–x,+x].

Enable limit check: Average

CONFigure:CDPower:EVMagnitude:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:PCDerror:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:IQOoffset:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:IQIMbalance:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:CDPower:CFERror:AVERage:LIMit[:SCALar]:SYMMetric:ENABle
<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	Limit check on Limit check off	ON	–	V3.22

Description of commands

These commands switch the limit check for the individual scalar *Average* parameters on or off.

CDPower:CDPower

The subsystems *CDPower:CDPower* measure the code domain power in the code domain channels contributing to a downlink WCDMA signal. The subsystem corresponds to the measurement menu *Code Domain Power,* application *Code Domain Power,* and to the sections in the popup menu *Code Domain Power Configuration* that are related to the *Code Domain Power.*

Control of Measurement – Subsystem CDPower:CDPower

The subsystem *CDPower:CDPower* controls the code domain power measurement. It corresponds to the softkey *Code Domain Power* in the measurement menu *Code Domain Power*.

INITiate:CDPower:CDPower	Start new measurement	⇒ *RUN*
ABORt:CDPower:CDPower	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:CDPower	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:CDPower	Next measurement step (only *stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the code domain power measurement, setting it to the status indicated in the top right column.		V3.22

CONFigure:CDPower:CDPower:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:CDPower:CDPower:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				
These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Code Domain Power* measurement. They correspond to the sections in the *Code Domain Power Configuration* menu that are related to the *Code Domain Power* application.

Subsystems CDPower:CDPower:CONTrol

The subsystem *CDPower:CDPower:CONTrol* configures the scope of the code domain power measurement. It corresponds to the *Control* tab in the popup menu *Code Domain Power Configuration*.

CONFigure:CDPower:CDPower:CONTrol:RMODe ***<Mode>***				Result Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | **ARRay**	Scalar values only (incl. limit matching) Scalar measured values and arrays	ARR	–	V3.22
Description of command				
This command specifies the type of measured values.				

CONFigure:CDPower:CDPower:CONTrol:STATistics ***<Statistics>***				Measurement Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	100	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:CDPower:CDPower:CONTrol:REPetition ***<Repetition>,<Stepmode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.				

CONFigure:CDPower:CDPower:CONTrol:CDPMode ***<Mode>***				CPICH Slot
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
WSCH | **NSCH**	CDP measured across the entire slot CDP is measured excluding the SCH contribution	WSCH	–	V3.22
Description of command				
This command qualifies whether the Code Domain Power is measured with or without the SCH contributions.				

CONFigure:CDPower:CDPower:CONTrol:CCHannel <*Channel*>				Code Channel
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 511	Code channel no.	0	–	V3.22
Description of command				
This command selects the code channel for the power vs. slot evaluation. The power vs. slot results obtained with the selected code channel can be retrieved by means of the `READ:ARRay:CDPower:CDPower:CHANnels…?` commands.				

CONFigure:CDPower:CDPower:CONTrol:CPIChslot <*Slot*>				CPICH Slot
<Slot>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 14	CPICH slot no.	0	–	V3.22
Description of command				
This command selects the CPICH slot no. for the power vs. code evaluation. The power vs. code results obtained with the selected CPICH slot can be retrieved by means of the `READ:ARRay:CDPower:CDPower:SLOTs…?` commands.				

CONFigure:CDPower:CDPower:CONTrol:UNIT <*Unit*>				Unit
<Unit>	Description of parameters	Def. value	Def. unit	FW vers.
ABS | **RCP |** **RAVG**	All powers in dBm units All powers relative to the P-CPICH power All powers relative to the total power	ABS	–	V3.22
Description of command				
This command selects the display unit for the code domain power results retrieved via `READ:ARRay:CDPower:CDPower:CHANnels:CURRent?` etc.				

DEFault:CDPower:CDPower:CONTrol <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Measured Values – Subsystem CDPower:CDPower?

The subsystem *CDPower:CDPower* measures and returns the code domain power results. The subsystem corresponds to the various output elements in the measurement menu *Code Domain Power,* application *Code Domain Power.*

Scalar Results:

READ[:SCALar]:CDPower:CDPower? Start single shot measurement and return results
FETCh[:SCALar]:CDPower:CDPower? Read out meas. results (unsynchronized)
SAMPle[:SCALar]:CDPower:CDPower? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Error Vector Magn. (x3),	0.0 % to 100.0 %	NAN	%	V3.22
Peak Code Domain Error (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Origin Offset Current (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Imbalance (x3),	–100.0 dB to 0.0 dB	NAN	dB	
Carrier Frequency Error (x3),	–5000.0 Hz to +5000.0 Hz	NAN	Hz	
Avg. Power,	–100.0 dBm to +60 dBm	NAN	dBm	
CPICH Power,	–100.0 dBm to +60 dBm	NAN	–	
Out of Tol.	0.0 % to 100.0 %	NAN	%	

Description of command

These commands are always queries. They start a `CDPower:CDPower` measurement `(READ...)`and/or return all scalar measurement results (see Chapter 4). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

FETCh[:SCALar]:CDPower:CDPower:SRATe? Symbol Rate

Returned values	Value range	Def. value	Def. unit	FW vers.
Symbol rate	7.5 kbps | 15 kbps | … | 960 kbps	NAN	kbps	V3.22

Description of command

This command is always a query. It returns the symbol rate of the code channel selected by means of `CONFigure:CDPower:CDPower:CONTrol:CCHannel`.

FETCh[:SCALar]:CDPower:CDPower:TOFFset? Timing Offset

Returned values	Value range	Def. value	Def. unit	FW vers.
Timing Offset	0 chips to 38400 chips (1 frame)	NAN	(chips)	V3.22

Description of command

This command is always a query. It returns the timing offset relative to the P-CPICH of the code channel selected by means of `CONFigure:CDPower:CDPower:CONTrol:CCHannel`.

CALCulate[:SCALar]:CDPower:CDPower:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
Error Vector Magn. (x3),		INV	–	V3.22
Peak Code Domain Error (x3),	For all measured values:	INV	–	
I/Q Origin Offset Current (x3),		INV	–	
I/Q Imbalance (x3),	NMAU | NMAL | INV | OK	INV	–	
Carrier Frequency Error (x3)		INV	–	

Description of command

This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see commands above) are exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

READ:ARRay:CDPower:CDPower:CHANnels:CURRent? CDP and CD-ρ Bar Graphs
READ:ARRay:CDPower:CDPower:CHANnels:AVERage?
READ:ARRay:CDPower:CDPower:CHANnels:MAXimum?
READ:ARRay:CDPower:CDPower:CHANnels:MINimum?

READ:ARRay:CDPower:CDPower:SLOTs:CURRent?
READ:ARRay:CDPower:CDPower:SLOTs:AVERage?
READ:ARRay:CDPower:CDPower:SLOTs:MAXimum?
READ:ARRay:CDPower:CDPower:SLOTs:MINimum?
Start single shot measurement and return results ⇒ *RUN*

FETCh:ARRay:CDPower:CDPower:CHANnels:CURRent?
FETCh:ARRay:CDPower:CDPower:CHANnels:AVERage?
FETCh:ARRay:CDPower:CDPower:CHANnels:MAXimum?
FETCh:ARRay:CDPower:CDPower:CHANnels:MINimum?

FETCh:ARRay:CDPower:CDPower:SLOTs:CURRent?
FETCh:ARRay:CDPower:CDPower:SLOTs:AVERage?
FETCh:ARRay:CDPower:CDPower:SLOTs:MAXimum?
FETCh:ARRay:CDPower:CDPower:SLOTs:MINimum?
Read measurement results (unsynchronized) ⇒ *RUN*

SAMPle:ARRay:CDPower:CDPower:CHANnels:CURRent?
SAMPle:ARRay:CDPower:CDPower:CHANnels:AVERage?
SAMPle:ARRay:CDPower:CDPower:CHANnels:MAXimum?
SAMPle:ARRay:CDPower:CDPower:CHANnels:MINimum?

SAMPle:ARRay:CDPower:CDPower:SLOTs:CURRent?
SAMPle:ARRay:CDPower:CDPower:SLOTs:AVERage?
SAMPle:ARRay:CDPower:CDPower:SLOTs:MAXimum?
SAMPle:ARRay:CDPower:CDPower:SLOTs:MINimum?
Read measurement results (synchronized) ⇒ *RUN*

Returned values, CHANnels	Description of parameters	Def. value	Def. unit	
–100.0 dBm to +60.0 dBm,	Code domain power in code channel 0	NAN	dB	
–100.0 dBm to +60.0 dBm,	Code domain power in code channel 1	NAN	dB	
... ,	...	...	...	
–100.0 dBm to +60.0 dBm	Code domain power in code channel 511	NAN	dB	

Returned values, SLOTs	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dBm to +60.0 dBm,	Code domain power in slot 0	NAN	–	V3.22
–100.0 dBm to +60.0 dBm,	Code domain power in slot 1	NAN	–	
... ,	...	...	...	
–100.0 dBm to +60.0 dBm	Code domain power in slot 14	NAN	–	

Description of command

These commands are always queries. They start a `CDPower:CDPower` measurement (`READ...`)and/or return the CDP in either all 512 code channels that may be active in the downlink WCDMA signal (`CHANnels`… commands) or in all 15 CPICH slots (`SLOTs`… commands). The `CHANNnels`… results are obtained with the CPICH slot selected via `CONFigure:CDPower:<CDP_Application>:CONTrol:CPIChslot`; the `SLOTs`… results with the code channel number selected via `CONFigure:CDPower:CDPower:CONTrol:CCHannel`.

The unit of the results depends on the *`CONFigure:CDPower:CDPower:CONTrol:UNIT`* setting (see p. 6.46): In the default setting (absolute powers), the value ranges quoted above apply. With relative unit settings, the results are in the range between –100.0 dB to 0.0 dB.

The calculation of *Current, Average, Maximum* and *Minimum* results is explained in Chapter 3 (see *display mode*).

CDPower:PCDerror

The subsystem *CDPower:PCDerror* measures the Peak Code Domain Error (PCDerror) of the downlink WCDMA signal for a particular spreading factor. The subsystem corresponds to the measurement menu *Code Domain Power,* applications *Peak Code Dom. Error,* and the sections in the popup menu *Code Domain Power Configuration* that are related to the *Peak Code Dom. Error* application*.*

Control of Measurement – Subsystem CDPower:PCDerror

The subsystems *CDPower:PCDerror* controls the PCDerror measurement. It corresponds to the softkey *Peak Code Dom. Error* in the measurement menu *Code Domain Power*.

INITiate:CDPower:PCDerror	Start new measurement	⇒ *RUN*
ABORt:CDPower:PCDerror	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:PCDerror	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:PCDerror	Next measurement step (only *stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the peak code domain error measurement, setting it to the status indicated in the top right column.		V3.22

CONFigure:CDPower:PCDerror:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.22
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:CDPower:PCDerror:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	V3.22
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
	Counter for current statistics cycle			
1 to 10000 |	No counting mode set			
NONE,		NONE	–	
	Counter for current evaluation period within a cycle			
1 to 1000 |	Statistic count set to off			
NONE		NONE	–	
Description of command				
These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Code Domain Power* measurement. They correspond to the sections in the *Code Domain Power Configuration* menu that are related to the *Peak Code Dom. Error* application.

Subsystems CDPower:PCDerror:CONTrol

The subsystem *CDPower:PCDerror:CONTrol* configures the scope of the code domain power measurement. They correspond to the *Control* tab in the popup menu *Code Domain Power Configuration*.

CONFigure:CDPower:PCDerror:CONTrol:RMODe *<Mode>*				Result Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | **ARRay**	Scalar values only (incl. limit matching) Scalar measured values and arrays	ARR	–	V3.22
Description of command				
This command specifies the type of measured values.				

CONFigure:CDPower:PCDerror:CONTrol:STATistics *<Statistics>*				Measurement Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:CDPower:PCDerror:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.				

CONFigure:CDPower:PCDerror:CONTrol:SFACtor *<Factor>*				Display Spreading Factor
<Factor>	Description of parameters	Def. value	Def. unit	FW vers.
4 | 8 | 16 | 32 | 64 | 128 | 256 | 512	Explicit setting of the spreading factor of the WCDMA downlink signal	256	–	V3.22
Description of command				
This command determines the display spreading factor of the WCDMA downlink signal. The display spreading factor defines the length of the output arrays of the commands *READ:ARRay:CDPower:PCDerror:CHANnels:CURRent?* etc. (see p. 6.54).				

CONFigure:CDPower:PCDerror:CONTrol:CPIChslot *<Slot>*				CPICH Slot
<Slot>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 14	CPICH slot no.	0	–	V3.22
Description of command				
This command selects the CPICH slot no. for the power vs. code evaluation. The power vs. code results obtained with the selected CPICH slot can be retrieved by means of the commands *READ:ARRay:CDPower:PCDerror:CHANnels:CURRent?* etc. (see p. 6.54).				

DEFault:CDPower:PCDerror:CONTrol *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Measured Values – Subsystem CDPower:PCDerror?

The subsystem *CDPower:PCDerror* measures and returns the Peak Code Domain Error and other results and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *CDPower,* application *Peak Code Dom. Error.*

				Scalar Results:
READ[:SCALar]:CDPower:PCDerror?	Start single shot measurement and return results			
FETCh[:SCALar]:CDPower:PCDerror?	Read out meas. results (unsynchronized)			
SAMPle[:SCALar]:CDPower:PCDerror?	Read out measurement results (synchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
Error Vector Magn. (x3),	0.0 % to 100.0 %	NAN	%	V3.22
Peak Code Domain Error (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Origin Offset Current (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Imbalance (x3),	–100.0 dB to 0.0 dB	NAN	dB	
Carrier Frequency Error (x3),	–5000.0 Hz to +5000.0 Hz	NAN	Hz	
Avg. Power,	–100.0 dBm to +60 dBm	NAN	dBm	
CPICH Power,	–100.0 dBm to +60 dBm	NAN	–	
Out of Tol.	0.0 % to 100.0 %	NAN	%	

Description of command

These commands are always queries. They start a `CDPower:PCDerror` measurement (`READ...`)and/or return all scalar measurement results (see Chapter 4). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

CALCulate[:SCALar]:CDPower:PCDerror:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
Error Vector Magn. (x3),		INV	–	V3.22
Peak Code Domain Error (x3),	For all measured values:	INV	–	
I/Q Origin Offset Current (x3),		INV	–	
I/Q Imbalance (x3),	NMAU | NMAL | INV | OK	INV	–	
Carrier Frequency Error (x3)		INV	–	

Description of command

This command is always a query. It indicates whether and in which way the error limits for the scalar measured values (see commands above) are exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

READ:ARRay:CDPower:PCDerror:CHANnels:CURRent? PCDerror Bar Graphs
READ:ARRay:CDPower:PCDerror:CHANnels:AVERage?
READ:ARRay:CDPower:PCDerror:CHANnels:MAXimum?

READ:ARRay:CDPower:PCDerror:SLOTs:CURRent?
READ:ARRay:CDPower:PCDerror:SLOTs:AVERage?
READ:ARRay:CDPower:PCDerror:SLOTs:MAXimum?
Start single shot measurement and return results ⇒ *RUN*

FETCh:ARRay:CDPower:PCDerror:CHANnels:CURRent?
FETCh:ARRay:CDPower:PCDerror:CHANnels:AVERage?
FETCh:ARRay:CDPower:PCDerror:CHANnels:MAXimum?

FETCh:ARRay:CDPower:PCDerror:SLOTs:CURRent?
FETCh:ARRay:CDPower:PCDerror:SLOTs:AVERage?
FETCh:ARRay:CDPower:PCDerror:SLOTs:MAXimum?
Read measurement results (unsynchronized) ⇒ *RUN*

SAMPle:ARRay:CDPower:PCDerror:CHANnels:CURRent?
SAMPle:ARRay:CDPower:PCDerror:CHANnels:AVERage?
SAMPle:ARRay:CDPower:PCDerror:CHANnels:MAXimum?

SAMPle:ARRay:CDPower:PCDerror:SLOTs:CURRent?
SAMPle:ARRay:CDPower:PCDerror:SLOTs:AVERage?
SAMPle:ARRay:CDPower:PCDerror:SLOTs:MAXimum?
Read measurement results (synchronized) ⇒ *RUN*

Returned values, CHANnels	Description of parameters	Def. value	Def. unit	
–100.0 dB to 0.0 dB,	Code domain error in code channel 0	NAN	dB	
–100.0 dB to 0.0 dB,	Code domain error in code channel 1	NAN	dB	
... ,	...	...	...	
–100.0 dB to 0.0 dB	Code domain error in code channel 256[1)]	NAN	dB	
Returned values, SLOTs	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dB to 0.0 dB,	Peak code domain error in slot 0	NAN	–	V3.22
–100.0 dB to 0.0 dB,	Peak code domain error in slot 1	NAN	–	
... ,	...	...	...	
–100.0 dB to 0.0 dB	Peak code domain error in slot 14	NAN	–	

Description of command

These commands are always queries. They start a `CDPower:PCDerror` measurement (`READ...`)and/or return either the code domain error in all code channels that are considered for the PDCE calculation (`CHANnels`… commands) or the PCDerror in all 15 CPICH slots (`SLOTs`… commands). The `CHANNnels`… results are obtained with the CPICH slot selected via `CONFigure:CDPower:PCDerror:CONTrol:CPIChslot`; the `SLOTs`… results with the code channel number selected via `CONFigure:CDPower:PCDerror:CONTrol:CCHannel`.

The calculation of *Current, Average, Maximum* and *Minimum* results is explained in Chapter 3 (see *display mode*).

1) The number of returned results is equal to the display spreading factor set via `CONFigure:CDPower:PCDerror:CONTrol:SFACtor`. It can vary in the range between 4 and 512 and in powers of 2.

MODulation Measurements

The subsystem *MODulation* measures the modulation accuracy of the RF signal from the Node B. The subsystem corresponds to the measurement menu *Modulation* with its various applications and the associated popup menu *Modulation Configuration.*

- The third-level keyword `QPSK` denotes the *QPSK* applications.
- The third-level keyword `WCDMa` denotes the *WCDMA* applications.

The *Modulation* measurement provides a wide range of results that can be displayed in different menus. In manual control, the measurement menus correspond to the applications of the *Modulation* measurement. In remote control, the applications are distinguished by the third/fourth level keywords in the `MODulation` commands:

- The keywords `OVERview:WCDMa` denote the *Overview WCDMA* application.
- The keywords `EVMagnitude:WCDMa` denote the *EVM WCDMA* application.
- The keywords `MERRor:WCDMa` denotes the *Magn. Error WCDMA* application.
- The keywords `PERRor:WCDMa` denotes the *Phase Error WCDMA* application.

The three applications will be described in separate sections.

Common Settings

The following commands affect all *MODulation* applications.

CONFigure:MODulation:TMODel *<Model>*				Select Test Model
<Model>	Description of parameters	Def. value	Def. unit	FW vers.
M116 | M132 | M164 | **M2 |** **M316 | M332 |** **M4 |** **M562 |** **M5144 |** **M5308 |** **USR1 | USR2 |** **ACD**	Test model 1 with 16, 32 or 64 DPCHs Test model 2 Test model 3 with 16 or 32 DPCHs Test model 4 Test model 5 with 6 DPCHs and 2 HS-PDSCHs Test model 5 with 14 DPCHs and 4 HS-PDSCHs Test model 5 with 30 DPCHs and 8 HS-PDSCHs User test models 1 or 2 Automatic channel detection	M316	–	V3.22 V3.26 V3.26 V3.62
Description of command				
This command selects the test model for all *MODulation* applications. Test models 5 are available with option R&S® CMU-K79 only. The two user test models are configured via `CONFigure:U1TM:LINE<nr>` and `CONFigure:U2TM:LINE<nr>` (see section *Common Settings* on p. 6.40 ff.).				

CONFigure:MODulation:FCHDetection *<Model>*				Fast Channel Detection
<Model>	Description of parameters	Def. value	Def. unit	FW vers.
USR1 | USR2	User test models 1 or 2	USR1	–	V3.62
Description of command				
This command activates automatic channel detection, stores the detected DL channel configuration to the selected user test model and activates the user test model (see also `CONFigure:MODulation:TMODel`**)**.				

Tolerance values – Subsystem MODulation:OEMP:...:LIMit

The subsystem *MODulation:OEMP:...:LIMit* defines tolerance values for the modulation measurement in all applications. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

All Limits: Current & Max/Min

CONFigure:MODulation:OEMP:WCDMa:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue
<Error Vector Magn. (Peak)>, <Error Vector Magn. (RMS)>, <Magnitude Error (Peak)>, <Magnitude Error (RMS)>, <Phase Error (Peak)>, <Phase Error (RMS)>, <I/Q Origin Offset>, <I/Q Imbalance>, <Carrier Frequency Error>, <Waveform Quality>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	Error Vector Magn. (Peak)	+35.0	%	V3.22
0.0 % to +100.0 %,	Error Vector Magn. (RMS)	+17.5	%	
–100.0 % to +100.0 %,	Magnitude Error (Peak)	±35.0	%	
0.0 % to +100.0 %,	Magnitude Error (RMS)	+17.5	%	
–180.0 deg to +180.0 deg,	Phase Error (Peak)	±180.0	deg	
0.0 deg to +180.0 deg,	Phase Error (RMS)	+10.0	deg	
–80.00 dB to 0.00 dB,	I/Q Origin Offset	–30.0	dB	
–80.00 dB to 0.00 dB,	I/Q Imbalance	–30.0	dB	
–4000 Hz to +4000 Hz	Carrier Frequency Error	±100	Hz	
+0.7000 to +1.00	Waveform Quality	+0.970	–	

Description of command

This command defines upper limits for the *Current* and *Max./Min*. traces evaluated over the whole evaluation period and for the scalar modulation parameters derived from them. For parameters with symmetric ranges of limits (e.g. the Phase Error (Peak)), the entry of positive or negative values (say +x or –x) is equivalent: The limit will be interpreted in such a way that the parameter must be confined in the range [–x,+x].

The limits can be defined separately using commands of the type `CONFigure:MODulation:OEMP:WCDMa:<Meas_Parameter>:CMMax:LIMit…`

All Limits: Average

CONFigure:MODulation:OEMP:WCDMa:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue
<Error Vector Magn. (Peak)>, <Error Vector Magn. (RMS)>, <Magnitude Error (Peak)>, <Magnitude Error (RMS)>, <Phase Error (Peak)>, <Phase Error (RMS)>, <I/Q Origin Offset>, <I/Q Imbalance>, <Carrier Frequency Error>, <Waveform Quality>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	Error Vector Magn. (Peak)	+35.0	%	V3.22
0.0 % to +100.0 %,	Error Vector Magn. (RMS)	+17.5	%	
–100.0 % to +100.0 %,	Magnitude Error (Peak)	±35.0	%	
0.0 % to +100.0 %,	Magnitude Error (RMS)	+17.5	%	
–180.0 deg to +180.0 deg,	Phase Error (Peak)	±180.0	deg	
0.0 deg to +180.0 deg,	Phase Error (RMS)	+10.0	deg	
–80.00 dB to 0.00 dB,	I/Q Origin Offset	–30.0	dB	
–80.00 dB to 0.00 dB,	I/Q Imbalance	–30.0	dB	
–4000 Hz to +4000 Hz	Carrier Frequency Error	±100	Hz	
+0.7000 to +1.00	Waveform Quality	+0.970	–	

Description of command

This command defines upper limits for the *Current* and *Max./Min*. traces evaluated over the whole evaluation period and for the scalar modulation parameters derived from them. For parameters with symmetric ranges of limits (e.g. the Phase Error (Peak)), the entry of positive or negative values (say +x or –x) is equivalent: The limit will be interpreted in such a way that the parameter must be confined in the range [–x,+x].

The limits can be defined separately using commands of the type `CONFigure:MODulation:OEMP:WCDMa:<Meas_Parameter>:AVERage:LIMit…`

Separate Limits: Current & Max/Min

CONFigure:MODulation:OEMP:WCDMa:EVMPeak:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Error Vector Magn. (Peak)>
CONFigure:MODulation:OEMP:WCDMa:EVMRms:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Error Vector Magn. (RMS)>
CONFigure:MODulation:OEMP:WCDMa:MEPeak:CMMax:LIMit[:SCALar]:SYMMetric:VALue
<Magnitude Error (Peak)>
CONFigure:MODulation:OEMP:WCDMa:MERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Magnitude Error (RMS)>
CONFigure:MODulation:OEMP:WCDMa:PEPeak:CMMax:LIMit[:SCALar]:SYMMetric:VALue
<Phase Error (Peak)>
CONFigure:MODulation:OEMP:WCDMa:PERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Phase Error (RMS)>
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Origin Offset>
CONFigure:MODulation:OEMP:WCDMa:IQIMbalance:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Imbalance>
CONFigure:MODulation:OEMP:WCDMa:CFERror:CMMax:LIMit[:SCALar]:SYMMetric:VALue
<Carrier Frequency Error>
CONFigure:MODulation:OEMP:WCDMa:WFQuality:CMMax:LIMit[:SCALar]:ASYMmetric:LOWer:VALue
<Waveform Quality>

Description of commands

These commands define upper and lower limits for the *Current* and *Max./Min*. traces evaluated over the whole evaluation period and for the scalar modulation parameters derived from them. For parameters with symmetric ranges of limits (e.g. the Phase Error (Peak)), the entry of positive or negative values (say +x or –x) is equivalent: The limit will be interpreted in such a way that the parameter must be confined in the range [–x,+x]. All parameters, ranges and defaults are identical to the parameters of the command `CONFigure:MODulation:OEMP:WCDMa:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue`.

Enable limit check: Current & Max/Min

CONFigure:MODulation:OEMP:WCDMa:EVMPeak:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:EVMRms:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:MEPeak:CMMax:LIMit[:SCALar]:SYMMetric:ENABle
CONFigure:MODulation:OEMP:WCDMa:MERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:PEPeak:CMMax:LIMit[:SCALar]:SYMMetric:ENABle
CONFigure:MODulation:OEMP:WCDMa:PERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:IQIMbalance:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:CFERror:CMMax:LIMit[:SCALar]:SYMMetric:ENABle
CONFigure:MODulation:OEMP:WCDMa:WFQuality:CMMax:LIMit[:SCALar]:ASYMmetric:LOWer:ENABle
<ENABle>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	Limit check on Limit check off	ON	–	V3.22

Description of commands

These commands switch the limit check for the individual *Current* and *Max./Min*. modulation parameters on or off.

Separate Limits: Average

CONFigure:MODulation:OEMP:WCDMa:EVMPeak:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Error Vector Magn. (Peak)>
CONFigure:MODulation:OEMP:WCDMa:EVMRms:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Error Vector Magn. (RMS)>
CONFigure:MODulation:OEMP:WCDMa:MEPeak:AVERage:LIMit[:SCALar]:SYMMetric:VALue
<Magnitude Error (Peak)>
CONFigure:MODulation:OEMP:WCDMa:MERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Magnitude Error (RMS)>
CONFigure:MODulation:OEMP:WCDMa:PEPeak:AVERage:LIMit[:SCALar]:SYMMetric:VALue
<Phase Error (Peak)>
CONFigure:MODulation:OEMP:WCDMa:PERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<Phase Error (RMS)>
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Origin Offset>
CONFigure:MODulation:OEMP:WCDMa:IQIMbalance:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue
<I/Q Imbalance>
CONFigure:MODulation:OEMP:WCDMa:CFERror:AVERage:LIMit[:SCALar]:SYMMetric:VALue
<Carrier Frequency Error>
CONFigure:MODulation:OEMP:WCDMa:WFQuality:AVERage:LIMit[:SCALar]:ASYMmetric:LOWer:VALue
<Waveform Quality>

Description of commands

These commands define upper and lower limits for the *Average* traces evaluated over the whole evaluation period and for the scalar modulation parameters derived from them. For parameters with symmetric ranges of limits (e.g. the Phase Error (Peak)), the entry of positive or negative values (say +x or –x) is equivalent: The limit will be interpreted in such a way that the parameter must be confined in the range [–x,+x]. All parameters, ranges and defaults are identical to the parameters of the command `CONFigure:MODulation:OEMP:WCDMa:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue`.

Enable limit check: Average

CONFigure:MODulation:OEMP:WCDMa:EVMPeak:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:EVMRms:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:MEPeak:AVERage:LIMit[:SCALar]:SYMMetric:ENABle
CONFigure:MODulation:OEMP:WCDMa:MERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:PEPeak:AVERage:LIMit[:SCALar]:SYMMetric:ENABle
CONFigure:MODulation:OEMP:WCDMa:PERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:IQIMbalance:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle
CONFigure:MODulation:OEMP:WCDMa:CFERror:AVERage:LIMit[:SCALar]:SYMMetric:ENABle
CONFigure:MODulation:OEMP:WCDMa:WFQuality:AVERage:LIMit[:SCALar]:ASYMmetric:LOWer:ENABle
<ENABle>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	Limit check on Limit check off	ON	–	V3.22

Description of commands

These commands switch the limit check for the individual *Average* modulation parameters on or off.

DEFault:MODulation:OEMP:WCDMa:LIMit *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22

Description of command

If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.

MODulation:OVERview

The subsystem *MODulation:OVERview* measures scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Overview WCDMA,* and the sections in the popup menu *Modulation Configuration* that are related to the *Overview WCDMA* application*.*

Control of Measurement – Subsystem MODulation:OVERview

The subsystem *MODulation:OVERview* controls the modulation measurement. It corresponds to the softkeys *Overview WCDMA* in the measurement menu *Modulation*.

INITiate:MODulation:OVERview:WCDMa	Start new measurement	⇒ *RUN*
ABORt:MODulation:OVERview:WCDMa	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:OVERview:WCDMa	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:OVERview:WCDMa	Next measurement step (only *stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V3.22

CONFigure:MODulation:OVERview:WCDMa:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:MODulation:OVERview:WCDMa:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				
These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Overview WCDMA* application.

Subsystem MODulation:OVERview:...:CONTrol

The subsystem *MODulation:OVERview:WCDMa:CONTrol* configures the scope of the modulation measurement. It corresponds to the sections in the *Control* tab of the popup menu *Modulation Configuration* that are related to the *Overview WCDMA* application.

CONFigure:MODulation:OVERview:WCDMa:CONTrol:STATistics *<Statistics>*				Meas. Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:MODulation:OVERview:WCDMa:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot | 1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. ***Note:*** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				

CONFigure:MODulation:OVERview:WCDMa:CONTrol:CPIChslot *<Slot>*				CPICH Slot
<Slot>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 14	CPICH slot no.	0	–	V3.22
Description of command				
This command selects the CPICH slot no. for the `MODulation:OVERview` measurement.				

DEFault:MODulation:OVERview:WCDMa:CONTrol *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Measured Values – Subsystem MODulation:OVERview:WCDMa

The subsystem *MODulation:OVERview:WCDMa* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Overview WCDMA.*

				Scalar Results:
READ[:SCALar]:MODulation:OVERview:WCDMa?		Start single shot measurement and return results		
FETCh[:SCALar]:MODulation:OVERview:WCDMa?		Read out meas. results (unsynchronized)		
SAMPle[:SCALar]:MODulation:OVERview:WCDMa?		Read out measurement results (synchronized)		
Returned values	Value range	Def. value	Def. unit	FW vers.
EVM (Peak) (x3),	0.0 % to 100.0 %	NAN	%	V3.22
EVM (RMS) (x3),	0.0 % to 100.0 %	NAN	%	
Magn. Error (Peak) (x3),	0.0 % to 100.0 %	NAN	%	
Magn. Error (RMS) (x3),	0.0 % to 100.0 %	NAN	%	
Phase Error (Peak) (x3),	–180.0 deg to +180.0 deg	NAN	deg	
Phase Error (RMS) (x3),	–180.0 deg to +180.0 deg	NAN	deg	
I/Q Origin Offset (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Imbalance (x3),	–100.0 dB to 0.0 dB	NAN	dB	
Carrier Frequency Error (x3),	–5000.0 Hz to +5000.0 Hz	NAN	Hz	
Waveform Quality (x3),	0.0 to +1.0	NAN	–	
Avg. Power (Current),	–100.0 dBm to +60.0 dBm	NAN	dBm	
Out of Tolerance	0.0 % to 100.0 %	NAN	%	
Description of command				
These commands are always queries. They start a `MODulation:OVERview` measurement `(READ...)`and/or return all scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see section *Averaging and Statistical Evaluation*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.				

CALCulate[:SCALar]:MODulation:OVERview:WCDMa:MATChing:LIMit?	Limit Matching			
Returned values	Value range	Def. value	Def. unit	FW vers.
EVM (Peak) (x3),		INV	–	V3.22
EVM (RMS) (x3),		INV	–	
Magn. Error (Peak) (x3),	For all measured values:	INV	–	
Magn. Error (RMS) (x3),		INV	–	
Phase Error (Peak) (x3),		INV	–	
Phase Error (RMS) (x3),		INV	–	
I/Q Origin Offset (x3),	NMAU | NMAL | INV | OK	INV	–	
I/Q Imbalance (x3),		INV	–	
Frequency Error (x3),		INV	–	
Waveform Quality (x3)		INV	–	

Description of command

These commands are always queries. They indicate whether and in which way the error limits for the scalar measured values (see commands above) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures the error vector magnitude as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *EVM WCDMA,* and the sections in the popup menu *Modulation Configuration* that are related to the *EVM*... application.

Control of Measurement – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* controls the modulation measurement. It corresponds to the softkey *EVM WCDMA* in the measurement menu *Modulation*.

INITiate:MODulation:EVMagnitude:WCDMa	Start new measurement	⇒ *RUN*
ABORt:MODulation:EVMagnitude:WCDMa	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:EVMagnitude:WCDMa	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:EVMagnitude:WCDMa	Next measurement step (only *stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V3.22

CONFigure:MODulation:EVMagnitude:WCDMa:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:MODulation:EVMagnitude:WCDMa:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				
These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *EVM WCDMA* application.

Subsystem MODulation:EVMagnitude...:CONTrol

The subsystem *MODulation:EVMagnitude...:CONTrol* configures the scope of the modulation measurement. It corresponds to the *Control* tab in the popup menu *Modulation Configuration.*

CONFigure:MODulation:EVMagnitude:WCDMa:CONTrol:RMODe *<Mode>*				Result Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | **ARRay**	Scalar values only (incl. limit matching) Scalar measured values and arrays	ARR	–	V3.22
Description of command				
This command specifies the type of measured values.				

CONFigure:MODulation:EVMagnitude:WCDMa:CONTrol:STATistics *<Statistics>*				Meas. Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:MODulation:EVMagnitude:WCDMa:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				

CONFigure:MODulation:EVMagnitude:CONTrol:CPIChslot <*Slot*>				CPICH Slot
<Slot>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 14	CPICH slot no.	0	–	V3.22
Description of command				
This command selects the CPICH slot no. for the `MODulation:EVMagnitude` measurement.				

DEFault:MODulation:EVMagnitude:WCDMa:CONTrol <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Tolerance values – Subsystem MODulation:OEMP:WCDMa:LIMit

The subsystem *MODulation:OEMP:...:LIMit* (see section *Tolerance values – Subsystem MODulation:OEMP:...:LIMit* on p. 6.56 ff) defines tolerance values for the modulation measurement **in all four applications**. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:EVMagnitude:WCDMa <Mode>,<Start>,<Samples>{,<Start>,<Samples>} — Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	
0 chips to **2559 chips,**	Start time in current range	0	chips	
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 2560	Number of samples in current range	2560	–	V3.22

Description of command

This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:EVMagnitude...` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 chip period.

The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values.

By default, only one range corresponding to the total measurement range is used and all measurement values are returned.

Measured Values – Subsystem MODulation:EVMagnitude:WCDMa

The subsystem *MODulation:EVMagnitude:...?* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *EVM WCDMA.*

				Scalar Results:
READ[:SCALar]:MODulation:EVMagnitude:WCDMa?				Start single shot measurement and return results
FETCh[:SCALar]:MODulation:EVMagnitude:WCDMa?				Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude:WCDMa?				Read out measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
EVM (Peak) (x3),	0.0 % to 100.0 %	NAN	%	V3.22
EVM (RMS) (x3),	0.0 % to 100.0 %	NAN	%	
I/Q Origin Offset (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Imbalance (x3),	–100.0 dB to 0.0 dB	NAN	dB	
Frequency Error (x3),	–5000.0 Hz to +5000.0 Hz	NAN	Hz	
Avg. Power Current,	–100.0 dBm to +60.0 dBm	NAN		
Out of Tolerance	0.0 % to 100.0 %	NAN	%	

Description of command

These commands are always queries. They start a `MODulation:EVMagnitude` measurement (`READ...`)and/or return all scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see section *Averaging and Statistical Evaluation*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

CALCulate[:SCALar]:MODulation:EVMagnitude:WCDMa:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
EVM (Peak) (x3),		INV	–	V3.22
EVM (RMS) (x3),	For all measured values:	INV	–	
I/Q Origin Offset (x3),	NMAU | NMAL | INV | OK	INV	–	
I/Q Imbalance (x3),		INV	–	
Frequency Error (x3)		INV	–	

Description of command

These commands are always queries. They indicate whether and in which way the error limits for the scalar measured values (see commands above) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value. The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

READ:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent? EVM in evaluation period
READ:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?
READ:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?
Start single shot measurement and return results ⇒ *RUN*
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent?
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?
Read measurement results (unsynchronized) ⇒ *RUN*
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?
Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %, **... ,** **0.0 % to +100.0 %**	1st value for error vector magnitude ... 2560th value for error vector magnitude	NAN ... NAN	% ... %	V3.22

Description of command

These commands are always queries. They return the error vector magnitude vs. time at fixed, equidistant test points with a 1-chip raster. The results are obtained with the CPICH slot selected via `CONFigure:MODulation:EVMagnitude:CONTrol:CPIChslot`; the EVM (RMS) values of all CPICH slots can be measured by means of the `READ:ARRay:MODulation:EVMagnitude :WCDMa:SLOTs:CURRent?` etc. commands.

The calculation of *Current, Average,* and *MMAX* (Max./Min.) results is explained in Chapter 3 (see *display mode*).

READ:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:CURRent? EVM in CPICH Slots
READ:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:AVERage?
READ:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:MMAX?
Start single shot measurement and return results ⇒ *RUN*
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:CURRent?
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:AVERage?
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:MMAX?
Read measurement results (unsynchronized) ⇒ *RUN*
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:MMAX?
Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dB to 0.0 dB, **–100.0 dB to 0.0 dB,** **... ,** **–100.0 dB to 0.0 dB**	Error Vector Magnitude (RMS) in slot 0 Error Vector Magnitude (RMS) in slot 1 ... Error Vector Magnitude (RMS) in slot 14	NAN NAN ... NAN	% % ... %	V3.22

Description of command

These commands are always queries. They return the EVM (RMS) values in all 15 CPICH slots of the frame.

READ:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent? **READ:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?** **READ:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?**	Subarray Results
Start single shot measurement and return results	⇒ *RUN*
FETCh:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent? **FETCh:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?** **FETCh:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?**	
Read meas. results (unsynchronized)	⇒ *RUN*
SAMPle:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent? SAMPle:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage? **SAMPle:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?**	
Read results (synchronized)	⇒ *RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to+ 100.0 %, **... ,** **0.0 % to+ 100.0 %**	1^{st} value for error vector magnitude ... n^{th} value for error vector magnitude	NAN ... NAN	% ... %	V3.22

Description of command

These commands are always queries. They measure and return the error vector magnitude versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:EVMagnitude...` commands. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above.

The `CONFigure:SUBarrays:MODulation:EVMagnitude...` commands define a maximum of 32 subranges. If one of the statistical modes (`ARIThmetical`, `MINimum`, `MAXimum`) is set, only one value is returned per subrange.

The calculation of *Current, Average, and MMAX* (Max./Min.) results is explained in Chapter 3 (see *display mode*).

MODulation:MERRor

The subsystem *MODulation:MERRor* measures the magnitude error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Magn. Error WCDMA,* and the sections in the popup menu *Modulation Configuration* that are related to the *Magn. Error* ... application.

Control of Measurement – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* controls the modulation measurement. It corresponds to the softkey *Magn. Error WCDMA* in the measurement menu *Modulation*.

INITiate:MODulation:MERRor:WCDMa	Start new measurement	⇒ *RUN*
ABORt:MODulation:MERRor:WCDMa	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MERRor:WCDMa	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MERRor:WCDMa	Next measurement step (only *stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V3.22

CONFigure:MODulation:MERRor:WCDMa:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:MODulation:MERRor:WCDMa:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				
These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Magn. Error* application.

Subsystem MODulation:MERRor...:CONTrol

The subsystem *MODulation:MERRor...:CONTrol* configures the scope of the modulation measurement. It corresponds to the *Control* tab in the popup menu *Modulation Configuration.*

CONFigure:MODulation:MERRor:WCDMa:CONTrol:RMODe *<Mode>*				Result Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | **ARRay**	Scalar values only (incl. limit matching) Scalar measured values and arrays	ARR	–	V3.22
Description of command				
This command specifies the type of measured values.				

CONFigure:MODulation:MERRor:WCDMa:CONTrol:STATistics *<Statistics>*				Meas. Statistics
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:MODulation:MERRor:WCDMa:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.				

CONFigure:MODulation:MERRor:WCDMa:CONTrol:CPIChslot *<Slot>*				CPICH Slot
<Slot>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 14	CPICH slot no.	0	–	V3.22
Description of command				
This command selects the CPICH slot no. for the `MODulation:MERRor` measurement.				

DEFault:MODulation:MERRor:WCDMa:CONTrol *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Tolerance values – Subsystem MODulation:OEMP...:LIMit

The subsystem *MODulation:OEMP:...:LIMit* (see section *Tolerance values – Subsystem MODulation:OEMP:...:LIMit* on p. 6.56 ff) defines tolerance values for the modulation measurement **in all four applications**. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:MERRor:WCDMa <Mode>,<Start>,<Samples>{,<Start>,<Samples>}				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	
0 chips to 2559 chips,	Start time in current range	0	chips	
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 2560	Number of samples in current range	2560	–	V3.22

Description of command

This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:MERRor...` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 chip period.

The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values.

By default, only one range corresponding to the total measurement range is used and all measurement values are returned.

Measured Values – Subsystem MODulation:MERRor:...?

The subsystem *MODulation:MERRor:...?* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Magn. Error WCDMA.*

				Scalar Results:
READ[:SCALar]:MODulation:MERRor:WCDMa?				Start single shot measurement and return results
FETCh[:SCALar]:MODulation:MERRor:WCDMa?				Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:MERRor:WCDMa?				Read out measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
Magn. Error (Peak) (x3),	0.0 % to 100.0 %	NAN	%	V3.22
Magn. Error (RMS) (x3),	0.0 % to 100.0 %	NAN	%	
I/Q Origin Offset (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Imbalance (x3),	–100.0 dB to 0.0 dB	NAN	dB	
Frequency Error (x3),	–5000.0 Hz to +5000.0 Hz	NAN	Hz	
Avg. Power Current,	–100.0 dBm to +60.0 dBm	NAN		
Out of Tolerance	0.0 % to 100.0 %	NAN	%	
Description of command				

These commands are always queries. They start a `MODulation:MERRor` measurement (`READ...`)and/or return all scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see section *Averaging and Statistical Evaluation*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

CALCulate[:SCALar]:MODulation:MERRor:WCDMa:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
Magn. Error (Peak) (x3),		INV	–	V3.22
Magn. Error (RMS) (x3),	For all measured values:	INV	–	
I/Q Origin Offset (x3),		INV	–	
I/Q Imbalance (x3),	NMAU | NMAL | INV | OK	INV	–	
Frequency Error (x3)		INV	–	
Description of command				

These commands are always queries. They indicate whether and in which way the error limits for the scalar measured values (see commands above) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value. The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

READ:ARRay:MODulation:MERRor:WCDMa:CHANnels:CURRent? Magn. Error in Evaluation Period
READ:ARRay:MODulation:MERRor:WCDMa:CHANnels:AVERage?
READ:ARRay:MODulation:MERRor:WCDMa:CHANnels:MMAX?
Start single shot measurement and return results ⇒ *RUN*
FETCh:ARRay:MODulation:MERRor:WCDMa:CHANnels:CURRent?
FETCh:ARRay:MODulation:MERRor:WCDMa:CHANnels:AVERage?
FETCh:ARRay:MODulation:MERRor:WCDMa:CHANnels:MMAX?
Read measurement results (unsynchronized) ⇒ *RUN*
SAMPle:ARRay:MODulation:MERRor:WCDMa:CHANnels:CURRent?
SAMPle:ARRay:MODulation:MERRor:WCDMa:CHANnels:AVERage?
SAMPle:ARRay:MODulation:MERRor:WCDMa:CHANnels:MMAX?
Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 % to +100.0 %,	1^{st} value for magnitude error	NAN	%	V3.22
... ,	...	...	...	
–100.0 % to +100.0 %	2560^{th} value for magnitude error	NAN	%	

Description of command

These commands are always queries. They return the magnitude error vs. time at fixed, equidistant test points with a 1-chip raster. The results are obtained with the CPICH slot selected via `CONFigure:MODulation:MERRor:CONTrol:CPIChslot`; the Magnitude Error (RMS) values of all CPICH slots can be measured by means of the `READ:ARRay:MODulation:MERRor:WCDMa:SLOTs:CURRent?` etc. commands.

The calculation of *Current, Average, and MMAX* (Max./Min.) results is explained in Chapter 3 (see *display mode*).

READ:ARRay:MODulation:MERRor:WCDMa:SLOTs:CURRent? Magn. Error in CPICH Slots
READ:ARRay:MODulation:MERRor:WCDMa:SLOTs:AVERage?
READ:ARRay:MODulation:MERRor:WCDMa:SLOTs:MMAX?
Start single shot measurement and return results ⇒ *RUN*
FETCh:ARRay:MODulation:MERRor:WCDMa:SLOTs:CURRent?
FETCh:ARRay:MODulation:MERRor:WCDMa:SLOTs:AVERage?
FETCh:ARRay:MODulation:MERRor:WCDMa:SLOTs:MMAX?
Read measurement results (unsynchronized) ⇒ *RUN*
SAMPle:ARRay:MODulation:MERRor:WCDMa:SLOTs:CURRent?
SAMPle:ARRay:MODulation:MERRor:WCDMa:SLOTs:AVERage?
SAMPle:ARRay:MODulation:MERRor:WCDMa:SLOTs:MMAX?
Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 % to +100.0 %,	Magn. Error (RMS) in slot 0	NAN	%	V3.22
–100.0 % to +100.0 %,	Magn. Error (RMS) in slot 1	NAN	%	
... ,	...	...	...	
–100.0 % to +100.0 %	Magn. Error (RMS) in slot 14	NAN	%	

Description of command

These commands are always queries. They return the Magnitude Error (RMS) values in all 15 CPICH slots of the frame.

READ:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:CURRent? **READ:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:AVERage?** **READ:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:MMAX?**				Subarray Results
	Start single shot measurement and return results			⇒ *RUN*
FETCh:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:CURRent? **FETCh:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:AVERage?** **FETCh:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:MMAX?**				
	Read meas. results (unsynchronized)			⇒ *RUN*
SAMPle:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:CURRent? **SAMPle:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:AVERage?** **SAMPle:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:MMAX?**				
	Read results (synchronized)			⇒ *RUN*
Ret. values per subrange	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 % to +100.0 %, **... ,** **–100.0 % to +100.0 %**	1st value for magnitude error ... nth value for magnitude error	NAN ... NAN	% ... %	V3.22

Description of command

These commands are always queries. They measure and return the magnitude error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:MERRor...` commands. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above.

The `CONFigure:SUBarrays:MODulation:MERRor...` commands define a maximum of 32 subranges. If one of the statistical modes (`ARIThmetical`, `MINimum`, `MAXimum`) is set, only one value is returned per subrange.

The calculation of *Current, Average, and MMAX* (Max./Min.) results is explained in Chapter 3 (see *display mode*).

MODulation:PERRor

The subsystem *MODulation:PERRor* measures the phase error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Phase Error WCDMA,* and the sections in the popup menu *Modulation Configuration* that are related to the *Phase Error*... application.

Control of Measurement – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* controls the modulation measurement. It corresponds to the softkey *Phase Error WCDMA* in the measurement menu *Modulation*.

INITiate:MODulation:PERRor:WCDMa	Start new measurement	⇒ *RUN*
ABORt:MODulation:PERRor:WCDMa	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:PERRor:WCDMa	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:PERRor:WCDMa	Next measurement step (only *stepping mode*)	⇒ *RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V3.22

CONFigure:MODulation:PERRor:WCDMa:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	V3.22
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200/300 operating manual).				

FETCh:MODulation:PERRor:WCDMa:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.22
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	NONE	–	
Description of command				
These commands are always queries. They return the status of the measurement (see Chapters 3 and 5 of the CMU200/300 operating manual).				

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Phase Error* application.

Subsystem MODulation:PERRor:WCDMa:CONTrol

The subsystem *MODulation:PERRor...:CONTrol* configures the scope of the modulation measurement. It corresponds to the *Control* tab in the popup menu *Modulation Configuration.*

CONFigure:MODulation:PERRor:WCDMa:CONTrol:RMODe <*Mode*>				Result Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | **ARRay**	Scalar values only (incl. limit matching) Scalar measured values and arrays	ARR	–	V3.22
Description of command				
This command specifies the type of measured values.				

CONFigure:MODulation:PERRor:WCDMa:CONTrol:STATistics <*Statistics*> Measurement Statistics				
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | **NONE**	Number of evaluation periods per statistics cycle Statistics off (equivalent to 1)	10	–	V3.22
Description of command				
This command defines the number of slots forming a statistics cycle.				

CONFigure:MODulation:PERRor:WCDMa:CONTrol:REPetition ***<Repetition>,<StopCond>,<Stepmode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	V3.22
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** In the case of READ commands (`READ:`...), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.				

CONFigure:MODulation:PERRor:WCDMa:CONTrol:CPIChslot <*Slot*>				CPICH Slot
<Slot>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 14	CPICH slot no.	0	–	V3.22
Description of command				
This command selects the CPICH slot no. for the `MODulation:PERRor` measurement.				

DEFault:MODulation:PERRor:WCDMa:CONTrol <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.22
Description of command				
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Tolerance values – Subsystem MODulation:OEMP...:LIMit

The subsystem *MODulation:OEMP...:LIMit* (see section *Tolerance values – Subsystem MODulation:OEMP:...:LIMit o*n p. 6.56 ff) defines tolerance values for the modulation measurement **in all four applications.** The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:PERRor:WCDMa <Mode>,<Start>,<Samples>{,<Start>,<Samples>} Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	
0 chips to **2559 chips,**	Start time in current range	0	chips	
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 2560	Number of samples in current range	2560	–	V3.22

Description of command

This command configures the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays:MODulation:PERRor...` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the second numerical parameter) or a single statistical value is returned. The subranges are defined by the start time and the number of test points which are located on a fixed, equidistant grid with a step width of 1 chip period.

The subranges may overlap but must be within the total range of the *Modulation* measurement. Test points outside this range are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values.

By default, only one range corresponding to the total measurement range is used and all measurement values are returned.

Measured Values – Subsystem MODulation:PERRor:WCDMa

The subsystem *MODulation:PERRor:...?* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Phase Error WCDMA.*

				Scalar Results:
READ[:SCALar]:MODulation:PERRor:WCDMa?				Start single shot measurement and return results
FETCh[:SCALar]:MODulation:PERRor:WCDMa?				Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:PERRor:WCDMa?				Read out measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
Phase Error (Peak) (x3),	–180.0 deg to +180.0 deg	NAN	deg	V3.22
Phase Error (RMS) (x3),	–180.0 deg to +180.0 deg	NAN	deg	
I/Q Origin Offset (x3),	–100.0 dB to 0.0 dB	NAN	dB	
I/Q Imbalance (x3),	–100.0 dB to 0.0 dB	NAN	dB	
Frequency Error (x3),	–5000.0 Hz to +5000.0 Hz	NAN	Hz	
Avg. Power Current,	–100.0 dBm to +60.0 dBm	NAN		
Out of Tolerance	0.0 % to 100.0 %	NAN	%	

Description of command

These commands are always queries. They start a `MODulation:PERRor` measurement (`READ...`)and/or return all scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see section *Averaging and Statistical Evaluation*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value.

CALCulate[:SCALar]:MODulation:PERRor:WCDMa:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	FW vers.
Phase Error (Peak) (x3),		INV	–	V3.22
Phase Error (RMS) (x3),	For all measured values:	INV	–	
I/Q Origin Offset (x3),	NMAU | NMAL | INV | OK	INV	–	
I/Q Imbalance (x3),		INV	–	
Frequency Error (x3)		INV	–	

Description of command

These commands are always queries. They indicate whether and in which way the error limits for the scalar measured values (see commands above) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Max./Min.* value. The following messages may be returned for all measured values:

NMAU	Upper limit exceeded	*not matching, upper*
NMAL	Lower limit exceeded	*not matching, lower*
INV	Measurement invalid	*invalid*
OK	Result within the tolerance	

READ:ARRay:MODulation:PERRor:WCDMa:CHANnels:CURRent? Phase Error in Evaluation period
READ:ARRay:MODulation:PERRor:WCDMa:CHANnels:AVERage?
READ:ARRay:MODulation:PERRor:WCDMa:CHANnels:MMAX?
Start single shot measurement and return results ⇒ *RUN*
FETCh:ARRay:MODulation:PERRor:WCDMa:CHANnels:CURRent?
FETCh:ARRay:MODulation:PERRor:WCDMa:CHANnels:AVERage?
FETCh:ARRay:MODulation:PERRor:WCDMa:CHANnels:MMAX?
Read measurement results (unsynchronized) ⇒ *RUN*
SAMPle:ARRay:MODulation:PERRor:WCDMa:CHANnels:CURRent?
SAMPle:ARRay:MODulation:PERRor:WCDMa:CHANnels:AVERage?
SAMPle:ARRay:MODulation:PERRor:WCDMa:CHANnels:MMAX?
Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–180.0 deg to +180.0 deg, **... ,** **–180.0 deg to +180.0 deg**	1st value for phase error ... 2560th value for phase error	NAN ... NAN	deg ... deg	V3.22

Description of command

These commands are always queries. They return the phase error vs. time at fixed, equidistant test points with a 1-chip raster. The results are obtained with the CPICH slot selected via `CONFigure:MODulation:PERRor:CONTrol:CPIChslot`; the Phase Error (RMS) values of all CPICH slots can be measured by means of the `READ:ARRay:MODulation:PERRor:WCDMa:SLOTs:CURRent?` etc. commands.

The calculation of *Current, Average, and MMAX* (Max./Min.) results is explained in Chapter 3 (see *display mode*).

READ:ARRay:MODulation:PERRor:WCDMa:SLOTs:CURRent? Phase Error in CPICH Slots
READ:ARRay:MODulation:PERRor:WCDMa:SLOTs:AVERage?
READ:ARRay:MODulation:PERRor:WCDMa:SLOTs:MMAX?
Start single shot measurement and return results ⇒ *RUN*
FETCh:ARRay:MODulation:PERRor:WCDMa:SLOTs:CURRent?
FETCh:ARRay:MODulation:PERRor:WCDMa:SLOTs:AVERage?
FETCh:ARRay:MODulation:PERRor:WCDMa:SLOTs:MMAX?
Read measurement results (unsynchronized) ⇒ *RUN*
SAMPle:ARRay:MODulation:PERRor:WCDMa:SLOTs:CURRent?
SAMPle:ARRay:MODulation:PERRor:WCDMa:SLOTs:AVERage?
SAMPle:ARRay:MODulation:PERRor:WCDMa:SLOTs:MMAX?
Read measurement results (synchronized) ⇒ *RUN*

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
–180.0 deg to +180.0 deg, **–180.0 deg to +180.0 deg,** **... ,** **–180.0 deg to +180.0 deg**	Phase Error (RMS) in slot 0 Phase Error (RMS) in slot 1 ... Phase Error (RMS) in slot 14	deg deg ... deg	– – ... –	V3.22

Description of command

These commands are always queries. They return the Phase Error (RMS) values in all 15 CPICH slots of the frame.

READ:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:CURRent? Subarray Results
READ:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:AVERage?
READ:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:MMAX?
Start single shot measurement and return results ⇒ *RUN*
FETCh:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:CURRent?
FETCh:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:AVERage?
FETCh:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:MMAX?
Read meas. results (unsynchronized) ⇒ *RUN*
SAMPle:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:CURRent?
SAMPle:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:AVERage?
SAMPle:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:MMAX?
Read results (synchronized) ⇒ *RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	FW vers.
–180.0 deg to +180.0 deg, **... ,** **–180.0 deg to +180.0 deg**	1^{st} value for phase error ... n^{th} value for phase error	NAN ... NAN	deg ... deg	V3.22

Description of command

These commands are always queries. They measure and return the phase error versus time in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:PERRor...` commands. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above.

The `CONFigure:SUBarrays:MODulation:PERRor...` commands define a maximum of 32 subranges. If one of the statistical modes (`ARIThmetical`, `MINimum`, `MAXimum`) is set, only one value is returned per subrange.

The calculation of *Current, Average, and MMAX* (Max./Min.) results is explained in Chapter 3 (see *display mode*).

File Management – System MMEMory

The `MMEMory` system provides mass storage capabilities for the CMU. The functionality of this system is included in the *Data* menu; see CMU200/300 operating manual.

The mass storage of the CMU may be internal or external. The internal mass storage device is a section on the internal hard disk that is reserved for mass storage (directory c:\temp). The external mass storage device is either a floppy disk or a PCMCIA memory card, depending on the instrument configuration. The <*msus*> (mass storage unit specifier) parameter in the `MMEMory` commands denotes the root directory of the *INTernal* or *EXTernal* mass storage device.

The <FileName> parameter is a string. The contents of the string may contain characters for specifying subdirectories, e.g. "\TEMP\TRASH\test.txt" for the file named *test.txt* in the *TEMP\TRASH* subdirectory of the root directory or "TEMP\TRASH\test.txt" for the file named *test.txt* in the *TEMP\TRASH* subdirectory of the current directory, to be queried with the base system command `MMEMory:DIRectory [:CURRent]?`. The file name itself may contain the period as a separator for extensions.

MMEMory:SAVE:CURRent *<FileName> [,<msus>]*
Save configurations in current function group and test mode

Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>", INTernal | EXTernal	Name of the config. file to be created Storage device of the config. file	– INTernal	– –	V3.22

Description of command

This command saves the configuration of the current function group and test mode to a configuration file. A "?" in the specified file name will be replaced by current numbers that are automatically incremented, starting with zero. The auto-increment function overwrites an existing file with a "9" in its file name. For instrument settings that may be different in manual and remote control (e.g. the repetition mode for many measurements) the manual setting is saved. The command is available in all function groups. This command is CMU-specific.

MMEMory:RECall:CURRent *<FileName> [,<msus>]*
Recall configurations in current function group and test mode

Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>", INTernal | EXTernal	Name of the config. file to be recalled Storage device of the config. file	– INTernal	– –	V3.22

Description of command

This command recalls the configuration of the current function group and test mode from a configuration file. The command is available in all function groups. This command is CMU-specific.

Additional MMEMory… commands are available in *Signalling* mode; see section *Saving Layer 3 Message Log Files*.

Option Query

The *Options* subsystem contains the commands for querying information on the instrument and the available options. It corresponds to the *Options* tab in the *Setup* menu opened via the *SETUP* key on the front panel.

SYSTem:OPTions:INFO:CURRent?			Device Info
Response	Def. value	Default unit	FW vers.
Example: Rohde&Schwarz,CMU 200-1100.0008.02,840675/018, V3.10C:SP02 2002-10-25"WCDMA19UEFDD_Sig"	–	–	V3.22
Description of command			
This command returns the information on the device comprising the manufacturer, model, serial number and firmware version of the current function group. This command is always a query.			

Partial Reset

The *RESet* subsystem restores the (factory) default values for the current function group and test mode. It is similar to the *Reset* menu opened via the *RESET* key on the front panel.

SYSTem:RESet:CURRent	Partial Reset
Command description	FW vers.
This command sets all parameters of the current function group and test mode to default values. The command is available in all function groups. In contrast to the *Reset* menu the command restores the default values defined for remote control operation. In cases where remote and manual control use distinct settings (e.g. the repetition mode for many measurements), the manual control settings are left unchanged.	V3.22

Measurements in Signalling Mode

The commands for the measurement groups in this section are only available in *Signalling* mode.

DL BER Test

The subsystem *DLBer:BER* comprises the commands for the downlink Bit Error Rate test. The subsystem corresponds to the main menu *DL BER Test* and the associated popup menu *DL BER Test Configuration.*

Note: *The DL BER Test results are only available while the R&S CMU is BCH/SFN synchronized.*

Measurement Control

The commands in this section control the receiver quality measurements. They correspond to the measurement control softkey *BER* in the *DL BER Test* menu.

INITiate:DLBer:BER	Start new measurement	⇒	*RUN*
ABORt:DLBer:BER	Abort running measurement and switch off	⇒	*OFF*
STOP:DLBer:BER	Stop measurement	⇒	*STOP*
Description of command			FW vers.
These commands have no query form. They start or stop the current measurement, setting it to the status indicated in the top right column.			V3.62

CONFigure:DLBer:BER:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SRSQ No reporting	OFF	–	V3.62
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of R&S CMU200/300 manual).				

FETCh:DLBer:BER:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stopped according to repetition mode and stop condition	OFF	–	V3.62
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	 NONE	–	
1 to 1000 | **NONE**	Counter for current evaluation period within a cycle Statistic count set to off	 NONE	–	
Description of command				
This command is always a query. It returns the status of the measurement (see Chapter 5).				

Subsystem DLBer:BER:CONTrol

The subsystem *DLBer:BER:CONTrol* sets the control parameters for the receiver quality measurement. The subsystem corresponds to the *Control* tab in the popup menu *Receiver Quality Configuration.*

CONFigure:DLBer:BER:CONTrol:REPetition *<Repetiton>, <StopCondition>, <Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (counting, until `Status = RDY`)	SING	–	V3.62
<StopCond>	Description of parameters	Def. value	Def. unit	FW vers.
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	V3.62
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE	Continue measurement according to its rep. mode	NONE	–	V3.62
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. The stepping mode is not relevant for DLBer tests. **Note:** *For READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				

CONFigure:DLBer:BER:CONTrol:TBContinuous *<Blocks>*				Transport Blocks Continuous
<Blocks>	Description of parameters	Def. value	Def. unit	FW vers.
10 to 10000	Transport blocks for continuous measurements	500	(blocks)	V3.62
Description of command				
This command defines the number of transport blocks to be used for averaging in continuous measurements.				

CONFigure:DLBer:BER:CONTrol:TBSingleshot *<Blocks>*				Transp. Blocks Single Shot
<Blocks>	Description of parameters	Def. value	Def. unit	FW vers.
10 to 100000	Transport blocks for single shot measurements	100	(blocks)	V3.62
Description of command				
This command defines the number of transport blocks to be sent in each single shot measurement cycle.				

CONFigure:DLBer:BER:CONTrol:AHOTime *<AGC_holdoff>*				AGC Holdoff Time
<AGC_holdoff>	Description of parameters	Def. value	Def. Unit	FW vers.
0 s to 100 s	AGC holdoff time (Automatic Gain Control)	3.0	s	V3.62
Description of command				Sig. State
This command defines the hold off time during which the R&S CMU can adapt itself to the new RF level at the beginning of the receiver quality measurement.				all

CONFigure:DLBer:BER:CONTrol:SHOTime <Sync_holdoff>				Sync. Holdoff Time
<Sync:holdoff>	Description of parameters	Def. value	Def. Unit	FW vers.
0 s to 100 s	Synchronization holdoff time	3.0	s	V3.62
Description of command				Sig. State
This command defines the maximum time during which the R&S CMU can synchronize to the received bit stream.				all

DEFault:DLBer:BER:CONTrol <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	All parameters are set to their default values Some or all parameters differ from the default values	ON	–	V3.62
Description of command				
As a *setting command* with the setting *ON* this command sets all parameters of the subsystem to default values (the setting *OFF* causes an error message). As a query, this command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

DEFault:DLBer:BER:CONTrol: PAResync <Enable>				Automatic Resync
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	Automatic resynchronization to Bit pattern is switched ON No resynchronization will be done in case of loss of synchronization	ON	–	V3.65
Description of command				
This command defines if an automatic resynchronization to PRBS pattern should be performed in case of a loss of synchronization .				

BER-Specific UL and DL Signal Configuration

The commands in this section define the BER power and transmitted bit sequence. They correspond to the measurement-specific *Node B Signal* and *UE Signal* settings.

CONFigure:DLBer:BER:UESignal:TTPower <*Level*>				Total Transmit Power (BER)
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –40 dBm **–137 dBm to –23 dBm** **–90 dBm to 0.0 dBm**	Total generator output power at RF 1 Total generator output power at RF 2 Total generator output power at RF 3 OUT	–80.0 –80.0 –80.0	dBm dBm dBm	V3.62
Description of command				
This command sets the Total TX Power in absolute units. The DPCCH/DPDCH power ratio and the number of DPDCHs is considered to be fixed for all channel configurations, so the command overwrites the value of `CONFigure:DLBer:BER:UESignal:DPCCh` and vice versa (see description of manual control).				

CONFigure:DLBer:BER:UESignal:DPCCh <*Level*>				DPCCH Level (BER)
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –10 dBm*	DPCCH level	–84.6	dBm	V3.62
Description of command				
This command sets the level of the Dedicated Physical Control Channel (DPCCH). The DPCCH/DPDCH power ratio and the number of DPDCHs is considered to be fixed for all channel configurations, so the command overwrites the value of `CONFigure:UESignal:LEVel:TTPower` and vice versa (see description of manual control). *) The level range depends on the *DPDCH Level* and the *Power Ratio DPCCH/DPDCH*. It is such that the allowed range of the *Total TX Power* is not exceeded. The value quoted above holds for output connector RF2 and a *Power Ratio DPCCH/DPDCH* of INF where the DPDCH is effectively switched off.				

CONFigure:DLBer: BER: UESignal:AWGN<Enable>				AWGN
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Transport blocks for single shot measurements	OFF	-	V3.65
Description of command				
This command switches the Additional White Gaussian Noise contribution to the RF generator signal on or off. The AWGN level is defined separately (`CONFigure:DLBer:BER:UESignal:NPOWer`). **This command is available** with option R&S CMU-K77, *AWGN and BER Simulation.*				

CONFigure:DLBer: BER: UESignal:NPOWer<*Level*>				Noise Level
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to -23 dBm*)	Noise level	–84.0	dBm	V3.65
Description of command				
This command defines the level of the Additional White Gaussian Noise contribution to the RF generator signal**.** The setting takes effect if the AWGN is enabled only (`CONFigure:DLBer:BER:UESignal:AWGN ON`). **This command is available** with option R&S CMU-K77, *AWGN and BER Simulation.* *) The 3GPP standard stipulates that the *Noise Level* must not be smaller than the *DPCCH Level* minus a variable margin depending on the actual *DPCCH Level* and the *Power Ratio DPCCH/DPDCH*. The range and default value quoted above holds for the default configuration of the *DPCCH Level* and the *Power Ratio DPCCH/DPDCH* and can vary if one of these parameters is changed. The *Noise Level* and the *DPCCH Level* overwrite each other as soon as their difference exceeds the margin defined in the standard.				

CONFigure:DLBer:BER:UESignal:DTCH <*Sequence*>				Channel Data Source DTCH
<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
PR9 | PR11 | PR15 | PR16	Pseudo-random bit sequences	PR9	–	V3.62
Description of command				
This command specifies the PRBS data sequence that the R&S CMU transmits on the UL DTCH.				

CONFigure:DLBer:BER:NBSignal:DTCH <*Sequence*>				Channel Data Source DTCH
<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
PR9 | PR11 | PR15 | PR16 | LOOP	Pseudo-random bit sequences Loopback at the Node B	LOOP	–	V3.62
Description of command				
This command specifies the PRBS data sequence that the R&S CMU expects to be transmitted on the DL DTCH. In loopback mode the PRBS sequence is the same as the UL sequence selected via `CONFigure:DLBer:BER:UESignal:DTCH`.				

Subsystem DLBer:BER:LIMit

The subsystem *DLBer:BER:LIMit* defines tolerance values for the receiver quality measurements. The subsystem corresponds to the *Limits* tab in the popup menu *DL BER Test Configuration.*

CONFigure:DLBer:BER:CURRent:LIMit[:SCALar]:ASYMmetric:UPPer:VALue ***<BER>, <BLER>, <DBLER>***				Limits
<BER>	Description of parameters	Def. value	Def. unit	FW vers.
0 % to 100 %| **OFF,**	Upper limit for Bit Error Rate Disable limit check	0.1	%	V3.62
<BLER>	Description of parameters	Def. value	Def. unit	FW vers.
0 % to 100 %| **OFF,**	Upper limit for Block Error Rate Disable limit check	1.0	%	V3.62
<DBLER>	Description of parameters	Def. value	Def. unit	FW vers.
0 % to 100 %| **OFF**	Upper limit for Data Block Error Rate Disable limit check	1.0	%	V3.62
Description of command				
This command defines upper limits for the BER, the BLER and the DBLER.				

DEFault:DLBer:BER:LIMit <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	All parameters are set to their default values Some or all parameters differ from the default values	ON	–	V3.62
Description of command				
As a *setting command* with the setting *ON* this command sets all parameters of the subsystem to default values (the setting *OFF* causes an error message). As a query, this command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Measured Values – Subsystem DLBer:BER?

The subsystem *DLBer:BER?* measures and returns the different bit error rates and compares them with the tolerance values. The subsystem corresponds to the left output table in the *Receiver Quality* menu*.*

READ[:SCALar]:DLBer:BER? **FETCh[:SCALar]:DLBer:BER?**	Scalar Results Start single shot measurement and return results Read out meas. results (unsynchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
BER, **BLER,** **DBLER**	0.000% to 100.000% 0.000% to 100.000% 0.000% to 100.000%	NAN NAN NAN	% % %	V3.62
Description of command				
These commands are always queries. They start a bit-error-rate test and return the measurement results (see also detailed explanation of measured values in chapter 4).				

CALCulate[:SCALar]:DLBer:BER:MATChing:LIMit?		Limit Matching		
Returned values	Value range	Def. value	Def. unit	FW vers.
BER, **BLER,** **DBLER**	NMAU | INV | OK NMAU | INV | OK NMAU | INV | OK	INV INV INV	– – –	V3.62

Description of command

This command is always a query. It indicates whether and in which way the tolerances for the bit error rate test (see command above) have been exceeded.

The following messages can be returned for the measured quantities:

NMAU	Tolerance exceeded	*Not matching, upper limit exceeded*
INV	Invalid measurement	*invalid*
OK	All tolerances matched	

RACH PREamble Test (Option R&S CMU-K71)

The subsystem *RACH:PREamble* comprises the commands for the RACH preamble test. The subsystem corresponds to the main menu *RACH Test* and the associated popup menu *RACH Test Configuration.*

Note: *RACH preamble test results are only available while the R&S CMU is BCH/SFN synchronized.*

Measurement Control

The commands in this section control the RACH preamble measurements. They correspond to the measurement control softkey *Rach preamble* in the *RACH Preamble Test* menu.

INITiate:RACH:PREamble	Start new measurement	⇒	RUN
ABORt:RACH:PREamble	Abort running measurement and switch off	⇒	OFF
STOP:RACH:PREamble	Stop measurement	⇒	STOP
Description of command			FW vers.
These commands have no query form. They start or stop the current measurement, setting it to the status indicated in the top right column.			V3.65

CONFigure:RACH:PREamble:EREPorting<*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.65
SOPC |	Single operation complete			
SRSQ |	SRQ and SRSQ			
OFF	No reporting			
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of R&S CMU200/300 manual).				

FETCh:RACH:PREamble:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	V3.65
RUN |	Running (after `INITiate` or `READ`)			
STOP |	Stopped (`STOP`)			
RDY,	Stopped according to repetition mode and stop condition			
NONE	For future extensions	NONE	–	
Description of command				
This command is always a query. It returns the status of the measurement (see Chapter 5).				

Subsystem RACH:COMMon:CONTrol

The subsystem *RACH:COMMon:CONTrol* sets the control parameters for the RACH test. The subsystem corresponds to the *Control* tab in the popup menu *RACH Test.*

CONFigure:RACH:COMMon:CONTrol:NPOWer<*Level*>				Noise Level
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–80 dBm to –60 dBm *) **–80 dBm to –43 dBm** *) **–80 dBm to –20 dBm** *)	Noise level at RF 1*) Noise level at RF 2*) Noise level at RF 3 OUT *)	–60.0 –60.0 –60.0	dBm dBm dBm	V3.65
Description of command				
This command defines the level of the Additional White Gaussian Noise contribution to the RF generator signal**.** The setting takes effect if the AWGN is enabled only (`CONFigure:RACH:COMMon:CONTrol:AWGN ON`). **This command is available** with option R&S CMU-K77, *AWGN and BER Simulation.* *) The 3GPP standard stipulates that the *Noise Level* for the RACH must be bigger than the *Preamble Power* minus 29.0 dB Therefore the range and default value quoted above holds for the default configuration of the *Preamble Power* and the *Signal to Noise Ratio* and can vary if one of these parameters is changed. The *Noise Level* the *Preamble Power* and the *Signal to Noise Ratio* overwrite each other as soon as their difference exceeds the margin defined in the standard.				

CONFigure:RACH:COMMon:CONTrol:AWGN<Enable>				AWGN
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	Transport blocks for single shot measurements	OFF	-	V3.65
Description of command				
This command switches the Additional White Gaussian Noise contribution to the RF generator signal on or off. The AWGN level is defined separately (`CONFigure:RACH:COMMon:CONTrol :NPOWer`**). This command is available** with option R&S CMU-K77, *AWGN and BER Simulation.*				

CONFigure:RACH:COMMon:CONTrol:ATTiming <*ATTiming*>				AICH Transmission Timing
<ATTiming >	Description of parameters	Def. value	Def. Unit	FW vers.
0 | **1**	3 Access Slots difference (7680 Chips) 4 Access Slots difference (12800 Chips)	0	-	V3.65
Description of command				
This command defines the timing parameter which adjusts the distance between preamble and message part.				

Subsystem RACH:PREamble:CONTrol

The subsystem *RACH:PREamble:CONTrol* sets the control parameters for the RACH preamble test. The subsystem corresponds to the *Control* tab in the popup menu *RACH Test.*

CONFigure:RACH:PREamble:CONTrol:POWer <*Level*> — Preamble Power

<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –31 dBm *)	Preamble output power at RF 1*)	–31.0	dBm	V3.65
–137 dBm to –14 dBm *)	Preamble output power at RF 2*)	–31.0	dBm	
–90 dBm to +9 dBm *)	Preamble output power at RF 3 OUT *)	–31.0	dBm	

Description of command

This command defines the Output Power of the RACH preambles.

*) The 3GPP standard stipulates that the *Preamble Power* for the RACH must be smaller than a value of 29.0 dB plus *Noise Level*. Therefore the range and default value quoted above holds for the default configuration of the *Preamble Power* , the *Signal to Noise Ratio(ECN0)* and the *Noise Level* can vary if one of these parameters is changed. The *Noise Level,* the *Preamble Power* and the *Signal to Noise Ratio* overwrite each other as soon as their difference exceeds the margin defined in the standard.

CONFigure:RACH:PREamble:CONTrol:ECN <*Ratio*> — Signal to Noise Ratio

<Ratio>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to +29 dBm *)	Signal to Noise Ratio at RF 1*)	–31.0	dBm	V3.65
–137 dBm to +29 dBm *)	Signal to Noise Ratio at RF 2*)	–31.0	dBm	
–90 dBm to +29 dBm *)	Signal to Noise Ratio at RF 3 OUT *)	–31.0	dBm	

Description of command

This command defines the Signal to Noise Ratio of the RACH preambles.

*) The 3GPP standard stipulates that the *Signal to Noise Ratio (ECN0)* for the RACH must be smaller than a value of 29.0 dB Therefore the range and default value quoted above holds for the default configuration of the *Preamble Power*, the *Signal to Noise Ratio(ECN0)* and the *Noise Level* can vary if one of these parameters is changed. The *Noise Level,* the *Preamble Power* and the *Signal to Noise Ratio* overwrite each other as soon as their difference exceeds the margin defined in the standard.

CONFigure:RACH:PREamble:CONTrol:SCODe<*Value*> — Scrambling Code Value

<Value>	Description of parameters	Def. value	Def. Unit	FW vers.
0 to 16777215	Scrambling code	0	-	V3.65

Description of command

This command selects the scrambling code for the uplink RF generator signal (RACH).

CONFigure:RACH:PREamble:CONTrol:NRPReambles<*Number*> — Number of Preambles

<Number>	Description of parameters	Def. value	Def. Unit	FW vers.
0 to 16777216	Number of preambles	1	-	V3.65

Description of command

This command defines the number of preambles that will be send.

CONFigure:RACH:PREamble:CONTrol:ASCNumber <*Number*> — AICH Spreading Code Number

<Number>	Description of parameters	Def. value	Def. Unit	FW vers.
0 to 255	AICH Spreading Code Number	6	-	V3.65

Description of command

This command defines the AICH Spreading Code Number.

CONFigure:RACH:PREamble:CONTrol:SFNNumber *<Number>*				SFN Number
<Number>	Description of parameters	Def. value	Def. Unit	FW vers.
0 to 4095	Activation SFN Number	0	-	V3.65
Description of command				
This command defines the Activation SFN of the first preamble to be sent. The setting takes effect if the SFNMode SFN Number is set (`CONFigure:RACH:PREamble:CONTrol:SFNMode SFNNr`).				

CONFigure:RACH:PREamble:CONTrol:SFNMode *<Mode>*				SFN Start Mode
<Mode>	Description of parameters	Def. value	Def. Unit	FW vers.
SFNNr **IMMed**	Start at a specific SFN. Start at the next possible SFN.	3.0	s	V3.65
Description of command				
This command defines the Start Mode of the Rach Preamble Test.				

CONFigure:RACH:PREamble:CONTrol:NASList *<Number>*				Number of AccessSlots in List
<Number>	Description of parameters	Def. value	Def. Unit	FW vers.
1 to 64	Number of Access Slots in List	1	-	V3.65
Description of command				
This command defines the number of predefined preambles in a cycle (using the Access Slot List).				

CONFigure:RACH:PREamble:CONTrol:ASTable<nr> *<AccFrame>*, *<AccSlot>*,*<Signature* >				AccessSlotList
<AccFrame>	Description of parameters	Def. value	Def. Unit	FW vers.
0..7	Access Frame Number for Access Slot Table line number <nr>, where <nr> = 1,2,…,64	0	-	V3.65
<AccSlot>	Description of parameters	Def. value	Def. Unit	FW vers.
0..7 **8..14**	Access Slot Number for Access Frame Number 0,2,4,6 Access Slot Number for Access Frame Number 1,3,5,7 for Access Slot Table line number <nr>, where <nr> = 1,2,…,64	0	-	V3.65
<Signature>	Description of parameters	Def. value	Def. Unit	FW vers.
1..64	Preamble Signature for Access Slot Table line number <nr>, where <nr> = 1,2,…,64	1	-	V3.65
Description of command				
This command defines an Access Frame Number, an Access Slot and the Signature for Access Slot Table line number <nr>, where <nr> = 1,2,…,64. This corresponds to the Configuration of every <nr>th preamble of the cycle to be sent.				

DEFault:RACH:CONTrol <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	All parameters are set to their default values Some or all parameters differ from the default values	ON	–	V3.65
Description of command				
As a *setting command* with the setting *ON* this command sets all parameters of the subsystem to default values (the setting *OFF* causes an error message). As a query, this command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Measured Values – Subsystem RACH:PREamble?

The subsystem *RACH:PREamble* measures (READ...) and returns the total number of detected AICHs and the number of correctly and incorrectly detected AICHs in relation to time and Signature of AICH. Besides the probability values for correct (P_d) and wrong detection (P_{fa}) of AICHs are returned. The subsystem corresponds to the output table in the *RACH:PREamble* menu.

				Scalar Results
READ[:SCALar]: RACH:PREamble?				Start single shot measurement and return results
FETCh[:SCALar]: RACH:PREamble?				Read out meas. results (unsynchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
Pd,	0.000% to 100.000%	NAN	%	V3.65
Pfa,	0.000% to 100.000%	NAN	%	
Detected AICHs,	0 to 16777216	NAN	-	
Correct AICHs,	0.to 16777216	NAN	-	
Wrong AICHs,	0 to 16777216	NAN	-	
AICH Average Power,	-100.00 dBm to 0.00 dBm	NAN	dBm	
Description of command				
These commands are always queries. They start a RACH Preamble test and return the measurement results(see also detailed explanation of measured values in chapter 4)..				

HSDPa Tests (Option R&S CMU-K72)

The subsystem *HSDPa:…* comprises the commands for the HSDPa tests. The subsystem corresponds to the main menu *HSDPA* and the associated popup menu *HSDPA Configuration.*

Note: *The HSDPA test results are only available while the R&S CMU is BCH/SFN synchronized.*

Common Settings – Subsystem HSDPa:CONTrol

The subsystem *HSDPa:CONTrol* defines settings for all HSDPA applications. The subsystem corresponds to the *Common* settings in the *Control* tab in the popup menu *HSDPa Configuration.*

CONFigure:HSDPa:CONTrol:SMODe <*Mode*>				Start Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
IMMediate | **HSFN |** **UEID**	Immediate start of the measurement Start at a definite HSDPA system frame number Start at a definite UE-ID	IMM	–	V3.82
Description of command				
This command specifies the start mode for the HSDPA measurement. The start HSFN is defined via `CONFigure:HSDPa:CONTrol:HSFN`, the start UE-ID via `CONFigure:HSDPa:CONTrol:UEID`.				

CONFigure:HSDPa:CONTrol:UEID <*UE-ID*>				UE-ID
<UE-ID>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 65535	Start UE-ID	0	–	V3.82
Description of command				
This command specifies the UE-ID for *Start Mode: UE-ID* (`CONFigure:HSDPa:CONTrol:SMODe UEID`).				

CONFigure:HSDPa:CONTrol:HSFN <*HSFN*>				*HSFN*
<HSFN>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 20479	Start HSFN	0	–	V3.82
Description of command				
This command specifies the start HSFN for *Start Mode: HSFN* (`CONFigure:HSDPa:CONTrol:SMODe HSFN`).				

CONFigure:HSDPa:CONTrol:NRUeid <*Number*>				Nr. of UE-IDs
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 128	Total number of analyzed UE-IDs	16	–	V3.82
Description of command				
This command specifies the total number of analyzed UE-IDs. This value determines the length of the *UE-ID Index Table* (`CONFigure:HSDPa:CONTrol:UITable`…).				

CONFigure:HSDPa:CONTrol:UITable<nr> *<UE-ID>*		UE-ID Index Table, Single Value		
<UE-ID>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 65535	UE-ID for index table <nr>	0	–	V3.82
Description of command				
This command specifies a single UE-ID value for the UE-ID index table. The numeric suffix <nr> defines the position in the table (<nr> = 2 to n where n is defined via `CONFigure:HSDPa:CONTrol:NRUeid`). The first entry (<nr> = 1) is always equal to the main UE-ID (see `CONFigure:NBSignal:HSDPa:MUID`). The query with numeric suffix 1 returns the main UE-ID; the setting command with suffix 1 results in an error message.				

CONFigure:HSDPa:CONTrol:UITable:ALL *<UE-ID>*		UE-ID Index Table, All Values		
<UE-ID>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 65535, **0 to 65535,** **…,** **0 to 65535**	UE-ID for 2nd entry in the index table UE-ID for 3rd entry in the index table UE-ID for nth entry in the index table	0 0 0	– – –	V3.82
Description of command				
This command specifies the UE-IDs for the UE-ID index table. The values correspond to the entries no. 2 to n in the table, where n is defined via `CONFigure:HSDPa:CONTrol:NRUeid`. The first entry is always equal to the main UE-ID (see `CONFigure:NBSignal:HSDPa:MUID`). The query returns n values including the main UE-ID.				

HSDPA:HINFormation

The commands in the *HSDPA:HINFormation* subsystem control the *HS-SCCH Information* measurement application. The following commands correspond to the measurement control softkey *HS-SCCH Information* in the *HSDPA* menu.

INITiate:HSDPa:HINFormation	Start new measurement	⇒	RUN
ABORt:HSDPa:HINFormation	Abort running measurement and switch off	⇒	OFF
STOP:HSDPa:HINFormation	Stop measurement	⇒	STOP
Description of command			FW vers.
These commands have no query form. They start or stop the current measurement, setting it to the status indicated in the top right column.			V3.82

CONFigure:HSDPa:HINFormation:EREPorting*<Mode>*		Event Reporting		
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SRSQ No reporting	OFF	–	V3.82
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of R&S CMU200/300 manual).				

FETCh:HSDPa:HINFormation:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stopped according to repetition mode and stop condition	OFF	–	V3.82
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 1024 | **NONE**	Counter for current evaluation period (HSDPA subframe) within a statistics cycle No counter result available	NONE	–	
Description of command				
This command is always a query. It returns the status of the measurement (see Chapter 5).				

Subsystem HSDPa:HINFormation:CONTrol

The subsystem *HSDPa:HINFormation:CONTrol* controls the scope of the *HS-SCCH Information* measurement. The subsystem corresponds to the settings in the *Control* tab in the popup menu *HSDPa Configuration* that are related to the *HS-SCCH Information* application*.*

CONFigure:HSDPa:HINFormation:CONTrol:REPetition ***<Repetiton>, <StopCondition>, <Stepmode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (counting, until `Status = RDY`)	SING	–	V3.82
<StopCond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE	Continue measurement in case of error	NONE	–	V3.82
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE	Continue measurement according to its rep. mode	NONE	–	V3.82
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. A single shot measurement always comprises 1024 consecutive HSDPA subframes. The stop condition and the stepping mode is not relevant for HSDPA tests. **Note:** *For READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				

CONFigure:HSDPa:HINFormation:CONTrol:DMODe *<Mode>*				Display Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
HSFN | **UEID**	Display consecutive HSFNs Skip HSFNs with four invalid UE IDs	HSFN	–	V3.82
Description of command				
This command selects the display mode for the HS-SCCH information table. UEID possibly extends the single shot measurement time.				

Measured Values – Subsystem HSDPa:HINFormation…?

The following commands measure (READ…) and return the total HS-SCCH information. The subsystem corresponds to the output tables in the *HS-SCCH Information* menu.

				UE IDs per HS-SCCH
READ:ARRay: HSDPa:HINFormation<nr>?				Start single shot measurement and return results
FETCh:ARRay: HSDPa:HINFormation<nr>?				Read out meas. results (unsynchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
HSFN_1,	0 to 20479	NAN	–	V3.82
UE-ID_1,	0 to 65535	NAN	–	
…,	…	NAN	–	
HSFN_1024,	0 to 20479	NAN	–	
UE-ID_1024	0 to 65535	NAN	–	
Description of command				
These commands are always queries. They start a *HS-SCCH Information* measurement (READ…) and return the decoded UE-ID values for HS-SCCH channel no. <nr> (<nr> = 1 to 4; see also detailed explanation of measured values in Chapter 4). To retrieve detailed information use the command with a parameter `DINFormation`; see below.				

				Detailed information per HS-SCCH
READ:ARRay: HSDPa:HINFormation<nr>? DINFormation				Start single shot measurement and return results
FETCh:ARRay: HSDPa:HINFormation<nr>? DINFormation				Read out meas. results (unsynchronized)
Returned values	Value range	Def. value	Def. unit	FW vers.
HSFN_1,	0 to 20479	NAN	–	V3.82
UE-ID_1,	0 to 65535	NAN	–	
New Data Indicator Bit,	0 | 1…	NAN	–	
Retransmission,	TRUE | FALSe	NAN	–	
Modulation Type,	QPSK | 16QAM	NAN	–	
Redundancy Version,	0 to 7	NAN	–	
s,	0 to 1	NAN	–	
r,	0 to 3	NAN	–	
b,	0 to 3	NAN	–	
HARQ Process Identifier,	1 to 8	NAN	–	
Block Size Index,	1 to 254	NAN	–	
Block Size,	127 to 27952	NAN	–	
Channel Code Offset,	0 to 15	NAN	–	
Number of Channels,	1 to 15	NAN	–	
CRC Error	TRUE | FALSe	NAN	–	
…,	…	NAN	–	
HSFN_1024,	0 to 20479	NAN	–	
UE-ID_1024,	0 to 65535	NAN	–	
…		NAN	–	
Description of command				
These commands are always queries. They start a *HS-SCCH Information* measurement (READ…) and return the detailed information for HS-SCCH channel no. <nr> (<nr> = 1 to 4; see also detailed explanation of measured values in Chapter 4).				

	UE IDs for all HS-SCCHs			
READ:ARRay: HSDPa:HINFormation:ALL?	Start single shot measurement and return results			
FETCh:ARRay: HSDPa:HINFormation:ALL?	Read out meas. results (unsynchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
HSFN_1,	0 to 20479	NAN	–	V3.82
UE-ID_1_Ch_1,	0 to 65535	NAN	–	
UE-ID_1_Ch_2,	0 to 65535	NAN	–	
UE-ID_1_Ch_3,	0 to 65535	NAN	–	
UE-ID_1_Ch_4,	0 to 65535	NAN	–	
…,	…	…	…	
HSFN_1024,	0 to 20479	NAN	–	
UE-ID_1024_Ch_1,	0 to 65535	NAN	–	
UE-ID_1024_Ch_2,	0 to 65535	NAN	–	
UE-ID_1024_Ch_3,	0 to 65535	NAN	–	
UE-ID_1024_Ch_4	0 to 65535	NAN	–	

Description of command

These commands are always queries. They start a *HS-SCCH Information* measurement (READ…) and return the decoded UE-ID values for all four HS-SCCHs (see also detailed explanation of measured values in Chapter 4). To retrieve detailed information use the command with a parameter `DINFormation`; see below.

	Detailed information for all HS-SCCHs			
READ:ARRay: HSDPa:HINFormation:ALL? DINFormation	Start single shot measurement and return results			
FETCh:ARRay: HSDPa:HINFormation:ALL? DINFormation	Read out meas. results (unsynchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
HSFN_1,	0 to 20479	NAN	–	V3.82
all HS-SCCH_1 parameters:				
UE-ID_1,	0 to 65535	NAN	–	
New Data Indicator Bit,	0 | 1…	NAN	–	
Retransmission,	TRUE | FALSe	NAN	–	
Modulation Type,	QPSK | 16QAM	NAN	–	
Redundancy Version,	0 to 7	NAN	–	
s,	0 to 1	NAN	–	
r,	0 to 3	NAN	–	
b,	0 to 3	NAN	–	
HARQ Process Identifier,	1 to 8	NAN	–	
Block Size Index,	1 to 254	NAN	–	
Block Size,	127 to 27952	NAN	–	
Channel Code Offset,	0 to 15	NAN	–	
Number of Channels,	1 to 15	NAN	–	
CRC Error	TRUE | FALSe	NAN	–	
all HS-SCCH_2 parameters:				
UE-ID_1,	0 to 65535	NAN	–	
…,	…	…	…	
HSFN_1024,	0 to 20479	NAN	–	
all HS-SCCH_1 parameters:				
UE-ID_1024,	0 to 65535	NAN	–	
…	…	…	…	

Description of command

These commands are always queries. They start a *HS-SCCH Information* measurement (READ…) and return the detailed information all four HS-SCCH channels (see also detailed explanation of measured values in Chapter 4).

READ[:SCALar]: HSDPa:HINFormation:RSUBframes? **FETCh[:SCALar]: HSDPa:HINFormation:RSUBframes?**	Received Subframes Start single shot measurement and return results Read out meas. results (unsynchronized)			
Returned values	Value range	Def. value	Def. unit	FW vers.
No. of subframes	1 to 1024	NAN	–	V3.82
Description of command				
These commands are always queries. They start a *HS-SCCH Information* measurement (READ...) and return the number of received HS-SCCH subframes.				

HSDPA:HTHRoughput

The commands in the *HSDPA:HTHRoughput* subsystem control the *HS-PDSCH Throughput* measurement application. The following commands correspond to the measurement control softkey *HS-PDSCH Throughput* in the *HSDPA* menu.

INITiate:HSDPa:HTHRoughput	Start new measurement	⇒	RUN
ABORt:HSDPa:HTHRoughput	Abort running measurement and switch off	⇒	OFF
STOP:HSDPa:HTHRoughput	Stop measurement	⇒	STOP
Description of command			FW vers.
These commands have no query form. They start or stop the current measurement, setting it to the status indicated in the top right column.			V3.82

CONFigure:HSDPa:HTHRoughput:EREPorting<*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SRSQ No reporting	OFF	–	V3.82
Description of command				
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of R&S CMU200/300 manual).				

FETCh:HSDPa:HTHRoughput:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stopped according to repetition mode and stop condition	OFF	–	V3.82
1 to 10000 | **NONE,**	Counter for current statistics cycle No counting mode set	NONE	–	
1 to 20480 | **NONE**	Counter for current evaluation period (HSDPA subframe) within a statistics cycle No counter result available	NONE	–	
Description of command				
This command is always a query. It returns the status of the measurement (see Chapter 5).				

Subsystem HSDPa:HTHRoughput:CONTrol

The subsystem *HSDPa:HTHRoughput:CONTrol* controls the scope of the *HS-PDSCH Throughput* measurement. The subsystem corresponds to the settings in the *Control* tab in the popup menu *HSDPa Configuration* that are related to the *HS-PDSCH Throughput* application.

CONFigure:HSDPa:HTHRoughput:CONTrol:REPetition ***<Repetiton>, <StopCondition>*, *<Stepmode>***				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (counting, until `Status = RDY`)	SING	–	V3.82
<StopCond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE	Continue measurement in case of error	NONE	–	V3.82
<Stepmode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE	Continue measurement according to its rep. mode	NONE	–	V3.82
Description of command				
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. A single shot measurement always comprises 1024 consecutive HSDPA subframes. The stop condition and the stepping mode is not relevant for HSDPA tests. **Note:** *For READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				

CONFigure:HSDPa:HTHRoughput:CONTrol:RSFSingle *<Mode>*				*Rec. Subframes Single*
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 20480	Recorded subframes (single shot)	1000	–	V3.82
Description of command				
This command specifies the number of subframes recorded in a *Single Shot* measurement.				

CONFigure:HSDPa:HTHRoughput:CONTrol:RSFCont *<Mode>*				*Rec. Subframes Cont.*
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 20480	Recorded subframes (single shot)	500	–	V3.82
Description of command				
This command specifies the number of subframes recorded in a *Single Shot* measurement.				

Measured Values – Subsystem HSDPa:HTHRoughput…?

The following commands measure (`READ…`) and return the HS-PDSCH throughput and data rate. The subsystem corresponds to the bar graph and the output tables in the *HS-PDSCH Throughput* menu.

Data Rate

READ:ARRay: HSDPa:HTHRoughput:DRATe? Start single shot measurement and return results
FETCh:ARRay: HSDPa:HTHRoughput:DRATe? Read out meas. results (unsynchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Current Data Rate_1,	0 kbps to 13 976 kbps,	NAN	kbps	V3.82
Average Data Rate_1,	0 kbps to 13 976 kbps,	NAN	kbps	
Maximum Data Rate_1,	0 kbps to 13 976 kbps,	NAN	kbps	
…,	…,			
Current Data Rate_n,	0 kbps to 13 976 kbps,	NAN	kbps	
Average Data Rate_n,	0 kbps to 13 976 kbps,	NAN	kbps	
Maximum Data Rate_n	0 kbps to 13 976 kbps	NAN	kbps	

Description of command

These commands are always queries. They start a *HS-PDSCH Throughput* measurement (`READ…`) and return the current, average, and maximum data rates for all UE-IDs in the index table. The number n of UE-IDs and the length of the output arrays is defined via `CONFigure:HSDPa:CONTrol:NRUeid`.

Data Rate

READ:ARRay: HSDPa:HTHRoughput:DRATe:CURRent? Start single shot measurement and return results
FETCh:ARRay: HSDPa:HTHRoughput:DRATe:CURRent? Read out meas. results (unsynchronized)

READ:ARRay: HSDPa:HTHRoughput:DRATe:AVERage? Start single shot measurement and return results
FETCh:ARRay: HSDPa:HTHRoughput:DRATe:AVERage? Read out meas. results (unsynchronized)

READ:ARRay: HSDPa:HTHRoughput:DRATe:MAXimum? Start single shot measurement and return results
FETCh:ARRay: HSDPa:HTHRoughput:DRATe:MAXimum? Read out meas. results (unsynchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Data Rate_1,	0 kbps to 13 976 kbps,	NAN	kbps	V3.82
…,	…,			
Data Rate_n	0 kbps to 13 976 kbps	NAN	kbps	

Description of command

These commands are always queries. They start a *HS-PDSCH Throughput* measurement (`READ…`) and return the current, average, and maximum data rates for all UE-IDs in the index table. The number n of UE-IDs and the length of the output arrays is defined via `CONFigure:HSDPa:CONTrol:NRUeid`.

Throughput

READ:ARRay: HSDPa:HTHRoughput:THRoughput? Start single shot measurement and return results
FETCh:ARRay: HSDPa:HTHRoughput:THRoughput? Read out meas. results (unsynchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Current Throughput_1,	0 kbps to 13 976 kbps,	NAN	kbps	V3.82
Average Throughput_1,	0 kbps to 13 976 kbps,	NAN	kbps	
Minimum Throughput_1,	0 kbps to 13 976 kbps,	NAN	kbps	
Maximum Throughput_1,	0 kbps to 13 976 kbps,	NAN	kbps	
…,	…,			
Current Throughput_n,	0 kbps to 13 976 kbps,	NAN	kbps	
Average Throughput_n,	0 kbps to 13 976 kbps,	NAN	kbps	
Minimum Throughput_n,	0 kbps to 13 976 kbps,	NAN	kbps	
Maximum Throughput_n	0 kbps to 13 976 kbps	NAN	kbps	

Description of command

These commands are always queries. They start a *HS-PDSCH Throughput* measurement (`READ…`) and return the current, average, minimum, and maximum throughputs for all UE-IDs in the index table. The number n of UE-IDs and the length of the output arrays is defined via `CONFigure:HSDPa:CONTrol:NRUeid`.

	Throughput
READ:ARRay: HSDPa:HTHRoughput:THRoughput:CURRent?	Start single shot meas. and return results
FETCh:ARRay: HSDPa:HTHRoughput:THRoughput:CURRent?	Read out meas. results (unsynchronized)
READ:ARRay: HSDPa:HTHRoughput:THRoughput:AVERage?	Start single shot meas. and return results
FETCh:ARRay: HSDPa:HTHRoughput:THRoughput:AVERage?	Read out meas. results (unsynchronized)
READ:ARRay: HSDPa:HTHRoughput:THRoughput:MINimum?	Start single shot meas. and return results
FETCh:ARRay: HSDPa:HTHRoughput:THRoughput:MINimum?	Read out meas. results (unsynchronized)
READ:ARRay: HSDPa:HTHRoughput:THRoughput:MAXimum?	Start single shot meas. and return results
FETCh:ARRay: HSDPa:HTHRoughput:THRoughput:MAXimum?	Read out meas. results (unsynchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Throughput_1, **…,** **Throughput_n**	0 kbps to 13 976 kbps, …, 0 kbps to 13 976 kbps	NAN NAN	kbps kbps	V3.82

Description of command

These commands are always queries. They start a *HS-PDSCH Throughput* measurement (READ...) and return the current, average, minimum, and maximum throughputs for all UE-IDs in the index table. The number n of UE-IDs and the length of the output arrays is defined via `CONFigure:HSDPa:CONTrol:NRUeid`.

	Total Data Rate and Throughput
READ[:SCALar]: HSDPa:HTHRoughput:TOTal?	Start single shot measurement and return results
FETCh[:SCALar]: HSDPa:HTHRoughput:TOTal?	Read out meas. results (unsynchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
Current Total Data Rate,	0 kbps to 13 976 kbps,	NAN	kbps	V3.82
Average Total Data Rate,	0 kbps to 13 976 kbps,	NAN	kbps	
Maximum Total Data Rate,	0 kbps to 13 976 kbps,	NAN	kbps	
Current Total Throughput,	…,	NAN	kbps	
Average Total Throughput,	0 kbps to 13 976 kbps,	NAN	kbps	
Minimum Total Throughput,	0 kbps to 13 976 kbps,	NAN	kbps	
Maximum Total Throughput	0 kbps to 13 976 kbps	NAN	kbps	

Description of command

These commands are always queries. They start a *HS-PDSCH Throughput* measurement (READ...) and return all total throughputs (7 values).

Connection Control (Signalling)

The remote-control commands presented in this section control the synchronization of the R&S CMU to the Node B signal, configure the RF analyzer and the generated uplink signal, determine the inputs and outputs, the reference frequency and the trigger settings, and control the BCH Monitor. They correspond to the settings in the *Connection Control* menu.

Connection Setup – Subsystem SIGNalling

The subsystem *SIGNalling* controls the band selection and the synchronization of the R&S CMU to the Node B signal. It corresponds to the *Connection* tab (for different signalling states, see command `PROCedure:SIGNalling:ACTion`) in the popup menu *Connection Control*.

PROCedure:SIGNalling:ACTion *<Action>*				Signalling Control
<Action>	Description of parameters	Def. value	Def. unit	FW vers.
SRUN | **SSTP**	Start synchronization (in UNS state) Stop synchronization (in SYN state)	–	–	V3.62
Description of command				Sig. State
This command has no query form. It changes between the different signalling states of the CMU. The current state can be queried via `SIGN:STAT?`				See par. description

[SENSe:]SIGNalling:STATe?				Signalling State
Return	Description of parameters	Def. value	Def. unit	FW vers.
UNS | **SIP |** **SYN**	Unsynchronized Synchronizing (synchronization in progress) Synchronized	UNS	–	V3.62
Description of command				Sig. State
This command is always a query. It returns the current signalling state. The query can be refined using `[SENSe:]SIGNalling:STO?`				all

[SENSe:]SIGNalling:STO?				Sync. Monitor
Return	Description of parameters	Def. value	Def. unit	FW vers.
CPICH_UNS | **CPICH_SYN |** **CPICH_LOST,** **BCH_UNS |** **BCH_SYN |** **BCH_LOST**	No CPICH sync. CPICH sync. achieved CPICH sync. lost No BCH sync. BCH sync. achieved BCH sync. lost	CPICH_UNS, BCH_UNS	–	V3.62
Description of command				Sig. State
This command is always a query. It returns two values, representing the current status of CPICH and BCH synchronization.				all

CONFigure:SIGNalling:SELect:BAND <*Band*>				Operating Band
<Band>	Description of parameters	Def. value	Def. unit	FW vers.
OB1 | OB2 | OB3 **OB4 | OB5 | OB6**	Operating Band I, II, III Operating Band IV, V, VI	OB1	–	V3.62
Description of command				Sig. State
This command selects the Operating Band of the UE. The channels and band frequencies of all operating bands are listed in Chapter 4.				UNS

[SENSe:]SIGNalling:MINFo:NPOWer? <*Power*>				Node B Power
<Power>	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dBm to +60 dBm	Node B Power	–	–	V3.62
Description of command				Sig. State
This command is always a query. It returns the average Node B power measured while the R&S CMU synchronizes to the Node B signal.				SYN

[SENSe:]SIGNalling:MINFo:CPOWer? <*Power*>				CPICH Power
<Power>	Description of parameters	Def. value	Def. unit	FW vers.
–100.0 dBm to +60 dBm	CPICH Power	–	–	V3.62
Description of command				Sig. State
This command is always a query. It returns the average CPICH power measured while the R&S CMU synchronizes to the Node B signal.				SYN

[SENSe:]SIGNalling:MINFo:FSHift? <*Offset*>				Frequency Shift
<Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–5000.0 Hz to +5000.0 Hz	Frequency shift	–	Hz	V3.62
Description of command				Sig. State
This command is always a query. It returns the frequency shift measured while the R&S CMU synchronizes to the Node B signal.				SYN

[SENSe:]SIGNalling:MINFo:SFN? <*SFN*>				SFN
<Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 4095	System Frame Number	–	Hz	V3.62
Description of command				Sig. State
This command is always a query. It returns the SFN used/detected while the R&S CMU synchronizes to the Node B signal.				SYN

[SENSe:]SIGNalling:MINFo:CSIR? <*SIR*>				CC8-SIR
<SIR>	Description of parameters	Def. value	Def. unit	FW vers.
–40 dB to +100 dB	System Frame Number	–	dB	V3.62
Description of command				Sig. State
This command is always a query. It returns the CC8-SIR detected while the R&S CMU synchronizes to the Node B signal.				SYN

Subsystem NBSignal (Node B Signal)

The subsystem *NBSignal* specifies the signal parameters that the R&S CMU must know in order to receive and decode the DL WCDMA transmitted by the Node B. It corresponds to the *Node B Signal* tab of the popup menu *Connection Control*.

Note: *The Node B and UE signal frequencies are always coupled and separated by the RX-TX frequency separation of the selected band (`CONFigure:NBSignal:RTFSeparate?`). Changing the Node B signal frequency also changes the UE signal frequency and vice versa. Therefore, both frequencies must be changed in the unsynchronized signalling state.*

DEFault:NBSignal *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.62
Description of command				Sig. State
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				UNS

CONFigure:NBSignal:CHANnel *<Number>*				RF Channel
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
2112.4 MHz to 2167.6 MHz **1932.4 MHz to 1987.6 MHz** **1807.4 MHz to 1877.6 MHz** **2112.4 MHz to 2167.6 MHz** **871.4 MHz to 891.6 MHz** **877.4 MHz to 882.6 MHz**	Analyzer frequency, op. band I Analyzer frequency, op. band II Analyzer frequency, op. band III Analyzer frequency, op. band IV Analyzer frequency, op. band V Analyzer frequency, op. band VI	2112.6 (ch. no. 10563) 1932.6 (ch. no. 9663) 1807.6 (ch. no. 9038) 2112.6 (ch. no. 10563) 871.6 (ch. no. 4358) 877.6 (ch. no. 4388)	MHz MHz MHz MHz MHz MHz	V3.62
Description of command				Sig. State
This command defines the frequency of the Node B signal. The frequencies must be set in multiples of 200 kHz. With the command `UNIT:NBSignal:CHANnel` the default frequency unit can be changed, and UARFCN (UTRA Absolute Radio Frequency Channel Numbers) can be entered instead of frequencies. The assignment of channel numbers and frequencies is in accordance with 3GPP specifications.				UNS

UNIT:NBSignal:CHANnel *<Unit>*				Frequency Unit
<Unit>	Description of parameters	Def. value	Def. unit	FW vers.
HZ | KHZ | MHZ | GHZ | **CH**	Frequency unit Channel number (UARFCN)	MHz	MHz	V3.62
Description of command				Sig. State
This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as an UARFCN. Frequency units must be used to select input signals that are outside the designated channel range.				UNS SYN

CONFigure:NBSignal:FOFFset <*Freq_Offset*>				Frequency Offset
<Freq_Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–100.000 kHz to +100.000 kHz	Offset for channel frequency	0	Hz	V3.62
Description of command				Sig. State
This command defines an offset for the RF analyzer frequency set with the command `CONFigure:NBSignal:CHANnel <Number>`. The offset frequency must be in multiples of 1 Hz; the selected value applies to all operating bands.				UNS

CONFigure:NBSignal:RTFSeparate? <*Offset*>				RX-TX Frequency Separation
<Offset>	Description of parameters	Def. value	Def. unit	FW vers.
190.0 MHz **80.0 MHz** **95.0 MHz** **400.0 MHz** **45.0 MHz** **45.0 MHz**	RX-TX Frequency Separation for Band I RX-TX Frequency Separation for Band II RX-TX Frequency Separation for Band III RX-TX Frequency Separation for Band IV RX-TX Frequency Separation for Band V RX-TX Frequency Separation for Band VI	– – – – – –	MHz MHz MHz MHz MHz MHz	V3.62
Description of command				Sig. State
This command is always a query and displays the frequency gap between the downlink and uplink bands.				UNS SYN

CONFigure:NBSignal:DLSCode:CPICh <*Code*>				DL Scrambling Code (CPICH)
<Code>	Description of parameters	Def. value	Def. unit	FW vers.
"0" to "3FFFE"	Scrambling code (string with 5-digit hex value)	"0"	–	V3.62
Description of command				Sig. State
This command specifies the scrambling code for the CPICH in the Node B signal. The range of scrambling code numbers corresponds to 0 to 3FFFE hexadecimal or 0 to 262 142 decimal. The value must be formatted as a string variable, i.e. a hex value enclosed in single or double quotes. The output is also a hex value formatted as a string.				UNS

CONFigure:NBSignal:DLSCode:DPCH <*Code*>				DL Scrambling Code (DPCH)
<Code>	Description of parameters	Def. value	Def. unit	FW vers.
"0" to "3FFFE"	Scrambling code (string with 5-digit hex value)	"0"	–	V3.62
Description of command				Sig. State
This command specifies the scrambling code for the DPCH in the Node B signal. The range of scrambling code numbers corresponds to 0 to 3FFFE hexadecimal or 0 to 262 142 decimal. The value must be formatted as a string variable, i.e. a hex value enclosed in single or double quotes. The output is also a hex value formatted as a string.				UNS

CONFigure:NBSignal:DLOPeration:MODE <*Mode*>				DL Operation Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
GPPR | **PHYS |** **HDSPa**	3GPP UL reference channel Physical channel HSDPA channels	GPPR	–	V3.62
Description of command				Sig. State
This command defines whether dedicated channel of the Node B signal is configured as a downlink 3GPP reference channel according to 3GPP TS 25.101, or as a downlink dedicated physical channel.				UNS SYN

CONFigure:NBSignal:DDPChannel:SFORmat <*Value*>				Slot Format
<Value>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 16	DL slot format	0	–	V3.62
Description of command				Sig. State
This command specifies the slot format of the downlink dedicated physical channel. This setting is used if `CONFigure:NBSignal:DLOPeration:MODE PHYS` is set.				UNS SYN

CONFigure:NBSignal:DDPChannel:SRATe? <*Value*>				Symbol Rate
<Value>	Description of parameters	Def. value	Def. unit	FW vers.
7.5 | 15 | 30 | 60 | 120 | 240 | 480 | 960	Symbol rate	0	ksps	V3.62
Description of command				Sig. State
This command is always a query. It returns the symbol rate corresponding to the DL slot format (`CONFigure:NBSignal:DDPChannel:SFORmat`).				UNS SYN

CONFigure:NBSignal:DDPChannel:CHCNumber <*Value*>				Channelization Code Number
<Value>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 511	Channelization code number	0	–	V3.62
Description of command				Sig. State
This command specifies the channelization code number of the downlink dedicated physical channel. This setting is used if `CONFigure:NBSignal:DLOPeration:MODE PHYS` is set. The maximum channelization code number is SF – 1, where SF is the spreading factor given by the slot format (`CONFigure:NBSignal:DDPChannel:SFORmat`).				UNS SYN

CONFigure:NBSignal:DDPChannel:DLDPoffset <*Value*>				CPICH – DL DPCH Offset
<Value>	Description of parameters	Def. value	Def. unit	FW vers.
0 chips to 38400 chips	CPICH – DL DPCH timing offset	0	(chips)	V3.62
Description of command				Sig. State
This command specifies the timing delay of the start of the DL DPCH relative to the P-CPICH timing. This setting is used if `CONFigure:NBSignal:DLOPeration:MODE PHYS` is set.				UNS SYN

CONFigure:NBSignal:GPPReference:CTYPe <*Bit_Rate*>				Reference Channel Type
<Bit_Rate>	Description of parameters	Def. value	Def. unit	FW vers.
12.2 kbps | 64 kbps | 144 kbps | 384 kbps	Information bit rate	12.2	kbps	V3.06
Description of command				Sig. State
This command sets the channel type (information bit rate) of the 3GPP DL reference channel. This setting is used if `CONFigure:NBSignal:DLOPeration:MODE GPPR` is set.				UNS SYN

CONFigure:NBSignal:GPPReference:CHCNumber <*Value*>				Channelization Code Number
<Value>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 511	Channelization code number	0	–	V3.62
Description of command				Sig. State
This command specifies the channelization code number of the 3GPP DL reference channel. This setting is used if `CONFigure:NBSignal:DLOPeration:MODE GPPR` is set. The maximum channelization code number is SF – 1, where SF is the spreading factor given by the channel type (`CONFigure:NBSignal:GPPReference:CTYPe`).				UNS SYN

CONFigure:NBSignal:GPPReference:DLDPoffset <*Value*>				CPICH – DL DPCH Offset
<Value>	Description of parameters	Def. value	Def. unit	FW vers.
0 chips to 38400 chips	CPICH – DL DPCH timing offset	0	(chips)	V3.62
Description of command				Sig. State
This command specifies the timing delay of the start of the DL DPCH relative to the P-CPICH timing. This setting is used if `CONFigure:NBSignal:DLOPeration:MODE GPPR` is set.				UNS SYN

Subsystem NBSignal:HSDPa (HSDPA Channels)

The subsystem *NBSignal:HSDPa* specifies the HSDPA signal parameters that the R&S CMU must know in order to receive and decode the HSDPA channels in the DL WCDMA signal. It corresponds to the *HSDPA Channels* section in the *Node B Signal* tab of the popup menu *Connection Control*.

CONFigure:NBSignal:HSDPa:MUID <*UE-ID*>				Main UE-ID
<UE-ID>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 65535	Start UE-ID	0	–	V3.82
Description of command				
This command specifies the first entry in the *UE-ID Index Table* (`CONFigure:HSDPa:CONTrol:UITable…`). The main UE-ID is also used to generate the *HS-UE-ID Trigger* events (`TRIGger[:SEQuence]:SOURce UEID`).				

CONFigure:NBSignal:HSDPa:HSSCch<nr> <*Code*>				HS-SCCH Ch. Code
<Code>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 127	HS-SCCH channelization code	2 (<nr> = 1) 3 (<nr> = 2) 4 (<nr> = 3) 5 (<nr> = 4)	–	V3.82
Description of command				
This command selects the channelization codes for up to four HS-SCCHs in the Node B signal numbered <nr> = 1 to 4. Channels above the specified no. of HS-SCCHs (`CONFigure:NBSignal:HSDPa:HSSCch:NUMBer`) are not decoded.				

CONFigure:NBSignal:HSDPa:HSSCch:NUMBer <*Number*>				*Nr. of HS-SCCHs*
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 4	Number of HS-SCCHs	1	–	V3.82
Description of command				
This command selects the total number of decoded HS-SCCHs.				

Subsystem UESignal (Generator control)

The subsystem *UESignal* configures the uplink WCDMA signal generated by the R&S CMU. It corresponds to the *UE Signal* tab in the popup menu *Connection Control*.

Note: *The UE Signal is only available while the R&S CMU is in the synchronized state. The UE Signal generator is automatically switched off when synchronization is lost. An unsynchronized uplink WCDMA signal is available in Non Signalling state.*

INITiate:UESignal ⇒		Start RF generator, reserve resources *RUN*
ABORt:UESignal ⇒		Switch off RF generator, release resources *OFF*
Description of command	Sig. State	FW vers.
These commands have no query form. They start and stop the RF generator, setting it to the status indicated in the top right column.	SYN	V3.62

FETCh:UESignal:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **ERR**	Generator switched off (`ABORt or *RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	V3.62
Description of command				Sig. State
This command is always a query. It returns the current generator status.				UNS SYN

DEFault:UESignal				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.62
Description of command				Sig. State
If used as a setting command with the parameter *ON* this command sets all parameters of the `UESignal` subsystem (including the commands in the following sub-sections) to default values. The setting *OFF* results in an error message. If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				UNS

Channel-Independent Settings

The following commands define the frequency, scrambling code, timing, power control parameters, operation mode, and SFN of the generated uplink WCDMA signal. The settings are in the *UE Settings* section in the *UE Signal* tab of the *Connection Control* menu.

Note: *The Node B and UE signal frequencies are always coupled and separated by the RX-TX frequency separation of the selected band (`CONFigure:NBSignal:RTFSeparate?`). Changing the Node B signal frequency also changes the UE signal frequency and vice versa. Therefore, both frequencies must be changed in the unsynchronized signalling state.*

CONFigure:UESignal:CHANnel <*Number*>				RF Channel Uplink
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
1922.4 MHz to 1977.6 MHz **1852.4 MHz to 1907.6 MHz** **1712.4 MHz to 1782.6 MHz** **1712.4 MHz to 1752.6 MHz** **826.4 MHz to 846.6 MHz** **832.4 MHz to 837.6 MHz**	Generator frequency, op. band I Generator frequency, op. band II Generator frequency, op. band III Generator frequency, op. band IV Generator frequency, op. band V Generator frequency, op. band VI	1922.4 (ch. no. 9613) 1852.4 (ch. no. 9263) 1712.4 (ch. no. 8563) 1712.4 (ch. no. 8563) 826.4 (ch. no. 4133) 832.4 (ch. no. 4163)	MHz MHz MHz MHz MHz MHz	V3.62
Description of command				Sig. State
This command defines the frequency of the generated UE signal. The default frequency unit can be changed with the command *UNIT:UESignal:CHANnel*, and UARFCNs (UTRA Absolute Radio Frequency Channel Numbers) can be entered instead of frequencies. The assignment of channel numbers and frequencies is in accordance with 3GPP specifications.				UNS

UNIT:UESignal:CHANnel <*Unit*>				Frequency Unit
<Unit>	Description of parameters	Def. value	Def. unit	FW vers.
Hz | KHz | MHz | GHz | CH	Frequency unit | Channel number	MHz	MHz	V3.62
Description of command				Sig. State
This command defines whether the frequency of the generated UE signal is specified in frequency units or as a channel number.				UNS SYN

CONFigure:UESignal:FOFFset <*FrequencyOffset*>				Frequency Offset
<FrequencyOffset>	Description of parameters	Def. value	Def. unit	FW vers.
–100.000 kHz to +100.000 kHz	Frequency offset	0	Hz	V3.62
Description of command				Sig. State
This command defines an offset for the RF generator frequency set with the command *CONFigure:UESignal:CHANnel*. The offset frequency must be in multiples of 1 Hz; the selected value applies to all operating bands.				UNS

CONFigure:UESignal:ULSCode <*Value*>				UL Scrambling Code
<Value>	Description of parameters	Def. value	Def. unit	FW vers.
"<6-digit hex value>"	Scrambling code	"0"	–	V3.62
Description of command				Sig. State
This command selects the long scrambling code for the uplink RF generator signal. The range of scrambling code numbers corresponds to 0 to FFFFFF hexadecimal or 0 to $2^{24} - 1 = 16777215$ decimal. The value must be formatted as a string variable, i.e. a hex value enclosed in single or double quotes. The output is also a hex value formatted as a string.				UNS SYN

CONFigure:UESignal:ULDPoffset <*Offset*>				CPICH – UL DPCH Offset
<Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 38400	CPICH – UL DPCH offset in chip periods	0	(chip periods)	V3.62
Description of command				Sig. State
This command defines the timing delay of the start of the UL DPCH relative to the CPICH.				UNS SYN

CONFigure:UESignal:ULPControl:TPCSsize <*Size*>				TPC Step Size
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
1 dB | 2 dB	TPC step size (absolute value)	1	dB	V3.62
Description of command				Sig. State
This command defines the power difference between two consecutive slots where the R&S CMU is commanded to change its output power.				UNS SYN

CONFigure:UESignal:ULPControl:MODE <*Mode*>				Mode
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
ALG1 | **ALG2**	UL power control algorithm 1: generator power toggles up and down by the TPCstep size UL power control algorithm 2: constant generator power	ALG1	–	V3.62
Description of command				Sig. State
This command the algorithm for uplink power control.				UNS SYN

CONFigure:UESignal:ULOPeration:MODE <*Mode*>				UL Operation Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
GPPR | **PHYS**	3GPP UL reference channel Physical channel	GPPR	–	V3.62
Description of command				Sig. State
This command defines whether the dedicated channel is configured as a uplink reference channel according to 3GPP TS 25.141 (see section *Subsystem UESignal:GPPReference (Reference Channel)* on p. 6.119 ff.) or as a physical channel (see section *Subsystem UESignal:UDPChannel (UL Ded. Physical Channel)* on p. 6.117 ff.).				UNS SYN

Uplink Power

The following commands define the level in the different channels of the uplink signal. They correspond to the *Uplink Power* section in the *UE Signal* tab of the popup menu *Connection Control*.

CONFigure:UESignal:UPOWer:TTPower <*Level*>				Total Transmit Power
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –40 dBm **–137 dBm to –23 dBm** **–90 dBm to 0.0 dBm**	Total generator output power at RF 1 Total generator output power at RF 2 Total generator output power at RF 3 OUT	–80.0 –80.0 –80.0	dBm dBm dBm	V3.62
Description of command				Sig. State
This command sets the Total TX Power in absolute units. The DPCCH/DPDCH power ratio and the number of DPDCHs is considered to be fixed for all channel configurations, so the command overwrites the value of `CONFigure:UESignal:UPOWer:DPCCh` and vice versa (see description of manual control).				UNS SYN

CONFigure:UESignal:UPOWer:DPCCh <*Level*>				DPCCH Level
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –10 dBm*	DPCCH level	–84.6	dBm	V3.62
Description of command				Sig. State
This command sets the level of the Dedicated Physical Control Channel (DPCCH). The DPCCH/DPDCH power ratio and the number of DPDCHs is considered to be fixed for all channel configurations, so the command overwrites the value of `CONFigure:UESignal:UPOWer:TTPower` and vice versa (see description of manual control). *) The level range depends on the *DPDCH Level* and the *Power Ratio DPCCH/DPDCH*. It is such that the allowed range of the *Total TX Power* is not exceeded. The value quoted above holds for output connector RF2 and a *Power Ratio DPCCH/DPDCH* of INF where the DPDCH is effectively switched off.				UNS SYN

CONFigure:UESignal:UPOWer:DPDCh?				DPDCH Level
Returned value	Description of parameters	Def. value	Def. unit	FW vers.
–137 dBm to –10 dBm*	DPDCH level	–81.9	dBm	V3.62
Description of command				Sig. State
This command is always a query and returns the level of the Dedicated Physical Data Channel (DPDCH). The DPDCH power depends on the channel configuration and the *Total TX Power;* see description of manual control. *) The level range depends on the *DPCCH Level* and the *Power Ratio DPCCH/DPDCH*. It is such that the allowed range of the *Total TX Power* is not exceeded. The value quoted above approximately holds for output connector RF2 and a very small *Power Ratio DPCCH/DPDCH* so that the DPCCH contribution is negligible.				UNS SYN

CONFigure:UESignal:UPOWer:RCD:PHYSical <*Ratio*>				Power Ratio DPCCH/DPDCH
<Ratio>	Description of parameters	Def. value	Def. unit	FW vers.
±23.52 dB | ± 17.5 dB | ±13.98 dB | ±11.48 dB | ±9.54 dB | ± 7.96 dB | ±6.62 dB | ±5.46 dB | ±4.44 dB | ±3.52 dB | ±2.69 dB | ±1.94 dB | ±1.24 dB | ±0.60 dB | 0.0 dB INF	Finite power ratio DPCCH/DPDCH for physical channels DPDCH switched off	–2.69	dB	V3.06
Description of command				Sig. State
This command sets the DPCCH/DPDCH power ratio for physical channels in the uplink WCDMA signal. The value can be set in all instrument states; it takes effect after a physical uplink channel is selected (`CONFigure:UESignal:ULOPeration:MODE`).				UNS SYN

CONFigure:UESignal:UPOWer:AWGN <*Enable*>				AWGN
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch AWGN contribution to the RF generator signal on or off	OFF	–	V3.62
Description of command				Sig. State
This command switches the Additional White Gaussian Noise contribution to the RF generator signal on or off. The AWGN level is defined separately (`CONFigure:UESignal:UPOWer :NLEVel`). This command is available with option R&S CMU-K77, *AWGN and BER Simulation.*				UNS SYN

CONFigure:UESignal:UPOWer:NLEVel *<Level>*				Noise Level
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–137.0 dBm to –23 dBm*)	Noise level	–84.0	dBm	V3.62
Description of command				Sig. State
This command defines the level of the Additional White Gaussian Noise contribution to the RF generator signal. The setting takes effect if the AWGN is enabled only (`CONFigure:UESignal:UPOWer:AWGN ON`). This command is available with option R&S CMU-K77, *AWGN and BER Simulation.* *) The 3GPP standard stipulates that the *Noise Level* must not be smaller than the *DPCCH Level* minus a variable margin depending on the actual *DPCCH Level* and the *Power Ratio DPCCH/DPDCH*. The range and default value quoted above holds for the default configuration of the *DPCCH Level* and the *Power Ratio DPCCH/DPDCH* and can vary if one of these parameters is changed. The *Noise Level* and the *DPCCH Level* overwrite each other as soon as their difference exceeds the margin defined in the standard.				UNS SYN

Subsystem UESignal:UDPChannel (UL Ded. Physical Channel)

The subsystem *UESignal:UDPChannel* defines the properties of the physical channel. It corresponds to the *Uplink Dedicated Physical Channel* section in the *UE Signal* tab of the *Connection Control* menu.

CONFigure:UESignal:ULDPoffset *<Offset>*				CPICH – UL DPCH Offset
<Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 38400	CPICH – UL DPCH offset in chip periods	0	(chip periods)	V3.62
Description of command				Sig. State
This command defines the timing delay of the start of the UL DPCH relative to the CPICH.				UNS SYN

CONFigure:UESignal:UDPChannel:DPCCh:SFORmat?				Slot Format
Returned value	Description of parameters	Def. value	Def. unit	FW vers.
0	DPCCH slot format	0	–	V3.62
Description of command				Sig. State
This command is always a query and returns the fixed slot format of the Dedicated Physical Control Channel (DPCCH).				UNS SYN

CONFigure:UESignal:UDPChannel:DPCCh:SRATe?				Symbol Rate
Returned value	Description of parameters	Def. value	Def. unit	FW vers.
15	DPCCH symbol rate	15	ksps	V3.62
Description of command				Sig. State
This command is always a query and returns the fixed symbol rate of the Dedicated Physical Control Channel (DPCCH).				UNS SYN

CONFigure:UESignal:UDPChannel:DPCCh:TFCI:CWORd <*Code*> — TFCI Code Word

<Code>	Description of parameters	Def. value	Def. unit	FW vers.
"<8-digit hex value>" (≤3FFFFFFF)	TFCI code word	"3FFFFFFF"	–	V3.62

Description of command	Sig. State
This command defines the Transport Format Combination Indicator (TFCI) code word to be transmitted on the uplink physical channel. The value of the TFCI code word must be formatted as a string variable, i.e. a hex value enclosed in single or double quotes. The output is also a hex value formatted as a string.	UNS SYN

CONFigure:UESignal:UDPChannel:DPCCh:TPC:ROMode <*Mode*> — Read Out Mode

<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
CPATtern | **AL01 |** **AL10 |** **ALL0 |** **ALL1 |** **SPA0 |** **SPA1 |** **SPALternate**	Continuous pattern Alternating starting 01 Alternating starting10 All 0 All 1 Single Pattern + All 0 Single Pattern + All 1 Single Pattern + Alternating	CPAT	–	V3.62

Description of command	Sig. State
This command defines the rule for constructing a TPC pattern of infinite length to be transferred to Node B. The actual pattern transferred depends on the finite single pattern defined via `CONFigure:UESignal:UDPChannel:DPCCh:TPC:PATTern` and the read out mode.	UNS SYN

CONFigure:UESignal:UDPChannel:DPCCh:TPC:PLENgth <*Length*> — Pattern Length

<Length>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 32	Length of a single finite TPC pattern	32	–	V3.62

Description of command	Sig. State
This command defines the length (number of bits) of the finite TPC command pattern that is used to construct the TPC pattern transmitted to Node B.	UNS SYN

CONFigure:UESignal:UDPChannel:DPCCh:TPC:PATTern <*Sequence*> — Data Source

<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
"<32-digit binary value>"	Single TPC pattern	"0101..." (32 digits)	–	V3.62

Description of command	Sig. State
This command defines the single TPC bit pattern transmitted on the uplink physical channel. The value is entered as a string parameter.	UNS SYN

CONFigure:UESignal:UDPChannel:DPDCh:SFORmat <*Format*> — Slot Format

<Format>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 6	Slot format	2	–	V3.62

Description of command	Sig. State
This command defines the slot format of the UL DPDCH. For slot format no. 6, the number of code channels can be defined in addition (`CONFigure:UESignal:UDPChannel:DPDCh:CCHNumber`).	UNS SYN

CONFigure:UESignal:UDPChannel:DPDCh:CCHNumber <*Channels*>		Number of Code Channels		
<Channels>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 6	Number of code channels	1	–	V3.62
Description of command				Sig. State
This command specifies the number of code channels for slot format 6. Slot format 6 must be selected (`CONFigure:UESignal:UDPChannel:DPDCh:TOTal:SFORmat 6`) before this command can be used.				UNS SYN

CONFigure:UESignal:UDPChannel:DPDCh:SRATe? <*Rate*>		Symbol Rate		
<Rate>	Description of parameters	Def. value	Def. unit	FW vers.
15 ksps | 30 ksps | 60 ksps | 120 ksps | 240 ksps | 480 ksps | 960 ksps	Total symbol rate for 1 DPDCH	–	ksps	V3.62
Description of command				Sig. State
This command is always a query and returns the symbol rate of the UL DPDCH. For slot format 6 (symbol rate 960 kbps) a higher effective symbol rate can be achieved by using several code channels (`CONFigure:UESignal:UDPChannel:DPDCh:CCHNumber`).				UNS SYN

CONFigure:UESignal:UDPChannel:DPDCh:CDSource <*Sequence*>		Channel Data Source DPDCH		
<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
ALL0 | **ALL1 |** **ALT |** **PR9 | PR11 | PR15 | PR16**	Bit sequence consisting of zeros Bit sequence consisting of ones 010101... bit sequence Pseudo-random bit sequences	PR9	–	V3.62
Description of command				Sig. State
This command defines the bit pattern transmitted on the UL DPDCH.				UNS SYN

Subsystem UESignal:GPPReference (Reference Channel)

The subsystem *UESignal:GPPReference* defines the properties of the 3GPP reference channel. It corresponds to the *3GPP Reference Channel* section in the *UE Signal* tab of the popup menu *Connection Control*.

CONFigure:UESignal:GPPReference:CTYPe <*Bit_Rate*>		Reference Channel Type		
<Bit_Rate>	Description of parameters	Def. value	Def. unit	FW vers.
12.2 kbps | 64 kbps | **144 kbps | 384 kbps | 2048 kbps**	Information bit rate	12.2	kbps	V3.62
Description of command				Sig. State
This command sets the information bit rate of the 3GPP UL reference channel.				UNS SYN

CONFigure:UESignal:GPPReference:CDSource:DTCH <*Sequence*>		Channel Data Source DTCH		
<Sequence>	Description of parameters	Def. value	Def. unit	FW vers.
PR9 | PR11 | PR15 | PR16	Pseudo-random bit sequences	PR9	–	V3.62
Description of command				Sig. State
This command defines the bit pattern transmitted on the Dedicated Traffic Channel part of the 3GPP UL reference channel.				UNS SYN

CONFigure:UESignal:GPPReference:TFCibits <*Bits*>				TFCI Bits
<Bits>	Description of parameters	Def. value	Def. unit	FW vers.
"<10-digit binary value>"	TFCI bits	"0000000000"	–	V3.62
Description of command				Sig. State
This command defines the Transport Format Combination Indicator (TFCI) bits to be transmitted on the 3GPP UL reference channel. The value is entered as a string parameter.				UNS SYN

CONFigure:UESignal:GPPReference:BVER:MODE *<Enable>*				BER/BLER Verification – Mode
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **BER |** **BLER**	Uplink signal with no bit errors or block errors Uplink signal with definite bit error rate Uplink signal with definite block error rate	OFF	–	V3.62
Description of command				Sig. State
This command enables or disables the BER or BLER verification mode. The BER or BLER of the signal is defined separately (`CONFigure:UESignal:LEVel:GPPReference:BVER:BER`, `CONFigure:UESignal:LEVel:GPPReference:BVER:BLER`).				UNS SYN

CONFigure:UESignal:GPPReference:BVER:BER <*Rate*> **CONFigure:UESignal:GPPReference:BVER:BLER <*Rate*>**				BER Value BLER Value
<Rate>	Description of parameters	Def. value	Def. unit	FW vers.
0.00 % to 100.00 %	B(L)ER value in multiples of 0.01 dB	0.01	%	V3.62
Description of command				Sig. State
These commands define the Bit Error Rate (BER) or Block Error Rate (BLER) of the uplink signal that the CMU generates if the BER or BLER verification mode is enabled (`CONFigure:UESignal:LEVel:GPPReference:BVER:MODE BER | BLER`).				UNS SYN

Subsystem UESignal:HSDPA (HSDPA Channels, with Option R&S CMU-K73)

The subsystem *UESignal:HSDPA* switches the HS-DPCCH channel in the UL WCDMA signal on or off and defines the properties of the generated HS-DPCCH. It corresponds to the *HSDPA Signal* parameter and to the *HS-DPCCH* section in the *UE Signal* tab of the popup menu *Connection Control*. All commands require option R&S CMU-K73, *HSDPA Stimulate*.

CONFigure:UESignal:HSDPa:SIGNal:ENABle <*Enable*>				HSDPA Signal
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	Switch on HSDPA signal including UL WCDMA channel Switch off HSDPA signal	OFF	–	V3.82
Description of command				Sig. State
This command switches the HS-DPCCH channel in the UL WCDMA signal on or off. Enabling the HSDPA signal requires BCH/SFN synchronization. Moreover the UL generator must be switched off in order to enable the HSDPA contributions (`ABORt:UESignal`).				SYN

CONFigure:UESignal:HSDPa:CTYPe <*Type*>				HS-DPCCH Configuration Type
<*Type*>	Description of parameters	Def. value	Def. unit	FW vers.
ANC | **CQI |** **ANACk**	ACK/NACK & CQI CQI ACK/NACK	ANC	–	V3.82
Description of command				Sig. State
This command activates both the *ACK/NACK & CQI* slots or one slot type only (*ACK/NACK* with DTX in the CQI slots or CQI with DTX in the ACK/NACK slots).				UNS SYN

CONFigure:UESignal:HSDPa:ACK:TMODe <*Mode*>				ACK Transmit Mode
<*Mode*>	Description of parameters	Def. value	Def. unit	FW vers.
FRUN | **UITRiggered**	Free Run UI-ID Triggered	FRUN	–	V3.82
Description of command				Sig. State
This command enables ACK/NACK transmission every n^{th} HSDPA subframe where n is the *ACK Transmit Distance* (`CONFigure:UESignal:HSDPa:ACK:TDIStance`) or single ACK/NACK transmission each time the main UE-ID (`CONFigure:NBSignal:HSDPa:MUID`) is received on one of the DL HS-SCCHs.				UNS SYN

CONFigure:UESignal:HSDPa:ACK:TDIStance <*Subframes*>				ACK Transmit Distance
<*Subframes*>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 4095	Transmit distance in HSDPA subframes	5	–	V3.82
Description of command				Sig. State
This command defines the distance between two active ACK/NACK slots.				UNS SYN

CONFigure:UESignal:HSDPa:ACK:PDELta <*Ratio*>				ACK Power Delta
<*Ratio*>	Description of parameters	Def. value	Def. unit	FW vers.
–23.52 | –17.50 | –13.98 | –11.48 | –9.54 | –7.96 | –6.62 | –5.46 | –4.43 | –3.52 | –2.69 | –1.94 | –1.24 | –0.60 | 0.00 | 0.56 | 1.09 | 1.58 | 2.05 |2.50 | 2.92 | 3.33 | 3.71 | 4.08 | 4.44 | 4.78 | 5.10 | 5.42 | 5.73 | 6.02	HS-DPCCH (ACK) / DPCCH power ratio	0.00	–	V3.82
Description of command				Sig. State
This command defines the ratio between the HS-DPCCH gain factors β_{hs} for ACK slots and the gain factor β_c for the DPCCHs. According to standard TS 25.214, the ratio is equal to 20*log(ΔACK). Entries between the values quoted above are rounded.				UNS SYN

CONFigure:UESignal:HSDPa:NACK:PDELta <*Ratio*>				NACK Power Delta
<*Ratio*>	Description of parameters	Def. value	Def. unit	FW vers.
–23.52 | –17.50 | –13.98 | –11.48 | –9.54 | –7.96 | –6.62 | –5.46 | –4.43 | –3.52 | –2.69 | –1.94 | –1.24 | –0.60 | 0.00 | 0.56 | 1.09 | 1.58 | 2.05 |2.50 | 2.92 | 3.33 | 3.71 | 4.08 | 4.44 | 4.78 | 5.10 | 5.42 | 5.73 | 6.02	HS-DPCCH (NACK) / DPCCH power ratio	0.00	–	V3.82
Description of command				Sig. State
This command defines the ratio between the HS-DPCCH gain factors β_{hs} for NACK slots and the gain factor β_c for the DPCCHs. According to standard TS 25.214, the ratio is equal to 20*log(ΔNACK). Entries between the values quoted above are rounded.				UNS SYN

CONFigure:UESignal:HSDPa:ACK:HSFN:MODE <*Mode*>				Activation HSFN Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
IMMediate | **HNUMber**	Immediate start of HS-DPCCH Start at definite HSFN	IMM	–	V3.82
Description of command				Sig. State
This command defines whether HS-DPCCH generation starts immediately after the HSDPA signal is switched on or after a definite *HSFN Number* (`CONFigure:UESignal:HSDPa:ACK:HSFN :NUMBer`).				UNS SYN

CONFigure:UESignal:HSDPa:ACK:HSFN:NUMBer <*Mode*>				Activation HSFN Number
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 4095	Activation HSFN	0	–	V3.82
Description of command				Sig. State
This command defines the HSDPA System Frame Number where the HS-DPCCH is switched on for `CONFigure:UESignal:HSDPa:ACK:HSFN:MODE HNUMber`.				UNS SYN

CONFigure:UESignal:HSDPa:ACK:NUMBer <*Number*>				No of ACKs in Table
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 64	Length of the ACK table	10	–	V3.82
Description of command				
This command determines the length of the *ACK Table* (`CONFigure:UESignal:HSDPa:ACK:TABLe`...).				

CONFigure:UESignal:HSDPa:ACK:TABLe<nr> <*ACK*>				ACK Table, Single Value
<ACK>	Description of parameters	Def. value	Def. unit	FW vers.
ACK | NACK | OFF	Entry for ACK table <nr>	ACK	–	V3.82
Description of command				
This command specifies a single entry for the ACK table. The numeric suffix <nr> defines the position in the table (<nr> = 1 to n where n is defined via `CONFigure:UESignal:HSDPa:ACK:NUMBer`).				

CONFigure:UESignal:HSDPa:ACK:TABLe:ALL <*ACK*>				ACK Table, All Values
<ACK>	Description of parameters	Def. value	Def. unit	FW vers.
ACK | NACK | OFF, **ACK | NACK | OFF,** **…,** **ACK | NACK | OFF**	1^{st} entry in the ACK table 2^{nd} entry in the ACK table n^{th} entry in the ACK table	ACK ACK ACK	– – –	V3.82
Description of command				
This command specifies all entries for the ACK table. The total number n of entries is defined via `CONFigure:UESignal:HSDPa:ACK:NUMBer`.				

CONFigure:UESignal:HSDPa:CQI:TDIStance <*Subframes*>				CQI Transmit Distance
<Subframes>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 4095	Transmit distance in HSDPA subframes	5	–	V3.82
Description of command				Sig. State
This command defines the distance between two active pairs of CQI slots.				UNS SYN

CONFigure:UESignal:HSDPa:CQI:PDELta <*Ratio*>				CQI Power Delta
<Ratio>	Description of parameters	Def. value	Def. unit	FW vers.
–23.52 | –17.50 | –13.98 | –11.48 | –9.54 | –7.96 | –6.62 | –5.46 | –4.43 | –3.52 | –2.69 | –1.94 | –1.24 | –0.60 | 0.00 | 0.56 | 1.09 | 1.58 | 2.05 |2.50 | 2.92 | 3.33 | 3.71 | 4.08 | 4.44 | 4.78 | 5.10 | 5.42 | 5.73 | 6.02	HS-DPCCH (CQI) / DPCCH power ratio	0.00	–	V3.82
Description of command				Sig. State
This command defines the ratio between the HS-DPCCH gain factors β_{hs} for CQI slots and the gain factor β_c for the DPCCHs. According to standard TS 25.214, the ratio is equal to 20*log(ΔCQI). Entries between the values quoted above are rounded.				UNS SYN

CONFigure:UESignal:HSDPa:CQI:HSFN:MODE <*Mode*>				Activation HSFN Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
IMMediate | **HNUMber**	Immediate start of HS-DPCCH Start at definite HSFN	IMM	–	V3.82
Description of command				Sig. State
This command defines whether HS-DPCCH generation starts immediately after the HSDPA signal is switched on or after a definite *HSFN Number* (`CONFigure:UESignal:HSDPa:CQI:HSFN :NUMBer`).				UNS SYN

CONFigure:UESignal:HSDPa:CQI:HSFN:NUMBer <*Mode*>				Activation HSFN Number
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 4095	Activation HSFN	0	–	V3.82
Description of command				Sig. State
This command defines the HSDPA System Frame Number where the HS-DPCCH is switched on for `CONFigure:UESignal:HSDPa:CQI:HSFN:MODE HNUMber`.				UNS SYN

CONFigure:UESignal:HSDPa:CQI:NUMBer <*Number*>				No of CQIs in Table
<Number>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 64	Length of the CQI table	10	–	V3.82
Description of command				
This command determines the length of the *CQI Table* (`CONFigure:UESignal:HSDPa:CQI:TABLe`…).				

CONFigure:UESignal:HSDPa:CQI:TABLe<nr> <*CQI*>				CQI Table, Single Value
<CQI>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 30	Entry for CQI table <nr>	1	–	V3.82
Description of command				
This command specifies a single entry for the CQI table. The numeric suffix <nr> defines the position in the table (<nr> = 1 to n where n is defined via `CONFigure:UESignal:HSDPa:CQI:NUMBer`).				

CONFigure:UESignal:HSDPa:CQI:TABLe:ALL *<CQI>*				CQI Table, All Values
<CQI>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 30, **1 to 30,** **…,** **1 to 30**	1st entry in the CQI table 2nd entry in the CQI table nth entry in the CQI table	1 1 1	– – –	V3.82
Description of command				
This command specifies all entries for the CQI table. The total number n of entries is defined via `CONFigure:UESignal:HSDPa:CQI:NUMBer`.				

Commands for Input and Output Connectors

The commands in this section configure the input and output connectors. They correspond to the tab *AF/RF* connectors in the popup menu *Connect. Control*.

INPut[:STATe] *<State>*				RF Input
<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 **RF2** **RF4**	Connector RF1 used as input Connector RF2 used as input Connector RF4 IN used as input	RF2	–	V3.62
Description of command				Sig. State
This command determines the connector to be used for RF input signals. The bidirectional connectors RF1 and RF2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`). Only one input and one output may be active at the same time, a new RF input setting overwrites the previous one.				UNS SYN

OUTPut[:STATe] *<State>*				RF Output
<State>	Description of parameters	Def. value	Def. unit	FW vers.
RF1 **RF2** **RF3**	Connector RF1 used as output Connector RF2 used as output Connector RF3 OUT used as output	RF2	–	V3.62
Description of command				Sig. State
This command determines the connector to be used for RF output signals. The bidirectional connectors RF1 and RF2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting overwrites the previous one.				UNS SYN

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] *<Attenuation >*				Ext. Att. Input
<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Ext. attenuation at RF <nr>, where <nr> = 1,2,4	0	dB	V3.62
Description of command				Sig. State
This command assigns an external attenuation value to one of the inputs defined before (see command `INPut:STATe`).				UNS SYN

SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude] *<Attenuation>*				Ext. Att. Output
<Attenuation>	Description of parameters	Def. value	Def. unit	FW vers.
–50 dB to +90 dB	Ext. attenuation at RF <nr>, where <nr> = 1,2,3	0	dB	V3.62
Description of command				Sig. State
This command assigns an external attenuation value to one of the outputs defined before (see command `OUTPut:STATe`).				UNS SYN

Trigger Settings

The commands in this section configure the measurement trigger and the trigger output signals. They correspond to the *Trigger* tab in the popup menu *Connection Control*.

DEFault:TRIGger				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to default values Some or all parameters differ from the default values	ON	–	V3.62
Description of command				Sig. State
If used as a setting command with the parameter *ON* this command sets all parameters of the `TRIGger` subsystem (including the commands in the following sub-sections) to default values. The setting *OFF* results in an error message. If used as a query the command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				UNS SYN

TRIGger[:SEQuence]:SOURce *<Source>*				Source
<Source>	Description of parameters	Def. value	Def. unit	FW vers.
FRUN | EXT| FRAM | SFR	Trigger provided by analyzed RF signal External trigger signal Frame Trigger signal Superframe Trigger signal	FRUN	–	V3.65
Description of command				Sig. State
This command selects the source of the trigger events for internal measurements. The `TRIGger[:SEQuence]:SLOPe` and `TRIGger[:SEQuence]:ETCOffset` settings are valid for the external trigger source.				UNS SYN

TRIGger[:SEQuence]:SLOPe *<Polarity>*				Slope
<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
POS | NEG	Trigger on rising edge of external trigger signal Trigger on falling edge of external trigger signal	POS	–	V3.62
Description of command				Sig. State
This command qualifies whether the trigger event occurs on the rising edge or on the falling edge of the external meas. trigger signal.				UNS SYN

TRIGger[:SEQuence]:ETCoffset <*Chips*> — Chip Delay

<Chips>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 38399.75	Chip delay	0	(chips)	V3.62

Description of command	Sig. State
This command defines an integer number of chip periods between the external meas. trigger time and the start of the measurement.	UNS SYN

TRIGger[:SEQuence]:ISTStartsfn <*SFN*> — Start SFN

<SFN>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 4095	Start SFN	0	–	V3.65

Description of command	Sig. State
This command defines an integer number as Start SFN for the Internal Superframe Trigger.	UNS SYN

TRIGger[:SEQuence]:ISTPeriod <*Periods*> — Trigger Period

<Periods>	Description of parameters	Def. value	Def. unit	FW vers.
P2 | P4| P8| P16 P32 | P64| P128 P256 | P512| P1024 P2048 | P4096	Trigger Periods	P4096	–	V3.65

Description of command	Sig. State
This command defines Trigger Periods for the Superframe Trigger.	UNS SYN

TRIGger[:SEQuence]:HUTPre <*Chips*> — Pre Trigger

<Chips>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 256	Pre trigger	0	(chips)	V3.82

Description of command	Sig. State
This command defines the pre-trigger time for the HS UE-ID trigger signals.	UNS SYN

TRIGger:OUTPut:PIN<nr>:SIGNal <*Signal*> — Output Trigger Signal

<Signal>	Parameter description	Def. value	Default unit	FW vers.
NONE | SLOT| FRAM | SFR	No trigger signal or Slot, Frame or Superframe trigger at pin <nr>	SLOT (for <nr> = 2), FRAM (for <nr> = 3), SFR (for <nr> = 4), NONE (for <nr> = 5)	–	V3.65

Description of command
This command assigns the different trigger signals (or no signal) to pins 2 to 5 (<nr> = 2 to 5) of the AUX 3 connector. The settings are only valid for *Signalling* trigger source.

TRIGger:OUTPut:PIN<nr>:OFFSet:ENABle <*Enable*> — Output Trigger Signal

<Enable>	Parameter description	Def. value	Default unit	FW vers.
ON | OFF	Enable offset at pin 2,3,4 or 5	OFF (for <nr> = 2, 3, 4, 5)	–	V3.65

Description of command
This command qualifies whether the frame, slot or superframe trigger signal at pins 2 to 5 (<nr> = 2 to 5) of the AUX 3 connector are delayed by the specified offset (see command `TRIGger:OUTPut:OFFSet` below). The settings are only valid if a trigger signal is actually applied to the pins (command `TRIGger:OUTPut:PIN:SIGNal`).

TRIGger:OUTPut:OFFSet <*Chips*>				Trigger Offset
<Chips>	Parameter description	Def. value	Default unit	FW vers.
0 to 38399	Offset for slot, frame, or superframe trigger signal	0	(chips)	V3.65
Description of command				
This command sets an offset (integer number of chips) for the trigger signal. 0 chips is equivalent to the *OFF* setting in the `TRIGger:OUTPut:PIN:OFFSet:ENABle` command.				

Subsystem EPOWer (Expected Power)

The subsystem *EPOWer* configures the RF input path of the CMU. It corresponds to the *Analyzer* tab of the *Connection Control* menu.

[SENSe:]EPOWer:MODE <*Mode*>				Analyzer Level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
MANual | **AUTomatic**	Manual setting Automatic setting corresponding to average power of signal applied	AUT	–	V3.62
Description of command				Sig. State
This command defines how the RF analyzer is adapted to the expected input power.				UNS SYN

[SENSe:]EPOWer:VALue <*Level*>				Expected Power
<Level>	Description of parameters	Def. value	Def. unit	FW vers.
–42 dBm to +53 dBm **–56 dBm to +39 dBm** **–79 dBm to 0 dBm**	Maximum input level for RF 1 Maximum input level for RF 2 Maximum input level for RF 4 IN	+30.0 +30.0 0.0	dBm dBm dBm	V3.62
Description of command				Sig. State
This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command). Some measurements are restricted to a narrower input level range; see data sheet.				UNS SYN

[SENSe:]EPOWer:ATTenuation <*Mode*>				Attenuation
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NORMal | **LNOise |** **LDIStortion**	Mixer level in normal range Low noise (mixer level 10 dB higher than in normal setting) Low distortion (mixer level 10 dB lower than in normal setting)	LNOise	–	V3.62
Description of command				Sig. State
This command tunes the RF analyzer for normal setting, low noise level (full dynamic range), or low distortion (high intermodulation spacing).				UNS SYN

Subsystem BCHMonitor

The subsystem *BCHMonitor* retrieves the System Information Blocks received from the Node B. It corresponds to the *BCH Monitor* tab of the *Connection Control* menu.

Note: *The BCH Monitor results are only available while the R&S CMU is BCH/SFN synchronized.*

INITiate:BCHMonitor **ABORt:BCHMonitor**	Start new measurement ⇒ *RUN* Abort running measurement and switch off ⇒ *OFF*	
Description of command	Sig. State	FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status indicated in the top right column.	SYN	V3.62

[SENSe:]BCHMonitor:STATus?	Measurement Status			
Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate, CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	V3.62
Description of command				Sig. State
This command is always a query. It returns the status of the measurement (see Chapter 5).				SYN

[SENSe:]BCHMonitor: SIBReceived?	Received SIB			
Return	Description of parameters	Def. value	Def. unit	FW vers.
MIB | SIB1 … SIB13 | SIB13_1 … SIB13_4 | SIB14 | SIB15 | SIB15_1 … SIB15_5 | SIB16 | SIB17 | SIB18 | SB1 | SB2	Returns last received SIB	–	–	V3.62
Description of command				Sig. State
This command is always a query. It returns the last received SIB.				SYN

<table>
<tr><td colspan="5">[SENSe:]BCHMonitor:SIB? <Type> SIB Contents</td></tr>
<tr><td><Type></td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td>FW vers.</td></tr>
<tr><td>MIB | SIB1 … SIB13 | SIB13_1 … SIB13_4 | SIB14 | SIB15 | SIB15_1 … SIB15_5 | SIB16 | SIB17 | SIB18 | SB1 | SB2</td><td>Selection of SIB type</td><td>–</td><td>–</td><td>V3.62</td></tr>
<tr><td>Return</td><td>Description of parameters</td><td>Def. value</td><td>Def. unit</td><td>FW vers.</td></tr>
<tr><td>See below</td><td>See below</td><td>0</td><td>–</td><td>V3.62</td></tr>
<tr><td colspan="4">Description of command</td><td>Sig. State</td></tr>
<tr><td colspan="4">This command retrieves the contents of the last received SIB of the type selected via the <<i>Type</i>> parameter. If no parameter is specified, or if no SIB of the selected type has been decoded, the response is 0. Otherwise the R&S CMU returns the SIB contents in the following format:
<pre>
35,0,"cn-CommonGSM-MAP-NAS-SysInfo: (Len=2): "00 01 "h [OctetString]",
   1,"cn-DomainSysInfoList: [SequenceOf]",2,"[Count: 1]",4,"CN-DomainSysInfo: [SequenceOf]" ..
      6,"cn-DomainIdentity: cs_domain [ENUM]",7,"cn-Type: [Choice]",9   ...
        "gsm-MAP: (Len=2): "01 01 "h [OctetString]",6,"cn-DRX-CycleLengthCoeff: 8",1   ...
        "ue-ConnTimersAndConstants: [Sequence]",3,"t-301: ms2000 [ENUM]",3,"n-301: 2",3   ...
        "t-302: ms100 [ENUM]",3,"n-302: 0",3,"t-304: ms1000 [ENUM]",3,"n-304: 3",3   ...
        "t-305: m60 [ENUM]",3,"t-307: s50 [ENUM]",3,"t-308: ms320 [ENUM]",3,"t-309: 8",3   ...
        "t-310: ms320 [ENUM]",3,"n-310: 5",3,"t-311: ms500 [ENUM]",3,"t-312: 10",3   ...
        "n-312: s100 [ENUM]",3,"t-313: 10",3,"n-313: s20 [ENUM]",3,"t-314: s20 [ENUM]",3   ...
        "t-315: s30 [ENUM]",3,"n-315: s200 [ENUM]",3,"t-316: s50 [ENUM]",3   ...
        "t-317: s1800 [ENUM]",1,"ue-IdleTimersAndConstants: [Sequence]",3,"t-300: ms1000   ...
                                [ENUM]",3,"n-300: 7",3,"t-312: 10"
</pre>
The first number (in the example: 35) denotes the total number of returned values. After this number each returned string (written in double quotes) is preceded by a number denoting the indentation depth.</td><td>SYN</td></tr>
</table>

Data Logging – System LOGGing

The `LOGGing` system selects the type and destination of the recorded information. It corresponds to the *Logging* tab of the *Connection Control* menu.

<table>
<tr><td colspan="4">CONFigure:LOGGing:BCHMonitor <Destination></td><td>BCH Monitor</td></tr>
<tr><td><Destination></td><td>Parameter description</td><td>Def. value</td><td>Def. unit</td><td>FW vers.</td></tr>
<tr><td>NONE |
FILE |
COM</td><td>No message logging
Recording to a file
Transfer via COM 1 interface</td><td>NONE</td><td>–</td><td>V3.82</td></tr>
<tr><td colspan="5">Description of command</td></tr>
<tr><td colspan="5">This command enables or disables recording of the BCH Monitor information and selects a destination for the recorded information.</td></tr>
</table>

CONFigure:LOGGing:CDPower <*Destination*>				Code Domain Power
<Destination>	Parameter description	Def. value	Def. unit	FW vers.
NONE | **FILE |** **COM**	No message logging Recording to a file Transfer via COM 1 interface	NONE	–	V3.82
Description of command				
This command enables or disables recording of the *Code Domain Power* information and selects a destination for the recorded information.				

CONFigure:LOGGing:TCHannel <*Destination*>				Transport Channel
<Destination>	Parameter description	Def. value	Def. unit	FW vers.
NONE | **FILE |** **COM**	No message logging Recording to a file Transfer via COM 1 interface	NONE	–	V3.82
Description of command				
This command enables or disables recording of the *Transport Channel* information and selects a destination for the recorded information.				

DEFault:LOGging <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	All parameters are set to their default values Some or all parameters differ from the default values	ON	–	V3.82
Description of command				
As a *setting command* with the setting *ON* this command sets all parameters of the subsystem to default values (the setting *OFF* causes an error message). As a query, this command returns whether all parameters are set to default values *(ON)* or not *(OFF)*.				

Saving Log Files – System MMEMory:L3MSg

The `MMEMory` system provides mass storage capabilities for the CMU. The functionality of this system is included in the *Data* menu; see CMU200/300 operating manual.

The following commands control BCH, Code Domain Power, or Transport Channel information logging to a file. The message type is selected in the *Logging* tab of the *Connection Control* menu (corresponding to `CONFigure:LOGGing`…).

MMEMory:L3MSg:CDEStination <*FileName*>				Change Destination
Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>"	Default file name	–	–	V3.82
Description of command				
This command has no query form. It changes the default file name and path for logging files in the current storage device. The command is CMU-specific.				

MMEMory:L3MSg:SAVE *[<FileName>] [,<msus>]*				Save to File
Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>", **INTernal | EXTernal**	Name of the file to be saved Storage device of the file to be saved	see description INTernal	– –	V3.82
Description of command				
This command has no query form. It saves the current ring buffer content to the default logging file INTERNAL\LOG\WCDMA_L3_?.LOG (if no parameter is specified, see command `MMEMory:L3MSg:CDEStination`) or to the specified file and storage device. In the default file name "WCDMA_L3_?.LOG" the "?" is replaced by current numbers that are automatically incremented, starting with zero. The auto-increment function overwrites an existing file with a "9" in its file name. The command is CMU-specific. ***Note:*** *The default directory for logging files* INTERNAL\LOG *is fixed and can not be overwritten by the base system command* `MMEMory:CDIRectory`.				

MMEMory:L3MSg:BWRiting *<Enable>*				Buffer Writing
Parameters	Parameter description	Def. value	Def. unit	FW vers.
ON | OFF	Activate or deactivate buffer writing	OFF	–	V3.82
Description of command				
This command controls data recording into the ring buffer. The command is CMU-specific.				

MMEMory:L3MSg:BEMPty?				Buffer Empty
Ret. Parameters	Parameter description	Def. value	Def. unit	FW vers.
EMPT | **FULL**	Buffer contains no data Buffer contains data	–	–	V3.82
Description of command				
This command is always a query and returns whether or not the buffer is empty. The command is CMU-specific and has no equivalent in manual control.				

The following commands control BCH message logging to a file. Whenever buffer writing is enabled (`MMEMory:BCHMonitor:BWRiting ON`), the settings in the *Logging* tab of the *Connection Control* menu (corresponding to `CONFigure:LOGGing…`) are overwritten so that BCH logging to a file is enabled, Code Domain Power and Transport Channel logging is disabled.

MMEMory:BCHMonitor:CDEStination *<FileName>*				Change Destination
Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>"	Default file name	–	–	V3.65
Description of command				
This command has no query form. It changes the default file name and path for logging BCH message files in the current storage device. The command is CMU-specific.				

MMEMory:BCHMonitor:SAVE *[<FileName>] [,<msus>]*				Save to File
Parameters	Parameter description	Def. value	Def. unit	FW vers.
"<FileName>", **INTernal | EXTernal**	Name of the file to be saved Storage device of the file to be saved	see description INTernal	– –	– V3.65
Description of command				

This command has no query form. It saves the current ring buffer content to the default logging file INTERNAL\LOG\BCH_L3_?.LOG (if no parameter is specified, see command `MMEMory:BCHMonitor:CDEStination`) or to the specified file and storage device. In the default file name "BCH_L3_?.LOG" the "?" is replaced by current numbers that are automatically incremented, starting with zero. The auto-increment function overwrites an existing file with a "9" in its file name. The command is CMU-specific.

Note: *The default directory for logging files* INTERNAL\LOG *is fixed and can not be overwritten by the base system command* `MMEMory:CDIRectory`.

MMEMory:BCHMonitor:BWRiting *<Enable>*				Buffer Writing
Parameters	Parameter description	Def. value	Def. unit	FW vers.
ON | OFF	Activate or deactivate buffer writing	OFF	–	V3.65
Description of command				

This command controls data recording into the ring buffer. The command is CMU-specific.

Whenever buffer writing is enabled, the settings in the *Logging* tab of the *Connection Control* menu (corresponding to `CONFigure:LOGGing…`) are overwritten so that BCH logging to a file is enabled, Code Domain Power and Transport Channel logging is disabled.

MMEMory:BCHMonitor:BEMPty?				Buffer Empty
Ret. Parameters	Parameter description	Def. value	Def. unit	FW vers.
EMPT | **FULL**	Buffer contains no data Buffer contains data	–	–	V3.65
Description of command				

This command is always a query and returns whether or not the buffer is empty. The command is CMU-specific and has no equivalent in manual control.

List of Commands

In the following, all remote-control commands of the WCDMA UE function groups are listed with their parameters and page numbers. They are arranged alphabetically according to the **second** keyword of the command so that related commands belong to the same group. The commands for the two test modes *Non Signalling* and *Signalling* are listed separately.

Table 6-1 General settings (available in Non Sign. and Signalling)

Command (General settings, Non Sign. and Sign.)	Parameter	Remark	Page
MMEMory			
MMEMory:RECall:CURRent	<FileName> [,<msus>]	no query	6.85
MMEMory:SAVE:CURRent	<FileName> [,<msus>]	no query	6.85
Options Query			
SYSTem:OPTions:INFO:CURRent?	–	query only	6.86
System Reset			
SYSTem:RESet:CURRent	–	no query	6.86

Table 6-2 Connection Control (Non Signalling)

Command (Connection Control, Non Signalling)	Parameter	Remark	Page
Inputs and outputs			
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +90 dB	with query	6.16
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +90 dB	with query	6.16
[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]	–50 dB to +90 dB	with query	6.16
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]	–50 dB to +90 dB	with query	6.16
SOURce:DM:CLOCk:FREQuency	0.960 MHz to 30.720 MHz	with query	6.17
SOURce:DM:CLOCk:STATe	ON | OFF	with query	6.16
INPut[:STATe]	RF1 | RF2 | RF4	with query	6.15
OUTPut[:STATe]	RF1 | RF2 | RF3	with query	6.16
Expected Power			
DEFault:EPOWer	ON | OFF	with query	6.4
[SENSe:]EPOWer:ATTenuation	NORMal | LNOise | LDIStortion	with query	6.4
[SENSe:]EPOWer:MODE	MANual | AUTomatic	with query	6.3
[SENSe:]EPOWer:VALue	<Level>	with query	6.3
External Meas. And Wired Sync. Trigger			
CONFigure:EXTernal:TRIGger:SYNC:CDELay	0 to 10240	with query	6.15
CONFigure:EXTernal:TRIGger:SYNC:POLarity	RISing | FALLing	with query	6.15
CONFigure:EXTernal:TRIGger:SYNC:SOFFset	0 to 61440	with query	6.15
CONFigure:MEAS:TRIGger:CDELay	0 to 10240	with query	6.14
CONFigure:MEAS:TRIGger:POLarity	RISing | FALLing	with query	6.14

Command (Connection Control, Non Signalling)	Parameter	Remark	Page
CONFigure:MEAS:TRIGger:SOFFset	0 to 14	with query	6.14
CONFigure:MEAS:TRIGger:SOURce	FRUN | EXTern	with query	6.14
Node B Settings			
CONFigure:NB:ADIVersity	A1| A2 | OFF	with query	6.13
CONFigure:NB:DCHannel:SCODe:PRIMary	”000” to “1FF”	with query	6.13
CONFigure:NB:DCHannel:SCODe:SECondary	”0” to “F”	with query	6.14
RF Analyzer Settings			
DEFault:RFANalyzer	ON | OFF	with query	6.5
[SENSe:]RFANalyzer:FOFFset	–100 kHz to +100 kHz	with query	6.5
[SENSe:]RFANalyzer:FREQuency	15 MHz to 2700 MHz	with query	6.4
[SENSe:]RFANalyzer:FREQuency:UNIT	HZ | KHZ | MHZ | GHZ | CH	with query	6.4
RF Generator Settings			
INITiate:RFGenerator	–	no query	6.6
ABORt:RFGenerator	–	no query	6.6
DEFault:RFGenerator	ON | OFF	with query	6.6
SOURce:RFGenerator:DCHannel:MODE	TGPP | PHYS	with query	6.9
SOURce:RFGenerator:DCHannel:SCODe:VALue		6.10	
SOURce:RFGenerator:DCHannel:ULDPoffset	0 to 39424	with query	6.10
SOURce:RFGenerator:DCHannel:ULPControl:MODE	ALG1 | ALG2	with query	6.10
SOURce:RFGenerator:DCHannel:ULPControl:TPCSsize	1 dB | 2 dB	with query	6.10
SOURce:RFGenerator:FOFFset	–100 kHz to 100 kHz	with query	6.9
SOURce:RFGenerator:FREQuency	0.2 MHz to 2700 MHz	with query	6.8
UNIT:RFGenerator:FREQuency	Hz | KHz | MHz | GHz | CH	with query	6.9
SOURce:RFGenerator:GPPReference:BBVermode	OFF | BER | BLER	with query	6.11
SOURce:RFGenerator:GPPReference:BERValue	0 % to 100 %	with query	6.11
SOURce:RFGenerator:GPPReference:BLERvalue	0 % to 100 %	with query	6.11
SOURce:RFGenerator:GPPReference:CDSource:DTCH	ALL0 | ALL1 | ALT | PR9 | PR11 | PR15 | PR16	with query	6.11
SOURce:RFGenerator:GPPReference:CTYPE	12.2 | 64 | 144 | 384 | 2048	with query	6.10
SOURce:RFGenerator:GPPReference:TFCibits	10-digit binary value	with query	6.11
DEFault:RFGenerator:LEVel	ON | OFF	with query	6.8
SOURce:RFGenerator:LEVel:AWGN	ON | OFF	with query	6.8
SOURce:RFGenerator:LEVel:DPCCh	–137 dBm to –10 dBm	with query	6.7
SOURce:RFGenerator:LEVel:DPDCh?	–137 dBm to –10 dBm	query only	6.7
SOURce:RFGenerator:LEVel:NLEVel	<Level>	with query	6.8
SOURce:RFGenerator:LEVel:RCD:GPPReference?	<Level>	with query	6.7
SOURce:RFGenerator:LEVel:RCD:PHYSical	<Level>	with query	6.7
SOURce:RFGenerator:LEVel:TTPower	<Level>	with query	6.6
SOURce:RFGenerator:PCHannel:DPCCh:TFCI:CWORd	8-digit hex value	with query	6.12
SOURce:RFGenerator:PCHannel:DPCCh:TPC:PATTern		6.12	

Command (Connection Control, Non Signalling)	Parameter	Remark	Page
SOURce:RFGenerator:PCHannel:DPCCh:TPC:PLENgth	1 to 32	with query	6.12
SOURce:RFGenerator:PCHannel:DPCCh:TPC:ROMode	CPATtern | AL01 | ALL0 | ALL1 | SPA0 | SPA1 | SPALternate	with query	6.12
SOURce:RFGenerator:PCHannel:DPDCh:CDSource	ALL0 | ALL1 | ALT | PR9 | PR11 | PR15 | PR16	with query	6.13
SOURce:RFGenerator:PCHannel:DPDCh:TOTal:SRATe		with query	6.13
DEFault:RFGenerator:SETTings	ON | OFF	with query	6.9
FETCh:RFGenerator:STATus?	OFF | RUN | ERR	query only	6.6

Table 6-3 Measurements (available in Non Sign. and Signalling)

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
Code Domain Power			
INITiate:CDPower:CDPower	–	no query	6.44
ABORt:CDPower:CDPower	–	no query	6.44
STOP:CDPower:CDPower	–	no query	6.44
CONTinue:CDPower:CDPower	–	no query	6.44
READ:ARRay:CDPower:CDPower:CHANnels:AVERage?	–100.0 dB to 0.0 dB	query only	6.49
FETCh:ARRay:CDPower:CDPower:CHANnels:AVERage?	–100.0 dB to 0.0 dB	query only	6.49
SAMPle:ARRay:CDPower:CDPower:CHANnels:AVERage?	–100.0 dB to 0.0 dB	query only	6.49
READ:ARRay:CDPower:CDPower:CHANnels:CURRent?	–100.0 dB to 0.0 dB	query only	6.49
FETCh:ARRay:CDPower:CDPower:CHANnels:CURRent?	–100.0 dB to 0.0 dB	query only	6.49
SAMPle:ARRay:CDPower:CDPower:CHANnels:CURRent?	–100.0 dB to 0.0 dB	query only	6.49
READ:ARRay:CDPower:CDPower:CHANnels:MAXimum?	–100.0 dB to 0.0 dB	query only	6.49
FETCh:ARRay:CDPower:CDPower:CHANnels:MAXimum?	–100.0 dB to 0.0 dB	query only	6.49
SAMPle:ARRay:CDPower:CDPower:CHANnels:MAXimum?	–100.0 dB to 0.0 dB	query only	6.49
READ:ARRay:CDPower:CDPower:CHANnels:MINimum?	–100.0 dB to 0.0 dB	query only	6.49
FETCh:ARRay:CDPower:CDPower:CHANnels:MINimum?	–100.0 dB to 0.0 dB	query only	6.49
SAMPle:ARRay:CDPower:CDPower:CHANnels:MINimum?	–100.0 dB to 0.0 dB	query only	6.49
DEFault:CDPower:CDPower:CONTrol	ON | OFF	with query	6.46
CONFigure:CDPower:CDPower:CONTrol:CCHannel	0 to 511	with query	6.46
CONFigure:CDPower:CDPower:CONTrol:CDPMode	0 to 14	with query	6.45
CONFigure:CDPower:CDPower:CONTrol:CPIChslot	0 to 14	with query	6.46
CONFigure:CDPower:CDPower:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.45
CONFigure:CDPower:CDPower:CONTrol:RMODe	SCALar | ARRay	with query	6.45
CONFigure:CDPower:CDPower:CONTrol:STATistics	1 to 1000 | NONE	with query	6.45
CONFigure:CDPower:CDPower:CONTrol:UNIT	ABS | RCP | RAVG	with query	6.46

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
CONFigure:CDPower:CDPower:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.44
CALCulate[:SCALar]:CDPower:CDPower:MATChing:LIMit?	NMAU | NMAL | INV | OK	query only	6.48
READ:ARRay:CDPower:CDPower:SLOTs:AVERage?	0.0000 to 1.0000	query only	6.49
FETCh:ARRay:CDPower:CDPower:SLOTs:AVERage?	0.0000 to 1.0000	query only	6.49
SAMPle:ARRay:CDPower:CDPower:SLOTs:AVERage?	0.0000 to 1.0000	query only	6.49
READ:ARRay:CDPower:CDPower:SLOTs:CURRent?	0.0000 to 1.0000	query only	6.49
FETCh:ARRay:CDPower:CDPower:SLOTs:CURRent?	0.0000 to 1.0000	query only	6.49
SAMPle:ARRay:CDPower:CDPower:SLOTs:CURRent?	0.0000 to 1.0000	query only	6.49
READ:ARRay:CDPower:CDPower:SLOTs:MAXimum?	0.0000 to 1.0000	query only	6.49
FETCh:ARRay:CDPower:CDPower:SLOTs:MAXimum?	0.0000 to 1.0000	query only	6.49
SAMPle:ARRay:CDPower:CDPower:SLOTs:MAXimum?	0.0000 to 1.0000	query only	6.49
READ:ARRay:CDPower:CDPower:SLOTs:MINimum?	0.0000 to 1.0000	query only	6.49
FETCh:ARRay:CDPower:CDPower:SLOTs:MINimum?	0.0000 to 1.0000	query only	6.49
SAMPle:ARRay:CDPower:CDPower:SLOTs:MINimum?	0.0000 to 1.0000	query only	6.49
FETCh[:SCALar]:CDPower:CDPower:SRATe?	<Result>	query only	6.47
FETCh:CDPower:CDPower:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.44
FETCh[:SCALar]:CDPower:CDPower:TOFFset?	<Result>	query only	6.47
READ[:SCALar]:CDPower:CDPower?	<Result>	query only	6.47
FETCh[:SCALar]:CDPower:CDPower?	<Result>	query only	6.47
SAMPle[:SCALar]:CDPower:CDPower?	<Result>	query only	6.47
Code Domain Power – Limit Settings			
CONFigure:CDPower:CFERror:AVERage:LIMit[:SCALar]:SYMMetric:ENABle	ON | OFF	with query	6.43
CONFigure:CDPower:CFERror:AVERage:LIMit[:SCALar]:SYMMetric:VALue	<Carrier Frequency Error>	with query	6.43
CONFigure:CDPower:CFERror:CMMax:LIMit[:SCALar]:SYMMetric:ENABle	ON | OFF	with query	6.42
CONFigure:CDPower:CFERror:CMMax:LIMit[:SCALar]:SYMMetric:VALue	<Carrier Frequency Error>	with query	6.42
CONFigure:CDPower:EVMagnitude:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.43
CONFigure:CDPower:EVMagnitude:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<Error Vector Magnitude>	with query	6.43
CONFigure:CDPower:EVMagnitude:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.42
CONFigure:CDPower:EVMagnitude:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<Error Vector Magnitude>	with query	6.42
CONFigure:CDPower:FCHDetection	USR1 | USR2	with query	6.40
CONFigure:CDPower:IQIMBalance:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.43
CONFigure:CDPower:IQIMBalance:AVERage:LIMit[:SCALar]	<IQ Imbalance>	with query	6.43

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
:ASYMmetric:UPPer:VALue			
CONFigure:CDPower:IQIMBalance:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.42
CONFigure:CDPower:IQIMBalance:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<IQ Imbalance>	with query	6.42
CONFigure:CDPower:IQOoffset:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.43
CONFigure:CDPower:IQOoffset:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<IQ Origin Offset>	with query	6.43
CONFigure:CDPower:IQOoffset:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.42
CONFigure:CDPower:IQOoffset:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<IQ Origin Offset>	with query	6.42
Code Domain Power – Peak Code Domain Error			
INITiate:CDPower:PCDerror	–	no query	6.50
ABORt:CDPower:PCDerror	–	no query	6.50
STOP:CDPower:PCDerror	–	no query	6.50
CONTinue:CDPower:PCDerror	–	no query	6.50
CONFigure:CDPower:PCDerror:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.43
CONFigure:CDPower:PCDerror:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<Peak Code Domain Error>	with query	6.43
READ:ARRay:CDPower:PCDerror:CHANnels:AVERage?	–100.0 dB to 0.0 dB	query only	6.54
FETCh:ARRay:CDPower:PCDerror:CHANnels:AVERage?	–100.0 dB to 0.0 dB	query only	6.54
SAMPle:ARRay:CDPower:PCDerror:CHANnels:AVERage?	–100.0 dB to 0.0 dB	query only	6.54
READ:ARRay:CDPower:PCDerror:CHANnels:CURRent?	–100.0 dB to 0.0 dB	query only	6.54
FETCh:ARRay:CDPower:PCDerror:CHANnels:CURRent?	–100.0 dB to 0.0 dB	query only	6.54
SAMPle:ARRay:CDPower:PCDerror:CHANnels:CURRent?	–100.0 dB to 0.0 dB	query only	6.54
READ:ARRay:CDPower:PCDerror:CHANnels:MAXimum?	–100.0 dB to 0.0 dB	query only	6.54
FETCh:ARRay:CDPower:PCDerror:CHANnels:MAXimum?	–100.0 dB to 0.0 dB	query only	6.54
SAMPle:ARRay:CDPower:PCDerror:CHANnels:MAXimum?	–100.0 dB to 0.0 dB	query only	6.54
CONFigure:CDPower:PCDerror:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.42
CONFigure:CDPower:PCDerror:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<Peak Code Domain Error>	with query	6.42
DEFault:CDPower:PCDerror:CONTrol	ON | OFF	with query	6.52
CONFigure:CDPower:PCDerror:CONTrol:CPIChslot	0 to 14	with query	6.52
CONFigure:CDPower:PCDerror:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.51
CONFigure:CDPower:PCDerror:CONTrol:RMODe	SCALar | ARRay	with query	6.51
CONFigure:CDPower:PCDerror:CONTrol:SFACtor	AUTomatic | 4 | 8 | 16 | 32 | 64 | 128 | 256	with query	6.52
CONFigure:CDPower:PCDerror:CONTrol:STATistics	1 to 1000 | NONE	with query	6.51

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
CONFigure:CDPower:PCDerror:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.50
CALCulate[:SCALar]:CDPower:PCDerror:MATChing:LIMit?	NMAU | NMAL | INV | OK	query only	6.53
READ:ARRay:CDPower:PCDerror:SLOTs:AVERage?	0.0000 to 1.0000	query only	6.54
FETCh:ARRay:CDPower:PCDerror:SLOTs:AVERage?	0.0000 to 1.0000	query only	6.54
SAMPle:ARRay:CDPower:PCDerror:SLOTs:AVERage?	0.0000 to 1.0000	query only	6.54
READ:ARRay:CDPower:PCDerror:SLOTs:CURRent?	0.0000 to 1.0000	query only	6.54
FETCh:ARRay:CDPower:PCDerror:SLOTs:CURRent?	0.0000 to 1.0000	query only	6.54
SAMPle:ARRay:CDPower:PCDerror:SLOTs:CURRent?	0.0000 to 1.0000	query only	6.54
READ:ARRay:CDPower:PCDerror:SLOTs:MAXimum?	0.0000 to 1.0000	query only	6.54
FETCh:ARRay:CDPower:PCDerror:SLOTs:MAXimum?	0.0000 to 1.0000	query only	6.54
SAMPle:ARRay:CDPower:PCDerror:SLOTs:MAXimum?	0.0000 to 1.0000	query only	6.54
FETCh:CDPower:PCDerror:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.50
READ[:SCALar]:CDPower:PCDerror?	<Result>	query only	6.53
FETCh[:SCALar]:CDPower:PCDerror?	<Result>	query only	6.53
SAMPle[:SCALar]:CDPower:PCDerror?	<Result>	query only	6.53
Code Domain Power – Test Model			
CONFigure:CDPower:TMODel	M116 | M132 | M164 | M2 | M316 | M332 | M4 | M562 | M5144 | M5308 | USR1 | USR2 | ACD	with query	6.40
Modulation Measurements - EVM			
CONFigure:MODulation:EVMagnitude:CONTrol:CPIChslot	0 to 14	with query	6.66
CALCulate[:SCALar]:MODulation:EVMagnitude:QPSK:MATChing:LIMit?	<Result>	query only	6.68
INITiate:MODulation:EVMagnitude:WCDMa	–	no query	6.64
ABORt:MODulation:EVMagnitude:WCDMa	–	no query	6.64
STOP:MODulation:EVMagnitude:WCDMa	–	no query	6.64
CONTinue:MODulation:EVMagnitude:WCDMa	–	no query	6.64
CONFigure:SUBarrays:MODulation:EVMagnitude:WCDMa	ALL | ARIThmetical | MINimum | WCDMa,<Start>,<Samples>{,<Start>,<Samples>}	with query	6.67
READ:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?	0.0% to 100.0%	query only	6.69
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?	0.0% to 100.0%	query only	6.69
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:AVERage?	0.0% to 100.0%	query only	6.69
READ:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels :AVERage?	0.0% to 100.0%	query only	6.70
FETCh:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels :AVERage?	0.0% to 100.0%	query only	6.70

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
SAMPle:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels :AVERage?	0.0% to 100.0%	query only	6.70
READ:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent?	0.0% to 100.0%	query only	6.69
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent?	0.0% to 100.0%	query only	6.69
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:CURRent?	0.0% to 100.0%	query only	6.69
READ:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels :CURRent?	0.0% to 100.0%	query only	6.70
FETCh:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels :CURRent?	0.0% to 100.0%	query only	6.70
SAMPle:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels :CURRent?	0.0% to 100.0%	query only	6.70
READ:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?	0.0% to 100.0%	query only	6.69
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?	0.0% to 100.0%	query only	6.69
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?	0.0% to 100.0%	query only	6.69
READ:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?	0.0% to 100.0%	query only	6.70
FETCh:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?	0.0% to 100.0%	query only	6.70
SAMPle:SUBarrays:MODulation:EVMagnitude:WCDMa:CHANnels:MMAX?	0.0% to 100.0%	query only	6.70
DEFault:MODulation:EVMagnitude:WCDMa:CONTrol	ON | OFF	with query	6.66
CONFigure:MODulation:EVMagnitude:WCDMa:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.65
CONFigure:MODulation:EVMagnitude:WCDMa:CONTrol:RMODe	SCALar | ARRay	with query	6.65
CONFigure:MODulation:EVMagnitude:WCDMa:CONTrol:STATistics	1 to 1000 | NONE	with query	6.65
CONFigure:MODulation:EVMagnitude:WCDMa:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.64
CALCulate[:SCALar]:MODulation:EVMagnitude:WCDMa:MATChing:LIMit?	<Result>	query only	6.68
READ:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.69
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.69
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.69
READ:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.69
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.69
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.69
READ:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.69
FETCh:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.69
SAMPle:ARRay:MODulation:EVMagnitude:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.69
FETCh:MODulation:EVMagnitude:WCDMa:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.64
READ[:SCALar]:MODulation:EVMagnitude:WCDMa?	<Result>	query only	6.68
FETCh[:SCALar]:MODulation:EVMagnitude:WCDMa?	<Result>	query only	6.68
SAMPle[:SCALar]:MODulation:EVMagnitude:WCDMa?	<Result>	query only	6.68
CONFigure:MODulation:FCHDetection	USR1 | USR2	with query	6.55

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
Modulation Measurements – Magnitude Error			
INITiate:MODulation:MERRor:WCDMa	–	no query	6.71
ABORt:MODulation:MERRor:WCDMa	–	no query	6.71
STOP:MODulation:MERRor:WCDMa	–	no query	6.71
CONTinue:MODulation:MERRor:WCDMa	–	no query	6.71
READ:ARRay:MODulation:MERRor:WCDMa:CHANnels:AVERage?	–100.0% to +100.0%	query only	6.76
FETCh:ARRay:MODulation:MERRor:WCDMa:CHANnels:AVERage?	–100.0% to +100.0%	query only	6.76
SAMPle:ARRay:MODulation:MERRor:WCDMa:CHANnels:AVERage?	–100.0% to +100.0%	query only	6.76
READ:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:AVERage?	–100.0% to +100.0%	query only	6.77
FETCh:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:AVERage?	–100.0% to +100.0%	query only	6.77
SAMPle:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:AVERage?	–100.0% to +100.0%	query only	6.77
READ:ARRay:MODulation:MERRor:WCDMa:CHANnels:CURRent?	–100.0% to +100.0%	query only	6.76
FETCh:ARRay:MODulation:MERRor:WCDMa:CHANnels:CURRent?	–100.0% to +100.0%	query only	6.76
SAMPle:ARRay:MODulation:MERRor:WCDMa:CHANnels:CURRent?	–100.0% to +100.0%	query only	6.76
READ:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:CURRent?	–100.0% to +100.0%	query only	6.77
FETCh:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:CURRent?	–100.0% to +100.0%	query only	6.77
SAMPle:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:CURRent?	–100.0% to +100.0%	query only	6.77
READ:ARRay:MODulation:MERRor:WCDMa:CHANnels:MMAX?	–100.0% to +100.0%	query only	6.76
FETCh:ARRay:MODulation:MERRor:WCDMa:CHANnels:MMAX?	–100.0% to +100.0%	query only	6.76
SAMPle:ARRay:MODulation:MERRor:WCDMa:CHANnels:MMAX?	–100.0% to +100.0%	query only	6.76
READ:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:MMAX?	–100.0% to +100.0%	query only	6.77
FETCh:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:MMAX?	–100.0% to +100.0%	query only	6.77
SAMPle:SUBarrays:MODulation:MERRor:WCDMa:CHANnels:MMAX?	–100.0% to +100.0%	query only	6.77
DEFault:MODulation:MERRor:WCDMa:CONTrol	ON | OFF	with query	6.73
CONFigure:MODulation:MERRor:WCDMa:CONTrol:CPIChslot	0 to 14	with query	6.73
CONFigure:MODulation:MERRor:WCDMa:CONTrol:RMODe	SCALar | ARRay	with query	6.72
CONFigure:MODulation:MERRor:WCDMa:CONTrol:STATistics	1 to 1000 | NONE	with query	6.72
CONFigure:MODulation:MERRor:WCDMa:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.71
CALCulate[:SCALar]:MODulation:MERRor:WCDMa:MATChing:LIMit?	<Result>	query only	6.75
READ:ARRay:MODulation:MERRor:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.76
FETCh:ARRay:MODulation:MERRor:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.76
SAMPle:ARRay:MODulation:MERRor:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.76
READ:ARRay:MODulation:MERRor:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.76
FETCh:ARRay:MODulation:MERRor:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.76
SAMPle:ARRay:MODulation:MERRor:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.76
READ:ARRay:MODulation:MERRor:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.76
FETCh:ARRay:MODulation:MERRor:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.76
SAMPle:ARRay:MODulation:MERRor:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.76

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
FETCh:MODulation:MERRor:WCDMa:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.71
READ[:SCALar]:MODulation:MERRor:WCDMa?	<Result>	query only	6.75
FETCh[:SCALar]:MODulation:MERRor:WCDMa?	<Result>	query only	6.75
SAMPle[:SCALar]:MODulation:MERRor:WCDMa?	<Result>	query only	6.75
Modulation Measurements – Common Settings			
CONFigure:MODulation:OEMP:WCDMa:AVERage:LIMit[:SCALar] :SYMMetric[:COMBined]:VALue	<Error Vector Magn. (Peak)>, <Error Vector Magn. (RMS)>, <Magnitude Error (Peak)>, <Magnitude Error (RMS)>, <Phase Error (Peak)>, <Phase Error (RMS)>,<I/Q Origin Offset>, <I/Q Imbalance>, <Carrier Frequency Error>, <Waveform Quality>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:CFERror:AVERage:LIMit[:SCALar] :SYMMetric:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:CFERror:AVERage:LIMit[:SCALar] :SYMMetric:VALue	<Carrier Frequency Error>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:CFERror:CMMax:LIMit[:SCALar] :SYMMetric:ENABle	ON | OFF	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:CFERror:CMMax:LIMit[:SCALar] :SYMMetric:VALue	<Carrier Frequency Error>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:CMMax:LIMit[:SCALar] :SYMMetric[:COMBined]:VALue	<Error Vector Magn. (Peak)>, <Error Vector Magn. (RMS)>, <Magnitude Error (Peak)>, <Magnitude Error (RMS)>, <Phase Error (Peak)>, <Phase Error (RMS)>,<I/Q Origin Offset>, <I/Q Imbalance>, <Carrier Frequency Error>, <Waveform Quality>	with query	6.56
CONFigure:MODulation:OEMP:WCDMa:EVMPeak:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<Error Vector Magn. (Peak)>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:EVMPeak:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:EVMPeak:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<Error Vector Magn. (Peak)>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:EVMPeak:CMMax:LIMit[:SCALar] :ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:EVMRms:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:VALue	<Error Vector Magn. (RMS)>	with query	6.58

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
CONFigure:MODulation:OEMP:WCDMa:EVMRms:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:EVMRms:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<Error Vector Magn. (RMS)>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:EVMRms:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:IQIMBalance:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<IQ Imbalance>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:IQIMBalance:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:IQIMBalance:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<IQ Imbalance>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:IQIMBalance:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<IQ Origin Offset>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<IQ Origin Offset>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:IQOoffset:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.58
DEFault:MODulation:OEMP:WCDMa:LIMit	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:MEPeak:AVERage:LIMit[:SCALar]:SYMMetric:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:MEPeak:AVERage:LIMit[:SCALar]:SYMMetric:VALue	<Magn. Error (Peak)>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:MEPeak:CMMax:LIMit[:SCALar]:SYMMetric:ENABle	ON | OFF	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:MEPeak:CMMax:LIMit[:SCALar]:SYMMetric:VALue	<Magn. Error (Peak)>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:MERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<Magn. Error (RMS)>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:MERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:MERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<Magn. Error (RMS)>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:MERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:PEPeak:AVERage:LIMit[:SCALar]:SYMMetric:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:PEPeak:AVERage:LIMit[:SCALar]:SYMMetric:VALue	<Phase Error (Peak)>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:PEPeak:CMMax:LIMit[:SCALar]:SYMMetric:ENABle	ON | OFF	with query	6.58

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
CONFigure:MODulation:OEMP:WCDMa:PEPeak:CMMax:LIMit[:SCALar]:SYMMetric:VALue	<Phase Error (Peak)>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:PERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<Phase Error (RMS)>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:PERMs:AVERage:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:PERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	<Phase Error (RMS)>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:PERMs:CMMax:LIMit[:SCALar]:ASYMmetric:UPPer:ENABle	ON | OFF	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:WFQuality:AVERage:LIMit[:SCALar]:ASYMmetric:LOWer:VALue	<Waveform Quality>	with query	6.58
CONFigure:MODulation:OEMP:WCDMa:WFQuality:AVERage:LIMit[:SCALar]:ASYMmetric:LOWer:ENABle	ON | OFF	with query	6.59
CONFigure:MODulation:OEMP:WCDMa:WFQuality:CMMax:LIMit[:SCALar]:ASYMmetric:LOWer:VALue	<Waveform Quality>	with query	6.57
CONFigure:MODulation:OEMP:WCDMa:WFQuality:CMMax:LIMit[:SCALar]:ASYMmetric:LOWer:ENABle	ON | OFF	with query	6.58
CALCulate[:SCALar]:MODulation:OVERview:QPSK:MATChing:LIMit?	<Result>	query only	6.63
Modulation Measurements - Overview			
INITiate:MODulation:OVERview:WCDMa	–	no query	6.60
ABORt:MODulation:OVERview:WCDMa	–	no query	6.60
STOP:MODulation:OVERview:WCDMa	–	no query	6.60
CONTinue:MODulation:OVERview:WCDMa	–	no query	6.60
DEFault:MODulation:OVERview:WCDMa:CONTrol	ON | OFF	with query	6.62
CONFigure:MODulation:OVERview:WCDMa:CONTrol:CPIChslot	0 to 14	with query	6.61
CONFigure:MODulation:OVERview:WCDMa:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.61
CONFigure:MODulation:OVERview:WCDMa:CONTrol:STATistics	1 to 1000 | NONE	with query	6.61
CONFigure:MODulation:OVERview:WCDMa:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.60
CALCulate[:SCALar]:MODulation:OVERview:WCDMa:MATChing:LIMit?	<Result>	query only	6.63
FETCh:MODulation:OVERview:WCDMa:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.60
READ[:SCALar]:MODulation:OVERview:WCDMa?	<Result>	query only	6.62
FETCh[:SCALar]:MODulation:OVERview:WCDMa?	<Result>	query only	6.62
SAMPle[:SCALar]:MODulation:OVERview:WCDMa?	<Result>	query only	6.62
Modulation Measurements – Phase Error			
INITiate:MODulation:PERRor:WCDMa	–	no query	6.78

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
ABORt:MODulation:PERRor:WCDMa	–	no query	6.78
STOP:MODulation:PERRor:WCDMa	–	no query	6.78
CONTinue:MODulation:PERRor:WCDMa	–	no query	6.78
CONFigure:SUBarrays:MODulation:PERRor:WCDMa	ALL | ARIThmetical | MINimum | WCDMa,<Start>,<Samples>{,<Start>,<Samples>}	with query	6.81
READ:ARRay:MODulation:PERRor:WCDMa:CHANnels:AVERage?	–180.0 deg to +180.0 deg	query only	6.83
FETCh:ARRay:MODulation:PERRor:WCDMa:CHANnels:AVERage?	–180.0 deg to +180.0 deg	query only	6.83
SAMPle:ARRay:MODulation:PERRor:WCDMa:CHANnels:AVERage?	–180.0 deg to +180.0 deg	query only	6.83
READ:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:AVERage?	–180.0 deg to +180.0 deg	query only	6.84
FETCh:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:AVERage?	–180.0 deg to +180.0 deg	query only	6.84
SAMPle:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:AVERage?	–180.0 deg to +180.0 deg	query only	6.84
READ:ARRay:MODulation:PERRor:WCDMa:CHANnels:CURRent?	–180.0 deg to +180.0 deg	query only	6.83
FETCh:ARRay:MODulation:PERRor:WCDMa:CHANnels:CURRent?	–180.0 deg to +180.0 deg	query only	6.83
SAMPle:ARRay:MODulation:PERRor:WCDMa:CHANnels:CURRent?	–180.0 deg to +180.0 deg	query only	6.83
READ:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:CURRent?	–180.0 deg to +180.0 deg	query only	6.84
FETCh:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:CURRent?	–180.0 deg to +180.0 deg	query only	6.84
SAMPle:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:CURRent?	–180.0 deg to +180.0 deg	query only	6.84
READ:ARRay:MODulation:PERRor:WCDMa:CHANnels:MMAX?	–180.0 deg to +180.0 deg	query only	6.83
FETCh:ARRay:MODulation:PERRor:WCDMa:CHANnels:MMAX?	–180.0 deg to +180.0 deg	query only	6.83
SAMPle:ARRay:MODulation:PERRor:WCDMa:CHANnels:MMAX?	–180.0 deg to +180.0 deg	query only	6.83
READ:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:MMAX?	–180.0 deg to +180.0 deg	query only	6.84
FETCh:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:MMAX?	–180.0 deg to +180.0 deg	query only	6.84
SAMPle:SUBarrays:MODulation:PERRor:WCDMa:CHANnels:MMAX?	–180.0 deg to +180.0 deg	query only	6.84
DEFault:MODulation:PERRor:WCDMa:CONTrol	ON | OFF	with query	6.80
CONFigure:MODulation:PERRor:WCDMa:CONTrol:CPIChslot	0 to 14	with query	6.80
CONFigure:MODulation:PERRor:WCDMa:CONTrol:RMODe	SCALar | ARRay	with query	6.79
CONFigure:MODulation:PERRor:WCDMa:CONTrol:STATistics	1 to 1000 | NONE	with query	6.79
CONFigure:MODulation:PERRor:WCDMa:EREPorting	SRQ | SOPC | SRSQ |	with query	6.78

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
	OFF		
CALCulate[:SCALar]:MODulation:PERRor:WCDMa:MATChing:LIMit?	<Result>	query only	6.82
READ:ARRay:MODulation:PERRor:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.83
FETCh:ARRay:MODulation:PERRor:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.83
SAMPle:ARRay:MODulation:PERRor:WCDMa:SLOTs:AVERage?	0.0% to 100.0%	query only	6.83
READ:ARRay:MODulation:PERRor:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.83
FETCh:ARRay:MODulation:PERRor:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.83
SAMPle:ARRay:MODulation:PERRor:WCDMa:SLOTs:CURRent?	0.0% to 100.0%	query only	6.83
READ:ARRay:MODulation:PERRor:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.83
FETCh:ARRay:MODulation:PERRor:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.83
SAMPle:ARRay:MODulation:PERRor:WCDMa:SLOTs:MMAX?	0.0% to 100.0%	query only	6.83
FETCh:MODulation:PERRor:WCDMa:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.78
READ[:SCALar]:MODulation:PERRor:WCDMa?	<Result>	query only	6.82
FETCh[:SCALar]:MODulation:PERRor:WCDMa?	<Result>	query only	6.82
SAMPle[:SCALar]:MODulation:PERRor:WCDMa?	<Result>	query only	6.82
Modulation Measurements – Test Model			
CONFigure:MODulation:TMODel	M116 | M132 | M164 | M2 | M316 | M332 | M4 | M562 | M5144 | M5308 | USR1 | USR2 | ACD	with query	6.55
Power Measurements – General Settings			
DEFault:POWer:CONTrol	ON | OFF	with query	6.21
Power Measurements – Power Meter Frequency Selective			
INITiate:POWer:FSELective	–	no query	6.18
ABORt:POWer:FSELective	–	no query	6.18
STOP:POWer:FSELective	–	no query	6.18
CONTinue:POWer:FSELective	–	no query	6.18
DEFault:POWer:FSELective:CONTrol	ON | OFF	with query	6.21
[SENSe:]POWer:FSELective:CONTrol:BWIDth[:RESolution]	5 MHz | 7 MHz | WRRC	with query	6.20
CONFigure:POWer:FSELective:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.20
CONFigure:POWer:FSELective:CONTrol:STATistics	1 to 1000 | NONE	with query	6.20
CONFigure:POWer:FSELective:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.19
FETCh:POWer:FSELective:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.19
READ[:SCALar]:POWer:FSELective?	<Result>	query only	6.22
FETCh[:SCALar]:POWer:FSELective?	<Result>	query only	6.22

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
SAMPle[:SCALar]:POWer:FSELective?	<Result>	query only	6.22
Power Measurements – Wideband Power			
INITiate:POWer:WBANd	–	no query	6.18
ABORt:POWer:WBANd	–	no query	6.18
STOP:POWer:WBANd	–	no query	6.18
CONTinue:POWer:WBANd	–	no query	6.18
DEFault:POWer:WBANd:CONTrol	ON | OFF	with query	6.21
CONFigure:POWer:WBANd:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.20
CONFigure:POWer:WBANd:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.19
FETCh:POWer:WBANd:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 1000 | NONE	query only	6.19
READ[:SCALar]:POWer:WBANd?	<Result>	query only	6.21
FETCh[:SCALar]:POWer:WBANd?	<Result>	query only	6.21
SAMPle[:SCALar]:POWer:WBANd?	<Result>	query only	6.21
Spectrum Measurement – ACLR			
INITiate:SPECtrum:ACLR	–	no query	6.23
ABORt:SPECtrum:ACLR	–	no query	6.23
STOP:SPECtrum:ACLR	–	no query	6.23
CONTinue:SPECtrum:ACLR	–	no query	6.23
READ[:SCALar]:SPECtrum:ACLR:ABSolute?	<Result>	query only	6.27
FETCh[:SCALar]:SPECtrum:ACLR:ABSolute?	<Result>	query only	6.27
SAMPle[:SCALar]:SPECtrum:ACLR:ABSolute?	<Result>	query only	6.27
CONFigure:SPECtrum:ACLR:CONTrol:MLENgth	320 | 640 | 1280 | 2560	with query	6.25
CONFigure:SPECtrum:ACLR:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.25
CONFigure:SPECtrum:ACLR:CONTrol:STATistics	1 to 1000 | NONE	with query	6.24
CONFigure:SPECtrum:ACLR:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.23
CONFigure:SPECtrum:ACLR:LEVel:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:CHANnel<nr>:VALue	<ACLR_Limit	>with query	6.26
CONFigure:SPECtrum:ACLR:LEVel:AVERage:LIMit[:SCALar] :ASYMmetric:UPPer:CHANnel<nr>:ENABle	<ACLR_Limit	>with query	6.26
CONFigure:SPECtrum:ACLR:LEVel:CMAX:LIMit[:SCALar] :ASYMmetric:UPPer:CHANnel<nr>:VALue	<ACLR_Limit>	with query	6.26
CONFigure:SPECtrum:ACLR:LEVel:CMAX:LIMit[:SCALar] :ASYMmetric:UPPer:CHANnel<nr>:ENABle	<ACLR_Limit>	with query	6.26
CALCulate[:SCALar]:SPECtrum:ACLR:MATChing:LIMit?	NMAU | NMAL | INV | OK	query only	6.27
READ[:SCALar]:SPECtrum:ACLR:RELative?	<Result>	query only	6.27

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
FETCh[:SCALar]:SPECtrum:ACLR:RELative?	<Result>	query only	6.27
SAMPle[:SCALar]:SPECtrum:ACLR:RELative?	<Result>	query only	6.27
CONFigure:SPECtrum:ACLR:SCANning	ON | OFF	with query	6.25
FETCh:SPECtrum:ACLR:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.24
Spectrum Measurement – Emission Mask			
INITiate:SPECtrum:EMASk	–	no query	6.34
ABORt:SPECtrum:EMASk	–	no query	6.34
STOP:SPECtrum:EMASk	–	no query	6.34
CONTinue:SPECtrum:EMASk	–	no query	6.34
CONFigure:SPECtrum:EMASk:AVERage:LIMit:LINE:ASYMmetric:UPPer	<Limit>	with query	6.37
READ:ARRay:SPECtrum:EMASk:AVERage?	–100.0 dB to 0.0 dB	query only	6.39
FETCh:ARRay:SPECtrum:EMASk:AVERage?	–100.0 dB to 0.0 dB	query only	6.39
SAMPle:ARRay:SPECtrum:EMASk:AVERage?	–100.0 dB to 0.0 dB	query only	6.39
CONFigure:SPECtrum:EMASk:CMAX:LIMit:LINE:ASYMmetric:UPPer	<Limit>	with query	6.37
CONFigure:SPECtrum:EMASk:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.35
CONFigure:SPECtrum:EMASk:CONTrol:RMODe	SCALar | ARRay	with query	6.35
CONFigure:SPECtrum:EMASk:CONTrol:STATistics	1 to 1000 | NONE	with query	6.35
READ:ARRay:SPECtrum:EMASk:CURRent?	–100.0 dB to 0.0 dB	query only	6.39
FETCh:ARRay:SPECtrum:EMASk:CURRent?	–100.0 dB to 0.0 dB	query only	6.39
SAMPle:ARRay:SPECtrum:EMASk:CURRent?	–100.0 dB to 0.0 dB	query only	6.39
CONFigure:SPECtrum:EMASk:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.34
DEFault:SPECtrum:EMASk:LIMit:LINE	ON | OFF	with query	6.37
CONFigure:SPECtrum:EMASk:LIMit:LINE:SYMmetric:[COMBined]:VALue	AUTO | CL1 | CL2 | CL3 | CL4 | USER	with query	6.36
READ:ARRay:SPECtrum:EMASk:MAXimum?	–100.0 dB to 0.0 dB	query only	6.39
FETCh:ARRay:SPECtrum:EMASk:MAXimum?	–100.0 dB to 0.0 dB	query only	6.39
SAMPle:ARRay:SPECtrum:EMASk:MAXimum?	–100.0 dB to 0.0 dB	query only	6.39
FETCh:SPECtrum:EMASk:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.34
READ[:SCALar]:SPECtrum:EMASk?	<Result>	query only	6.38
FETCh[:SCALar]:SPECtrum:EMASk?	<Result>	query only	6.38
SAMPle[:SCALar]:SPECtrum:EMASk?	<Result>	query only	6.38
Spectrum Measurement – OBW			
INITiate:SPECtrum:OBW	–	no query	6.28
ABORt:SPECtrum:OBW	–	no query	6.28

Command (Measurements, Non Sign. and Signalling)	Parameters	Remark	Page
STOP:SPECtrum:OBW	–	no query	6.28
CONTinue:SPECtrum:OBW	–	no query	6.28
CONFigure:SUBarrays:SPECtrum:OBW	ALL | ARIThmetical | MINimum | MAXimum,<Start>,<Samples>{,<Start>,<Samples>}	with query	6.31
DEFault:SPECtrum:OBW:CONTrol	ON | OFF	with query	6.30
CONFigure:SPECtrum:OBW:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.29
CONFigure:SPECtrum:OBW:CONTrol:RMODe	SCALar | ARRay	with query	6.29
CONFigure:SPECtrum:OBW:CONTrol:STATistics	1 to 1000 | NONE	with query	6.29
READ:ARRay:SPECtrum:OBW:CURRent?	–100.0 dB to 0.0 dB	query only	6.33
FETCh:ARRay:SPECtrum:OBW:CURRent?	–100.0 dB to 0.0 dB	query only	6.33
SAMPle:ARRay:SPECtrum:OBW:CURRent?	–100.0 dB to 0.0 dB	query only	6.33
READ:SUBarrays:SPECtrum:OBW:CURRent?	–100.0 dB to 0.0 dB	query only	6.33
FETCh:SUBarrays:SPECtrum:OBW:CURRent?	–100.0 dB to 0.0 dB	query only	6.33
SAMPle:SUBarrays:SPECtrum:OBW:CURRent?	–100.0 dB to 0.0 dB	query only	6.33
CONFigure:SPECtrum:OBW:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.28
CALCulate[:SCALar]:SPECtrum:OBW:MATChing:LIMit?	NMAU | NMAL | INV | OK	query only	6.32
CONFigure:SPECtrum:OBW:OBANdwidth:AVERage:LIMit[:SCALar]: ASYMmetric:UPPer:Enable	ON | OFF	with query	6.30
CONFigure:SPECtrum:OBW:OBANdwidth:AVERage:LIMit[:SCALar] ASYMmetric:UPPer:VALue	<OBW_Limit>	with query	6.30
CONFigure:SPECtrum:OBW:OBANdwidth:CMAX:LIMit[:SCALar] :ASYMmetric:UPPer:Enable	ON | OFF	with query	6.30
CONFigure:SPECtrum:OBW:OBANdwidth:CMAX:LIMit[:SCALar]: ASYMmetric:UPPer:VALue	<OBW_Limit>	with query	6.30
FETCh:SPECtrum:OBW:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE , 1 to 1000 | NONE	query only	6.28
READ[:SCALar]:SPECtrum:OBW?	<Result>	query only	6.32
FETCh[:SCALar]:SPECtrum:OBW?	<Result>	query only	6.32
SAMPle[:SCALar]:SPECtrum:OBW?	<Result>	query only	6.32

Table 6-4 Measurements (available in Signalling mode)

Command (Measurements, Signalling only)	Parameter	Remark	Page
DL BER Test			
INITiate:DLBer:BER	–	no query	6.87
ABORt:DLBer:BER	–	no query	6.87
STOP:DLBer:BER	–	no query	6.87
DEFault:DLBer:BER:CONTrol	ON | OFF	with query	6.89
CONFigure:DLBer:BER:CONTrol:AHOtime	0 s to 100 s	with query	6.88
DEFault:DLBer:BER:CONTrol:PAResync	ON |OFF	with query	6.89
CONFigure:DLBer:BER:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 1000, SONerror | NONE, NONE	with query	6.88
CONFigure:DLBer:BER:CONTrol:SHOtime	0 s to 100 s	with query	6.88
CONFigure:DLBer:BER:CONTrol:TBContinuous	10 to 10000	with query	6.88
CONFigure:DLBer:BER:CONTrol:TBSingleshot	10 to 100000	with query	6.88
CONFigure:DLBer:BER:CURRent:LIMit[:SCALar]:ASYMmetric:UPPer:VALue	0 % to 100 %, 0 % to 100 %	with query	6.91
CONFigure:DLBer:BER:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.87
DEFault:DLBer:BER:LIMit	ON | OFF	with query	6.91
CALCulate[:SCALar]:DLBer:BER:MATChing:LIMit?	<Result>	query only	6.92
CONFigure:DLBer:BER:NBSignal:DTCH	PR9 | PR11 | PR15 | PR16	with query	6.90
FETCh:DLBer:BER:STATus?	OFF | RUN | STOP | ERR | RDY,1 to 10000 | NONE, 1 to 1000 | NONE	query only	6.87
CONFigure:DLBer:BER:UESignal:AWGN	ON |OFF	with query	6.90
CONFigure:DLBer:BER:UESignal:DPCCh	–137 dB to –10 dB	with query	6.89
CONFigure:DLBer:BER:UESignal:DTCH	PR9 | PR11 | PR15 | PR16	with query	6.90
CONFigure:DLBer:BER:UESignal:NPOWer	-137 dB to -23 dB	with query	6.90
CONFigure:DLBer:BER:UESignal:TTPower	<Level>	with query	6.89
READ[:SCALar]:DLBer:BER?	<Result>	query only	6.91
FETCh[:SCALar]:DLBer:BER?	<Result>	query only	6.91
HSDPA Analyzer			
CONFigure:HSDPa:ACK:NUMBer	1 to 64	with query	6.122
CONFigure:HSDPa:ACK:TABLe:ALL	ACK | NACK | OFF, …	with query	6.122
CONFigure:HSDPa:ACK:TABLe<nr>	ACK | NACK | OFF	with query	6.122
CONFigure:HSDPa:CONTrol:NRUeid	1 to 128	with query	6.98
CONFigure:HSDPa:CONTrol:SMODe	IMMediate | HSFN | UEID	with query	6.98
CONFigure:HSDPa:CONTrol:UEID	o to 65535	with query	6.98
CONFigure:HSDPa:CONTrol:UEID	0 to 20479	with query	6.98
CONFigure:HSDPa:CONTrol:UITable:ALL	0 to 65535	with query	6.99
CONFigure:HSDPa:CONTrol:UITable<nr>	0 to 65535	with query	6.99

Command (Measurements, Signalling only)	Parameter	Remark	Page
CONFigure:HSDPa:CQI:NUMBer	1 to 64	with query	6.123
CONFigure:HSDPa:CQI:TABLe:ALL	1 to 30, …	with query	6.124
CONFigure:HSDPa:CQI:TABLe<nr>	1 to 30	with query	6.123
INITiate:HSDPa:HINFormation	–	no query	6.99
ABORt:HSDPa:HINFormation	–	no query	6.99
STOP:HSDPa:HINFormation	–	no query	6.99
READ:ARRay:HSDPa:HINFormation:ALL?	<Result>	query only	6.102
FETCh:ARRay:HSDPa:HINFormation:ALL?	<Result>	query only	6.102
READ:ARRay:HSDPa:HINFormation:ALL? DINFormation	<Result>	query only	6.102
FETCh:ARRay:HSDPa:HINFormation:ALL? DINFormation	<Result>	query only	6.102
CONFigure:HSDPa:HINFormation:CONTrol:DMODe	HSFN | UEID	with query	6.100
CONFigure:HSDPa:HINFormation:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, NONE, NONE	with query	6.100
CONFigure:HSDPa:HINFormation:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.99
READ[:SCALar]:HSDPa:HINFormation:RSUBframes?	<Result>	query only	6.103
FETCh[:SCALar]:HSDPa:HINFormation:RSUBframes?	<Result>	query only	6.103
FETCh:HSDPa:HINFormation:STATus?	OFF | RUN | STOP | ERR | RDY,1 to 10000 | NONE, 1 to 1024 | NONE	query only	6.100
READ:ARRay:HSDPa:HINFormation<nr>?	<Result>	query only	6.101
FETCh:ARRay:HSDPa:HINFormation<nr>?	<Result>	query only	6.101
READ:ARRay:HSDPa:HINFormation<nr>? DINFormation	<Result>	query only	6.101
FETCh:ARRay:HSDPa:HINFormation<nr>? DINFormation	<Result>	query only	6.101
INITiate:HSDPa:HTHRoughput	–	no query	6.103
ABORt:HSDPa:HTHRoughput	–	no query	6.103
STOP:HSDPa:HTHRoughput	–	no query	6.103
CONFigure:HSDPa:HTHRoughput:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, NONE, NONE	with query	6.104
CONFigure:HSDPa:HTHRoughput:CONTrol:RSFCont	1 to 20480	with query	6.104
CONFigure:HSDPa:HTHRoughput:CONTrol:RSFSingle	1 to 20480	with query	6.104
FETCh:ARRay:HSDPa:HTHRoughput:DRATe:AVERage?	<Result>	query only	6.105
FETCh:ARRay:HSDPa:HTHRoughput:DRATe:CURRent?	<Result>	query only	6.105
FETCh:ARRay:HSDPa:HTHRoughput:DRATe:MAXimum?	<Result>	query only	6.105
FETCh:ARRay:HSDPa:HTHRoughput:DRATe?	<Result>	query only	6.105
CONFigure:HSDPa:HTHRoughput:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.103
FETCh:HSDPa:HTHRoughput:STATus?	OFF | RUN | STOP | ERR | RDY,1 to 10000 | NONE, 1 to 20480 | NONE	query only	6.103
FETCh:ARRay:HSDPa:HTHRoughput:THRoughput:AVERage?	<Result>	query only	6.106
FETCh:ARRay:HSDPa:HTHRoughput:THRoughput:CURRent?	<Result>	query only	6.106

Command (Measurements, Signalling only)	Parameter	Remark	Page
FETCh:ARRay:HSDPa:HTHRoughput:THRoughput:MAXimum?	<Result>	query only	6.106
FETCh:ARRay:HSDPa:HTHRoughput:THRoughput:MINimum?	<Result>	query only	6.106
FETCh:ARRay:HSDPa:HTHRoughput:THRoughput?	<Result>	query only	6.105
FETCh[:SCALar]:HSDPa:HTHRoughput:TOTal?	<Result>	query only	6.106
READ:ARRay:HSDPa:HTHRoughputDRATe:AVERage?	<Result>	query only	6.105
READ:ARRay:HSDPa:HTHRoughputDRATe:CURRent?	<Result>	query only	6.105
READ:ARRay:HSDPa:HTHRoughputDRATe:MAXimum?	<Result>	query only	6.105
READ:ARRay:HSDPa:HTHRoughputDRATe?	<Result>	query only	6.105
READ:ARRay:HSDPa:HTHRoughputTHRoughput:AVERage?	<Result>	query only	6.106
READ:ARRay:HSDPa:HTHRoughputTHRoughput:CURRent?	<Result>	query only	6.106
READ:ARRay:HSDPa:HTHRoughputTHRoughput:MAXimum?	<Result>	query only	6.106
READ:ARRay:HSDPa:HTHRoughputTHRoughput:MINimum?	<Result>	query only	6.106
READ:ARRay:HSDPa:HTHRoughputTHRoughput?	<Result>	query only	6.105
READ[:SCALar]:HSDPa:HTHRoughputTOTal?	<Result>	query only	6.106
RACH Preamble Test			
CONFigure:RACH:COMMon:CONTrol:ATTiming	0 to 1	with query	6.94
CONFigure:RACH:COMMon:CONTrol:AWGN	ON |OFF	with query	6.94
DEFault: RACH:CONTrol	ON | OFF	with query	6.96
INITiate:RACH:PREamble	–	no query	6.93
ABORt:RACH:PREamble	–	no query	6.93
STOP:RACH:PREamble	–	no query	6.93
CONFigure:RACH:PREamble:CONTrol:ASCNumber	0 to 255	with query	6.95
CONFigure:RACH:PREamble:CONTrol:ASTable	1 to 64, 0 to 7, 0 to 14, 1 to 64	with query	6.96
CONFigure:RACH:PREamble:CONTrol:ECN	-137 dB to 29 dB	with query	6.95
CONFigure:RACH:PREamble:CONTrol:NASList	1 to 64	with query	6.96
CONFigure:RACH:PREamble:CONTrol:NPOWer	-80.0 to -20.0	with query	6.94
CONFigure:RACH:PREamble:CONTrol:NRPReambles	0 to 16777216	with query	6.95
CONFigure:RACH:PREamble:CONTrol:POWer	-137 dB to 9 dB	with query	6.95
CONFigure:RACH:PREamble:CONTrol:SCODe	0 to 16777215	with query	6.95
CONFigure:RACH:PREamble:CONTrol:SCODe	SFNNr |IMMed	with query	6.96
CONFigure:RACH:PREamble:CONTrol:SFNNumber	0 to 4095	with query	6.96
CONFigure:RACH:PREamble:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.93
FETCh:RACH:PREamble:STATus?	OFF | RUN | STOP | RDY, NONE	query only	6.93
READ[:SCALar]:RACH:PREamble?	<Result>	query only	6.97
FETCh[:SCALar]:RACH:PREamble?	<Result>	query only	6.97

Table 6-5 Connection Control (Signalling)

Command (Connection Control, Signalling)	Parameter	Remark	Page
BCH Monitor			
INITiate:BCHMonitor	–	no query	6.128
ABORt:BCHMonitor	–	no query	6.128
[SENSe:]BCHMonitor:SIB? <Type>	<SIB_Contents>	query only	6.129
[SENSe:]BCHMonitor:SIBReceived? <Type>	<Received SIB>	with query	6.128
[SENSe:]BCHMonitor:STATus?	OFF | RUN | STOP | ERR | STEP | RDY	query only	6.128
Inputs and Outputs			
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	-50 dB to +90 dB	with query	6.124
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]	-50 dB to +90 dB	with query	6.125
INPut[:STATe]	RF1 | RF2 | RF4	with query	6.124
OUTPut[:STATe]	RF1 | RF2 | RF3	with query	6.124
Expected Power			
[SENSe:]EPOWer:ATTenuation	NORMal | LNOise | LDIStortion	with query	6.127
[SENSe:]EPOWer:MODE	MANual | AUTomatic	with query	6.127
[SENSe:]EPOWer:VALue	<Level>	with query	6.127
Data Logging			
DEFault:LOGging	ON | OFF	with query	6.130
CONFigure:LOGGing:BCHMonitor	NONE | FILE | COM	with query	6.129
CONFigure:LOGGing:CDPower	NONE | FILE | COM	with query	6.130
CONFigure:LOGGing:TCHannel	NONE | FILE | COM	with query	6.130
MMEMory:BCHMonitor:BEMPty	EMPT | FULL	query only	6.132
MMEMory:BCHMonitor:BWRiting	ON | OFF	with query	6.132
MMEMory:BCHMonitor:CDEStination	<FileName>	no query	6.131
MMEMory:BCHMonitor:SAVE	[<FileName>] [,<msus>]	no query	6.132
MMEMory:L3MSg:BEMPty	EMPT | FULL	query only	6.131
MMEMory:L3MSg:BWRiting	ON | OFF	with query	6.131
MMEMory:L3MSg:CDEStination	<FileName>	no query	6.130
MMEMory:L3MSg:SAVE	[<FileName>] [,<msus>]	no query	6.131
Node B Signal			
DEFault:NBSignal	ON | OFF	with query	6.109
CONFigure:NBSignal:Channel	<band-specific channels>	with query	6.109
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CONFigure:NBSignal:DDPChannel:DLDPoffset	0 chips to 38400 chips	with query	6.111
CONFigure:NBSignal:DDPChannel:SFORmat	0 to 16	with query	6.111
CONFigure:NBSignal:DDPChannel:SRATe?	7.5 to 960	query only	6.111
CONFigure:NBSignal:DLOPeration:MODE	GPPR | PHYS | HSDPa	with query	6.110
CONFigure:NBSignal:DLSCode:CPICH	”0” to “3FFFE”	with query	6.110
CONFigure:NBSignal:DLSCode:DPCH	”0” to “3FFFE”	with query	6.110

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CONFigure:NBSignal:FOFFset	–100 kHz to +100 kHz	with query	6.110
CONFigure:NBSignal:GPPReference:CHCNumber	0 to 511	with query	6.111
CONFigure:NBSignal:GPPReference:CTYPE	12.2 | 64 | 144 | 384	with query	6.111
CONFigure:NBSignal:GPPReference:DLDPoffset	0 chips to 38400 chips	with query	6.112
CONFigure:NBSignal:HSDPa:HSSCch:NUMBer	1 to 4	with query	6.112
CONFigure:NBSignal:HSDPa:HSSCch<nr>	0 to 127	with query	6.112
CONFigure:NBSignal:HSDPa:MUID	0 to 65535	with query	6.112
CONFigure:NBSignal:RTFSeparate?	<Offset>	query only	6.110
Signalling			
PROCedure:SIGNalling:ACTion	SRUN | SSTP	no query	6.107
[SENSe:]SIGNalling:MINFo:CPOWer?	–100.0 dBm to +60 dBm	query only	6.108
[SENSe:]SIGNalling:MINFo:CSIR?	–40 dB to +100 dB	query only	6.108
[SENSe:]SIGNalling:MINFo:FSHift?	–5000.0 Hz to +5000.0 Hz	query only	6.108
[SENSe:]SIGNalling:MINFo:NPOWer?	–100.0 dBm to +60 dBm	query only	6.108
[SENSe:]SIGNalling:MINFo:SFN?	0 to 4095	query only	6.108
CONFigure:SIGNalling:SELect:BAND	OB1 | OB2 | OB3 | OB4 | OB5 | OB6	with query	6.108
[SENSe:]SIGNalling:STATe?	SUNS | SIP | SYN	query only	6.107
[SENSe:]SIGNalling:STO?	SUNS | SIP | SYN	query only	6.107
Trigger			
DEFault:TRIGger	ON | OFF	with query	6.125
TRIGger:[:SEQuence]:ETCoffset	0 to 10240	with query	6.126
TRIGger:[:SEQuence]:HUTPre	0 to 256	with query	6.126
TRIGger:[:SEQuence]:ISTPeriod	P2 | P4 |P8| P16|P32| P64| P128| P256| P512| P1024| P2048| P4096	with query	6.126
TRIGger:[:SEQuence]:ISTStartsfn	0 to 4095	with query	6.126
TRIGger:[SEQuence:]SLOPe	POS | NEG	with query	6.125
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TRIGger:OUTPut:PIN<nr>:SIGNal	NONE | SLOT | FRAM | SFR	with query	6.126
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INITiate:UESignal	–	no query	6.113
ABORt:UESignal	–	no query	6.113
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CONFigure:UESignal:GPPReference:BVER:MODE	OFF | BER | BLER	with query	6.120

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CONFigure:UESignal:GPPReference:CTYPE	12.2 | 64 | 144 | 384 | 2048	with query	6.119
CONFigure:UESignal:GPPReference:TFCibits	10-digit binary value	with query	6.120
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CONFigure:UESignal:HSDPA:ACK:HSFN:NUMBer	0 to 4095	with query	6.122
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CONFigure:UESignal:HSDPA:ACK:TDIStance	1 to 4095	with query	6.121
CONFigure:UESignal:HSDPA:ACK:TMODe	FRUN |UITRiggered	with query	6.121
CONFigure:UESignal:HSDPA:CQI:HSFN:MODE	IMMediate | HNUMber	with query	6.123
CONFigure:UESignal:HSDPA:CQI:HSFN:NUMBer	0 to 4095	with query	6.123
CONFigure:UESignal:HSDPA:CQI:PDELta	–23.52 to 6.02	with query	6.123
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CONFigure:UESignal:HSDPA:NACK:PDELta	–23.52 to 6.02	with query	6.121
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CONFigure:UESignal:UDPChannel:DPCCh:TFCI:CWORd	8-digit hex value	with query	6.118
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CONFigure:UESignal:UDPChannel:DPDCh:CDSource	ALL0 | ALL1 | ALT | PR9 | PR11 | PR15 | PR16	with query	6.119
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