ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Software Option:

1xEV-DO
for R&S® CMU-B88

R&S® CMU-K88

1150.3900.02

Printed in the Federal
Republic of Germany

Supplement to the Operating Manual for 1xEV-DO Software Option

New Features in Versions 3.80 of Option R&S® CMU-K88 (with Base System V3.80)

Interleaving Factor, Spectrum Results

With firmware version V3.80 of the 1xEV-DO software, a new control parameter has been introduced in the *Traffic* section of the *Generator* tab of the *Connection Control* menu.

The ***Interleaving Factor*** allows an increase of the rate of data packets sent to a specific user (access terminal AT 1 to 4). With the default setting 1, each of the four ATs receives one fourth of the packets. Selecting an interleaving factor 2, 3, or 4 for a particular AT doubles, triples, or quadruples the rate of data packets addressed to this AT; the residual packet rate is distributed among the other ATs. With interleaving factor 4, all packets are addressed to a single AT; which accelerates the DUT-assisted Packet Error Rate measurement.

SOURce:RFGenerator:AT<nr>:IFACtor <*Factor*>			Interleaving Factor	
<Factor>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 4	Interleaving factor for AT <nr>	1	–	V3.80
Description of command				
This command specifies the interleaving factor for the access terminals 1 to 4 (<nr> = 1 to 4).				

In the ***Spectrum*** measurement a new remote control command controls the output of the `READ[:SCALar]:SPECtrum:ACP?`, `FETCh[:SCALar]:SPECtrum:ACP?`, and `SAMPle[:SCALar]:SPECtrum:ACP?` commands.

XTND:SPECtrum:ACP:STATistics[?] <*Enable*>			Scope of scalar results	
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Statistical results returned No statistical results returned	OFF	–	V3.80
Description of command				
This command qualifies whether `READ[:SCALar]:SPECtrum:ACP?`, `FETCh…?`, `SAMPle…?` return the statistical results *Out of Tolerance* and *Current Statistics*.				

Dear Customer,

throughout this manual, CMU-K88 is generally used as an abbreviation for software option R&S CMU-K88.
The Universal Radio Communication Tester R&S CMU 200 is abbreviated as CMU200.

Tabbed Divider Overview

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Contents of Manuals for Universal Radio Communication Tester CMU

The user documentation for the R&S CMU 200/300 is divided in an 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. The latest revisions of all manuals are also posted on the CMU Customer Web on GLORIS.

Operating Manual CMU-K88 (Software Options for CMU-B88)

The present operating manual describes the application of CMU for 1xEV-DO mobile tests. It gives comprehensive information about the operating concept and about manual and remote control of the CMU tester. Typical measurement tasks are explained in detail using the functions offered by the graphical user interface and a selection of program examples.

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 CMU for 1xEV-DO mobile tests and presents some typical measurement examples.

Chapter 3 Describes the operation in principle and the principles of measurement control.

Chapter 4 Serves as a reference of all functions of the user interface and their application. Allowed settings, default values and the corresponding remote control commands are listed for all functions.

Chapter 5 Describes the basics of remote control of the instrument for 1xEV-DO mobile tests.

Chapter 6 Lists all remote control commands defined for 1xEV-DO mobile tests. At the end of the chapter the commands are grouped together according to their function and sorted by alphabetical order.

Chapter 7 Contains program examples.

Chapter 8 Describes preventive maintenance.

Chapter 9 Contains a list of error codes

Chapter 10 Contains an index for the operating manual.

Operating Manual CMU200/CMU300

In the operating manual for CMU basic unit you will find everything that is needed to make yourself familiar with your Universal Radio Communication Tester CMU200. This includes information about the technical specifications of the CMU, the controls and connectors on the front and rear panel, necessary steps for putting the instrument into operation, the basic operating concept, manual and remote control. Typical measurement tasks are explained in detail using the functions of the user interface and program examples. In addition, the operating manual lists the most important warnings and error messages which may be output by the instrument.

General concepts of CMU control are described in the operating manual CMU200 and not repeated in the manuals for the individual software options.

Service Manual Instrument

The service manual instrument informs on how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for the maintenance of CMU by exchanging modules.

Service Manual Modules

The service manual modules is not delivered with the instrument but may be obtained from your R&S service department using the order number 1100.4903.91.

Service manual modules contains information about the individual modules of CMU. This comprises the test and adjustment of the modules, fault detection within the modules and the interface description.

Further Operating Manuals for Network Tests

The operating manuals listed in the following table describe the test of radio communication equipment supporting different standards by means of the CMU and the appropriate software and hardware options. The network test operating manuals are organized like the present 1xEV-DO operating manual.

Manual	Order Number	For Options		
		Type	Description	Stock No.
Operating Manual CMU-K20/-K21/-K22/-K23/-K24	1115.6088.12	CMU-K20 CMU-K21 CMU-K22 CMU-K23 CMU-K24 CMU-K42 CMU-K43 CMU-K45	GSM400-MS for CMU-B21 GSM900-MS for CMU-B21 GSM1800-MS for CMU-B21 GSM1900-MS for CMU-B21 GSM850-MS for CMU-B21 GPRS software extension for GSM EGPRS software extension for GSM AMR GSM for CMU200	1115.5900.02 1115.6007.02 1115.6107.02 1115.6207.02 1115.6307.02 1115.4691.02 1115.6907.02 1150.3100.02
Operating Manual CMU-K27/-K28	1115.6688.12	CMU-K27 CMU-K28	TDMA800-MS for CMU-B21 TDMA1900-MS for CMU-B21	1115.6607.02 1115.6707.02
Operating Manual CMU-K29	1115.6888.12	CMU-K29	AMPS-MS for CMU-B21	1115.6807.02
Operating Manual CMU-K30/-K31/-K32/-K33/-K34	1115.4185.12	CMU-K30 CMU-K31 CMU-K32 CMU-K33 CMU-K34 CMU-K39 CMU-K41	GSM400-BS for CMU-B21 GSM900-BS for CMU-B21 GSM1800-BS for CMU-B21 GSM1900-BS for CMU-B21 GSM850-BS for CMU-B21 MOC/MTC EDGE for CMU-K30/31/32/33	1115.4004.02 1115.4104.02 1115.4204.02 1115.4304.02 1115.4404.02 1115.4791.02 1115.4604.02
Operating Manual CMU-K53	1115.5081.12	CMU-K53	Bluetooth for CMU	1115.5000.02
Operating Manual CMU-K65/…/-K69	1115.4962.12	CMU-K65 CMU-K66 CMU-K67 CMU-K68 CMU-K69	WCDMA UE TX Test (3GPP/FDD) WCDMA UE DL Generator (3GPP/FDD) WCDMA UE Band III Signalling WCDMA UE Band I Signalling WCDMA UE Band II Signalling	1115.4891.02 1115.5100.02 1150.3000.02 1115.5300.02 1115.5400.02
Operating Manual CMU-K75/-K76	1150.3398.12	CMU-K75 CMU-K76	WCDMA Node B TX Tests WCDMA Generator (3GPP/FDD, Release 99, Uplink)	1150.3200.02 1150.3300.02
Operating Manual CMU-K81/-K82	1115.5581.12	CMU-K81 CMU-K82	CDMA800-MS (IS95) for CMU-B81 CDMA1900-MS (IS95) for CMU-B81	1115.5500.02 1115.5600.02
Operating Manual CMU-K83/-K84/-K85/-K86	1150.0382.12	CMU-K83 CMU-K84 CMU-K85 CMU-K86	CDMA2000-MS (450 MHz band) CDMA2000-MS (cellular band) CDMA2000-MS (PCS band) CDMA2000-MS (IMT-2000 band)	1150.3500.02 1150.3600.02 1150.3700.02 1150.3800.02

The GSM base station tests described in operating manual CMU-K30/-K31/-K32/-K33/-K34 and the WCDMA Node B tests described in operating manual CMU-K75/-K76 require a CMU300 (Universal Radio Communication Tester for BTS). Bluetooth tests can be performed with model CMU200, var. 02 or 53. All other radio communication equipment is tested with model CMU200, var.02.

Frequently Used Abbreviations

3GPP2	*3rd Generation Partnership Project 2*
Abs.	*Absolute*
Avg.	*Average*
AWGN	*Additive White Gaussian Noise*
CDMA	*Code Division Multiple Access*
CDP	*Code Domain Power*
Chan.	*Channel*
Channel.	*Channelization*
CRC	*Cyclic Redundancy Code*
Curr.	*Current*
Disp.	*Display*
DRC	*Data Rate Control*
DRCLock	*Data Rate Control Lock*
EIRP	*Effective Isotropic Radiated Power*
Err.	*Error*
ESN	*Electronic Serial Number*
EVM	*Error Vector Magnitude*
Ext., Extern.	*External*
FFT	*Fast Fourier Transform*
Freq.	*Frequency*
GPIB	*General Purpose Interface Bus = IEEE488 Bus*
HPSK	*Hybrid Phase Shift Keying*
I	*In-phase*
IF	*Intermediate Frequency*
Int.	*Internal*
Lev.	*Level*
MAC	*Media Access Control*
Magn.	*Magnitude*
Max.	*Maximum (e.g. Level)*
ME	*Magnitude Error*
Meas.	*Measurement*
Min.	*Minimum*
Ovw	*Overview*
PCS	*Personal Communications Services*
PCDE	*Peak Code Domain Error*
PE	*Phase Error*
PER	*Packet Error Rate*
Pk.	*Peak*
Q	*Quadrature-phase*
QPSK	*Quadrature Phase Shift Keying*
RA	*Reverse Activity*
RAB	*Reverse Activity Bit*
RBW	*Resolution Bandwidth*
Ref.	*Reference*
Rel.	*Relative*
RF	*Radio Frequency*
RMS	*Root Mean Square*
RPC	*Reverse Power Control*
RX	*Receiver*
Scr.	*Scrambling*
SW	*Software*
Sym.	*Symbol*
Sync.	*Synchronous*
Synch.	*Synchronization*
Trg.	*Trigger*
TX	*Transmitter*
Vect.	*Vector*

Glossary of Terms

The following list contains definitions of terms that are often used throughout this manual.

Access Channel — A reverse communication channel used by a mobile station to communicate to a base station.

Carrier Feedthrough — Ratio of the I/Q offset vector (i.e. the estimated DC offset of the measured signal) to the average offset-corrected signal vector.

Carrier frequency error — Deviation of the mobile's modulated carrier frequency from the frequency received from the base station.

Chip rate — Product of the symbol rate and the spreading factor. For the CDMA2000® 1XEV-DO system a fixed chip rate of 1.2288 Mcps is specified.

Code domain — The entire set of channelization codes involved in a CDMA2000® 1xEV-DO signal configuration. Measuring a parameter in code domain means to determine its values as a function of the individual channelization codes.

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.

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.

Cyclic Redundancy Code (CRC) — A class of linear error detecting codes which generate parity check bits by finding the remainder of a polynomial division.

E_b — Average energy per information bit for the Sync Channel, Paging Channel, or Forward Traffic Channel at the mobile station antenna connector.

E_b/N_t — The ratio of the combined received energy per bit to the effective noise power spectral density for the Sync Channel, Paging Channel, or Forward Traffic Channel at the mobile station antenna connector.

Error vector magnitude — Difference vector connecting the measured and the ideal modulated signal vector. The error vector magnitude (EVM) is the critical quantity to assess the modulation accuracy of the mobile's transmitter.

I/Q imbalance — Difference between the estimated I and Q amplitudes of the measured signal, normalized and expressed in dB units.

MAC — Used in two contexts. 1) The MAC laver is the Media Access Control layer that coordinates the operation of the physical layer with the needs of the traffic and signalling systems in the upper layers. 2) As a region within the forward link 1xEV-DO slot format, that contains Reverse Control Control bits and other indicators. This region is repeated four times within a slot.

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 mobile is set to its maximum power control level.

Minimum power — Operating mode where the mobile is set to its minimum power control level.

Modulation accuracy — Ability of the mobile's transmitter to generate an ideally modulated signal.

N_t — The effective noise power spectral density at the mobile station antenna connector.

Peak code domain error Maximum of the *code domain errors* for all codes in the domain, expressed in dB.

Phase error Difference in phase between the measured and the ideal modulated signal vector.

Reverse Power Control bit A bit sent (within the MAC region) in every slot. Each bit commands the access terminal to raise or lower its transmit power.

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

TIA/EIA/IS-856-1, cdma2000® High Rate Packet Data Air Interface Specification - Addendum 1

Contents

1 Introduction

This chapter describes the installation and update of software options for the Universal Radio Communication Tester R&S CMU 200.

Table 1-1 lists the 1xEV-DO networks supported when the 1xEV-DO hardware and software option are installed to support 1xEV-DO functionality.

Table 1-1 CDMA networks supported

CMU Options for CDMA	**Band Class**	**Network**
CMU-K88 1xEV-DO NSig	Band Class 0	US and Korean Cellular
	Band Class 1	North American PCS
	Band Class 2	TACS
	Band Class 3	JTACS
	Band Class 4	Korean PCS
	Band Class 5	NMT-450
	Band Class 6	IMT-2000
	Band Class 7	North American 700 MHz
	Band Class 8	1800 MHz
	Band Class 9	900 MHz
	Band Class 10	Secondary 800 MHz

Installation Instructions

Before performing 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 CMU Operating manual. The hardware and software options available are shown in the *Startup* menu. The Hardware Option entry "CMU-B88" indicates the status of the hardware option required for 1xEV-DO mobile tests. The Software Option entry CMU-K88 indicates the status of the software option required for 1xEV-DO mobile tests.

- If version number is indicated, the CMU is ready to perform 1xEV-DO mobile tests. In this case you may skip this chapter, except if you wish to update the current software version.
- If `disabled` is indicated, the software option must be enabled using a key code; see section *Creating a new Software Configuration* on page 1.5.
- If `not installed` is indicated, the software must be installed via the PCMCIA interface or the floppy disk drive.

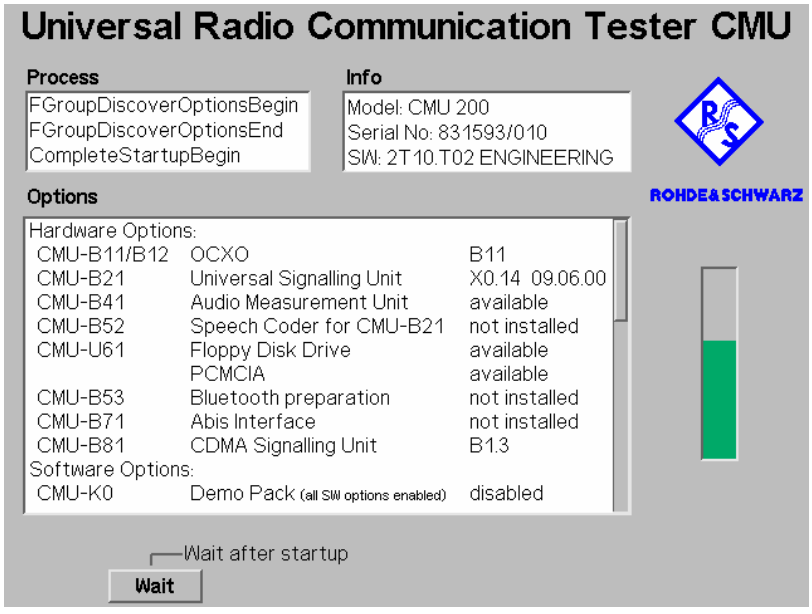


Figure 1-1 Setup – Options menu

Software Installation or Update

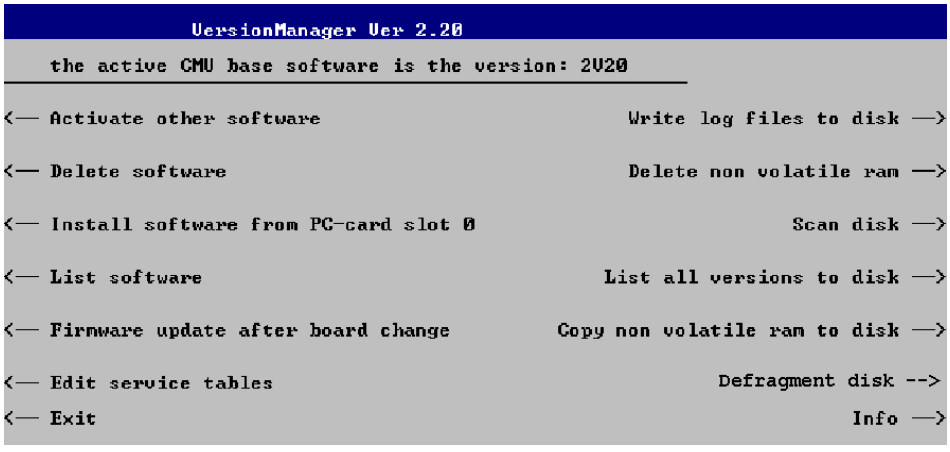
The CMU is always delivered with the latest software version available. New CMU software versions are available for download on the R&S Lotus Notes Service board. To be loaded via the CMU's PCMCIA interface, the software must be copied to one or several flash disks/memory cards or PCMCIA hard disks as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

Note: *If your CMU is equipped with a floppy disk drive (option 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 software proceed as follows:

- Switch off the CMU.
- Insert the flash disk into one of the two slots of the PCMCIA interface.
- Switch on the CMU.

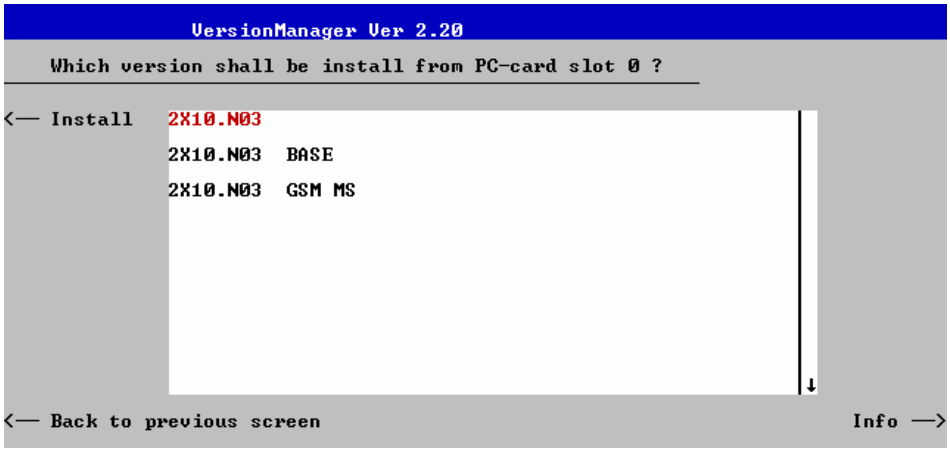
The installation is started automatically while the CMU performs its start-up procedure. When ready to proceed, the *VersionManager* is displayed (for a detailed description of the *VersionManager* refer to chapter 1 of the CMU operating manual or to the on-line help accessible via *Info):*



Softkey no. 5 on the left softkey bar, *Install software...,* is used to install new software from an external storage medium. The 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.*

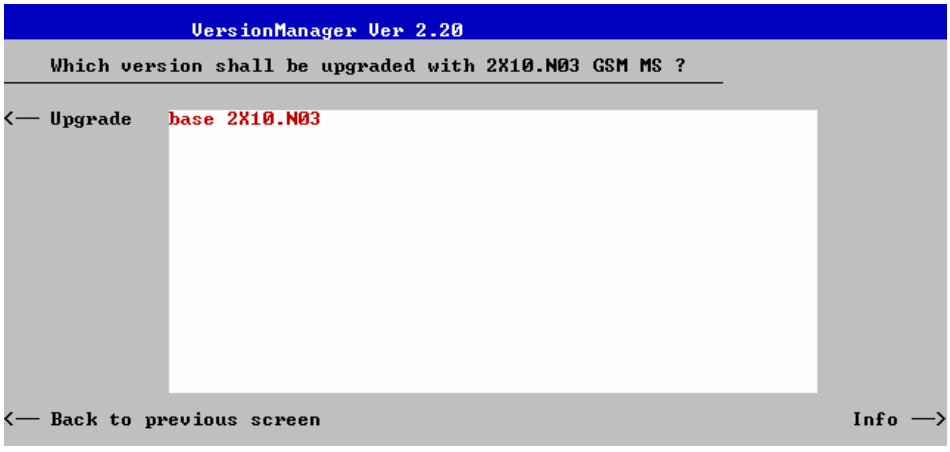
- Press left softkey no. 5 *(Install software...)* to start the installation.

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 *Measurements* version you intend to install.
- Press *Install* to start the installation.

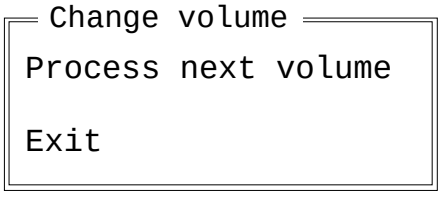
The installation is started. To be operable on your instrument, a network option must be combined with a compatible version of the CMU base software. Any base software version installed on the CMU hard disk can be combined with one or several network options to form an independent software configuration. If none of the configurations is compatible to the new *Measurements* 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 1.5. 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 *Measurements* software.

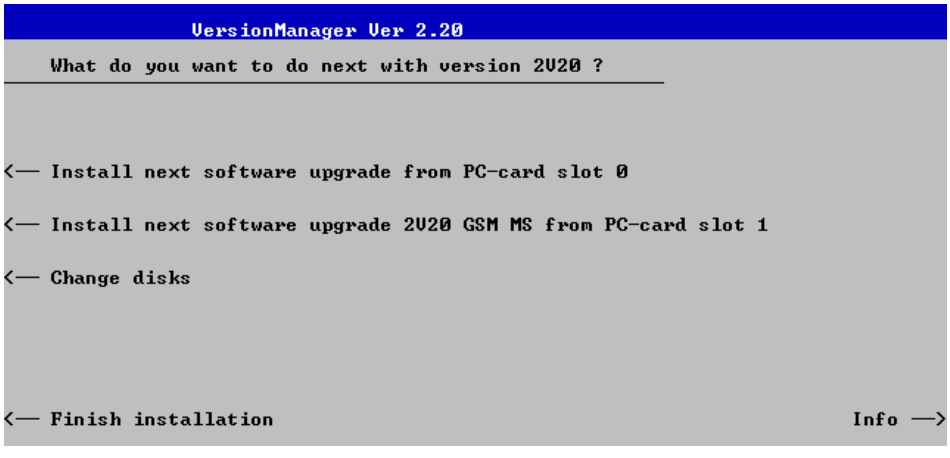
- Select the appropriate base version and press *Upgrade*.

The new *Measurements* option is added to the configuration or updates the previous *Measurements* version of the configuration. To indicate that the storage medium must be changed the 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 CMU displays the following screen:



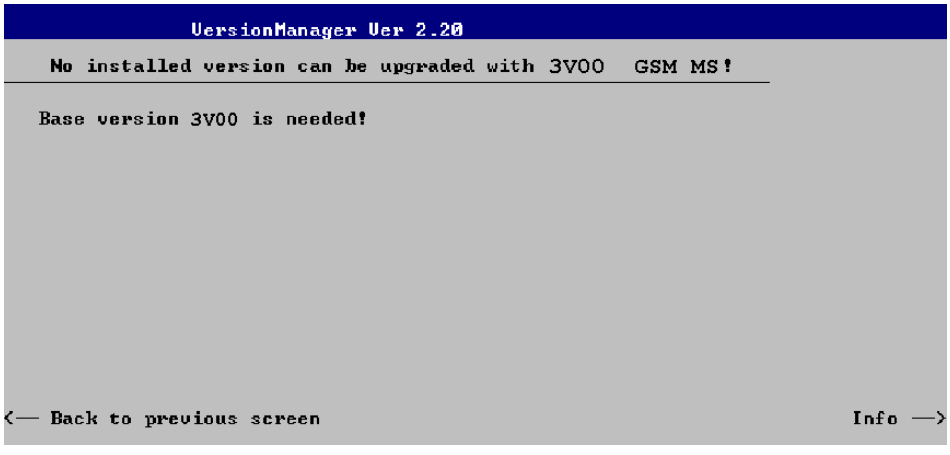
- If you wish to install or upgrade other software versions, press left softkey no 4 or 5 *(Install next software...)* or insert new storage medium into the PCMCIA slot or floppy disk drive and press *Change disks*.
- To finish the installation, remove all disks from the drive and press *Finish installation*.

The *VersionManager* is closed and the 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.

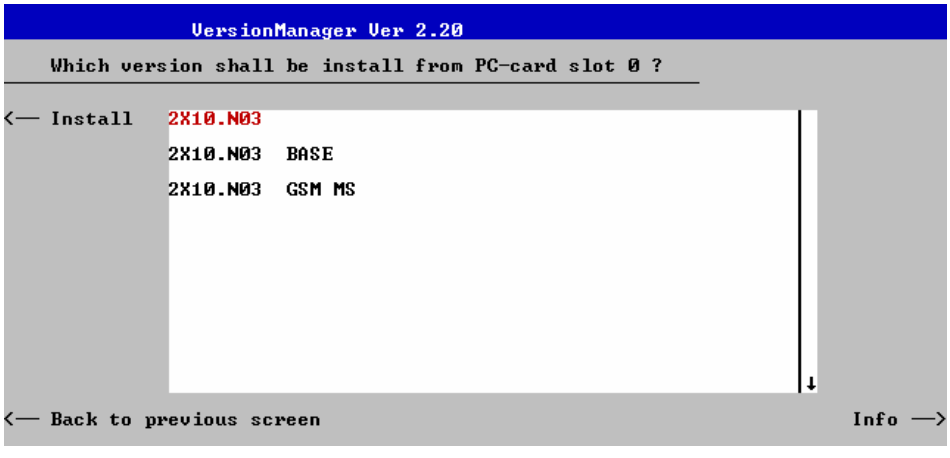
Creating a new Software Configuration

The 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 CMU will refuse to install a new *Measurements* software option selected in the software selection dialog (see previous section). Instead, it displays the following error message:



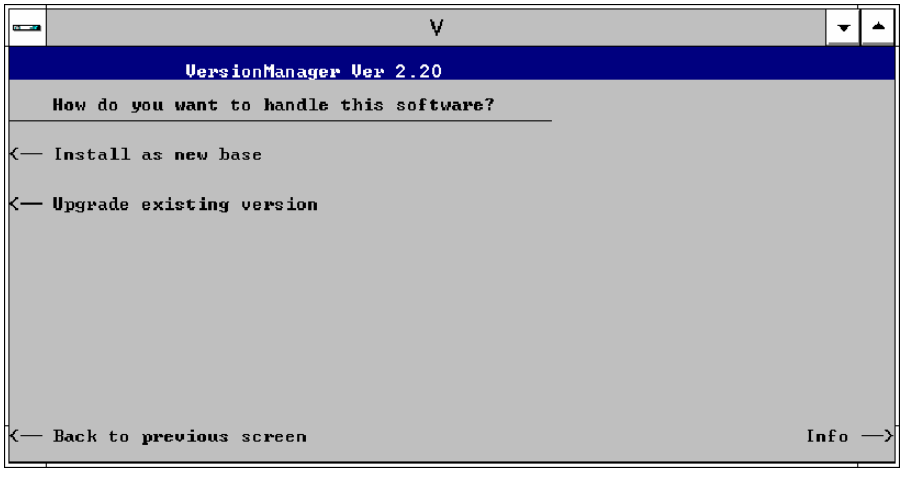
➢ Press *Back to installation* to return to the software version selection dialog.



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

Note: *As a rule, firmware versions for the base system and for network options are compatible if they differ only in the last digit.*

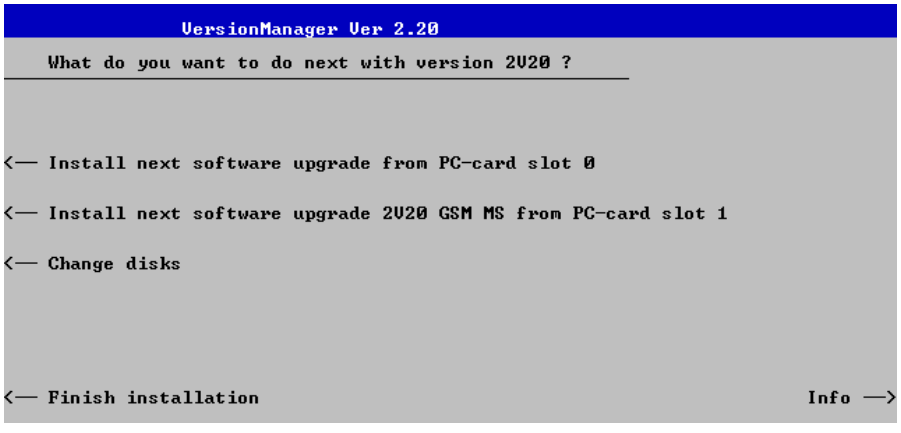
With a new base software version, it is possible to either update an existing configuration or create a new one. A dialog selecting between the two alternatives is opened:



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 *Measurements* 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. After adding the new base software as a new configuration or updating the existing configuration, the 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.1.2. to install the new *Measurements* version and assign it to the new configuration.

Enabling Software Options

A new 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 CMU Operating manual.

Note: *The CMU software is delivered in complete versions containing all software options available. Software installation and enabling of software options are completely independent from each other.*

Contents

2 Getting Started

This chapter provides examples of using the CMU Universal Radio Communication Tester to perform tests on an 1xEV-DO access terminal. It is intended to provide a quick overview of how to setup a test for the 1xEV-DO function group.

Before starting any measurements with the CMU, please note the instructions given in Chapter 1 of the CMU Operating manual for putting the instrument into operation. Chapters 2 through 4 of the CMU Operating manual contain information on customizing the instrument and display according to your personal preferences. For instructions about activating the 1xEV-DO option, refer to Chapter 1 of this manual.

The procedures in this chapter include:

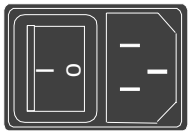
- Connection of an access terminal
- Startup and reset
- Function group selection
- Analyzer/Generator operation

The left side of each double column page illustrates the steps and results obtained on the CMU screen. The right column of the page provides additional information on each step. If available, alternative settings and related measurements are provided.

Manual operation principles are discussed in Chapter 3. All menus, functions, and parameters (including 1xEV-DO background information) are discussed in Chapter 4.

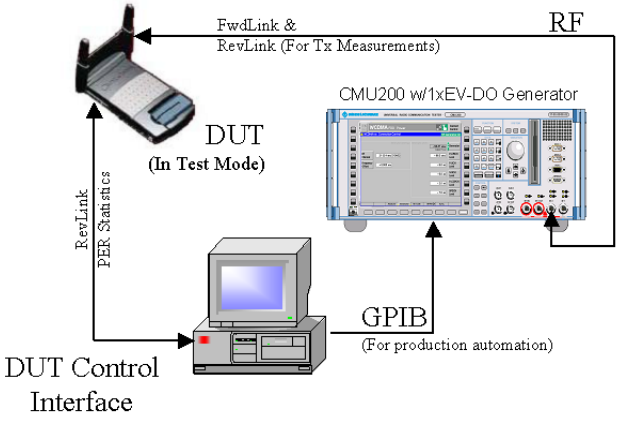
Connecting an Access Terminal

This chapter describes how to use the CMU to perform 1xEV-DO access terminal tests. Prior to starting any tests, the CMU must be correctly set up and connected to the AC power supply as described in the CMU operating manual. The 1xEV-DO option must be enabled as described in chapter 1 of this manual.



Step 1

- Switch on the CMU using the mains switch on the rear panel.
- Check the status of the ON/STANDBY key on the front panel. The yellow LED should be illuminated indicating the CMU is in the standby operating mode.



Step 2

- Connect the bi-directional RF connector RF 2 of the CMU to the Rx/TX connector of the access terminal.
- For certain tests the Rx connector of the access terminal can be connected to an further workstation.
- For GPIB tests connect a controlling workstation with the CMU.
- Supply the access terminal with the correct operating voltage (battery or power supply).

Additional Information...

Alternative Settings and Measurements

☞ Chapter 1 of the CMU operating manual

... on Step 1

Mains switch on the rear panel

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

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

The *ON/STANDBY* key 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

RF connection of the access terminal

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

Input and output connectors can be selected in the *AF/RF* ⊶ tab of the *Connect. Control* menu. The tab is also used to report an external input and output attenuation to the CMU.

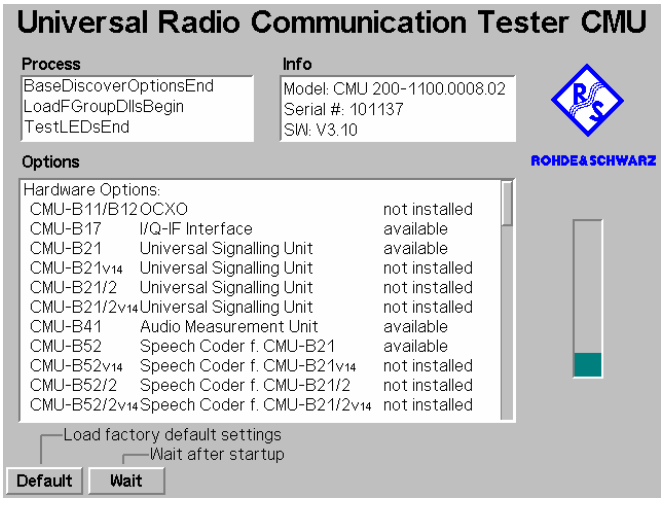
Ensure that the attenuation cable or connector used is being taken into account by the CMU. During the test, the mobile receiver is being tested with very low RF signal levels, and even a small attenuation can cause the CMU to show a fail indication.

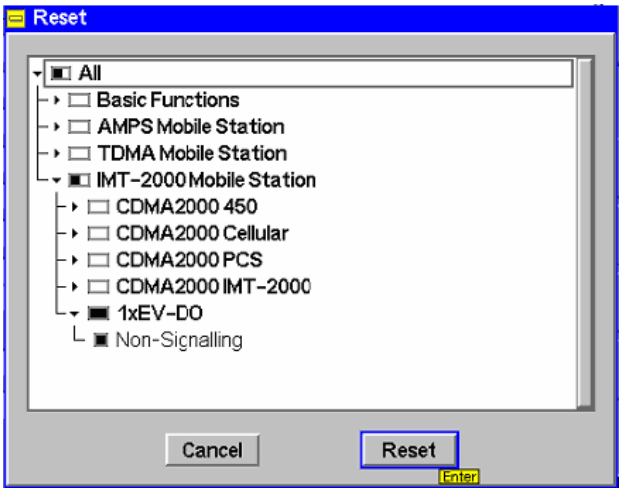
An external signal from a real network may interfere with the signal sent from the CMU to the access terminal. The tests should ideally be performed in a shielded room, however, if this is not possible, the channel(s) used for the test should be changed. If different results are obtained on neighboring channels, the problem is likely to be due to external interference.

The CMU provides two bidirectional RF connectors (RF1 and RF2) differing by their input and output levels. RF2 is the recommended connector for 1xEV-DO access terminals.

The unidirectional connectors RF4 IN and RF3 OUT are intended for connecting modules requiring high input levels or modules with low RF output levels.

Startup and Reset





Step 3

- Press the *ON/STANDBY* front panel key on the CMU.

The startup menu displays while the CMU performs the power-up tests (see also additional information on p. 2.5).

After the power-up tests are complete, the CMU returns to the last menu used in the previous session.

Step 4

- Press the *RESET* key to open the *Reset* popup menu.
- Proceed as described in Chapter 4, section *Reset of Instrument Settings,* of the CMU 200/300 operating manual to expand the tree of function groups.
- Select the 1xEV-DO function group to be reset. The corresponding nodes must be black.
- Use the cursor keys to activate the *Reset* button and press *ENTER.*
- In the popup window opened *(Are you sure?)*, select *Yes* to confirm the instrument reset.

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

Additional Information...

... on Step 3

Startup menu

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).

Before starting a measurement, a reset is recommended to put the CMU in a known operating mode.

... on Step 4

The CMU indicates that it performs a reset of all settings in the selected function group(s). After finishing, the CMU is ready to carry out the remaining steps. The *Reset* popup menu closes automatically.

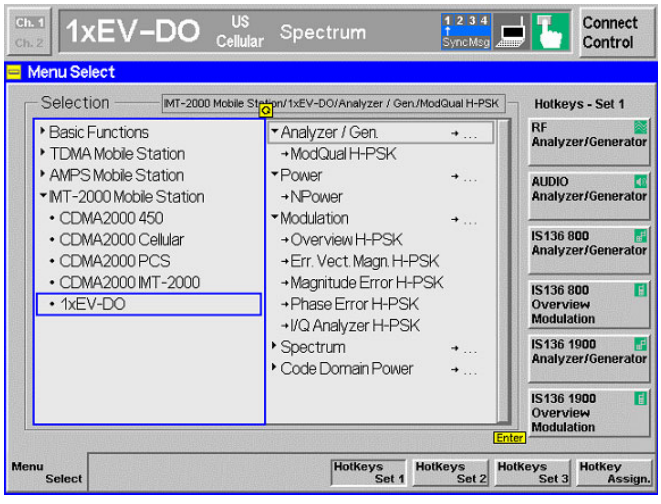
Alternative Settings and Measurements

☞ Chapter 4 of CMU operating manual

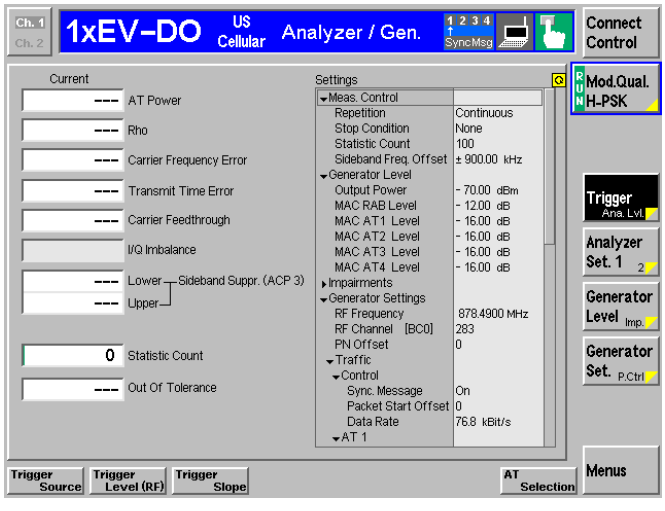
Chapter 4 also contains information on customizing the CMU.

Analyzer/Generator Tests

MENU SELECT



⇓



Step 5

➢ Press the *Menu Select* key to open the *Menu Select* menu.

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

From this menu, you can select the measurement you want to run.

➢ Select the IMT-2000 Mobile Station header

➢ Select the 1xEV-DO function group.

➢ Scroll down to *Analyzer/Gen.* and expand the list.

➢ Scroll down to *ModQual HPSK* and press ENTER.

➢ This displays the *Analyzer/Generator* screen and starts the HPSK modulation quality measurement.

Step 6

The *Analyzer/Generator* screen displays the current power and modulation measurement results and the RF generator and analyzer settings of the CMU.

Output fields displaying "---" indicate that no valid measurement results are available. Currently, no results are available, because the DUT is not supplying an RF signal to the CMU200

Additional Information...

Alternative Settings and Measurements

... on Step 5

Menu Select menu

The *Menu Select* menu shows all function groups installed and enabled on the CMU.

☞ Chapter 3

... on Step 6

Analyzer/Generator screen

The *Analyzer/Generator* screen contains two panels of information:

- Measurement results
- Settings

The status of the *Modulation* measurement is included in the softkey. For ongoing measurements, the results in the output fields are constantly updated.

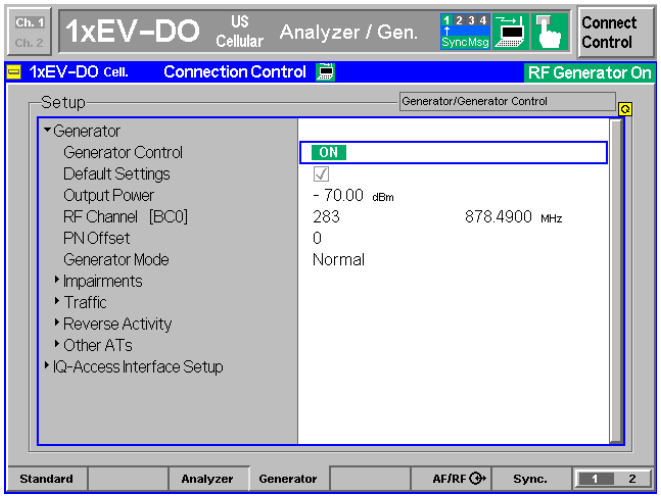
Changing the RF Channel number automatically adjusts the base station's transmit and receive frequencies (BS Tx Frequency and BS Rx Frequency) to the corresponding RF Channel number.

☞ Chapter 4

The section Chapter 4 of this manual provides detailed information about all measurement settings, measurement results, and a description of all softkey/hotkey menu buttons.

The current options for the measurement state are *RUN* (default) and *OFF*. A third state, *HLT*, occurs after a single-shot measurement.

Once selected, the Generator or Modulation measurement is switched off and on again by means of the toggle key *ON/OFF*.



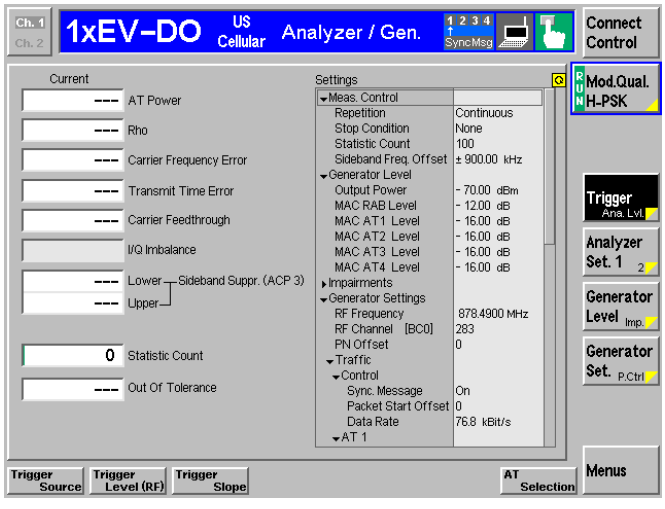
Step 7

- Press the *Connect Control* softkey. This displays the Connection Control screen.
- Select the Generator tab at the bottom of the display.

The Generator settings allow you to adjust all generator settings and turn the RF Generator on or off.

- Select (press) the Generator softkey and press ON/OFF to turn on the RF generator.

Press the *Connect Control* softkey again to return to the measurement screen.



Step 8

- Press the *Analyzer Settings* softkey. This displays a set of hotkeys at the bottom of the screen.

The hotkeys at the bottom of the screen allow you to directly adjust the measurement control settings without opening an additional configuration menu.

- Press the *RF Frequency* softkey and adjust the analyzer frequency to the default generator frequency .
- If the input signal level at RF2 is still too low, press *Generator Level – AT Power* and increase the RF generator level.
- Select the *Long Code Mask* for the given setup. Without a valid *Long Code Mask* the measurements will not display any valid results.
- Select the configuration of the *Code Channel Filters* in order to filter the measurements results and display the desired results. .

Additional Information...

Alternative Settings and Measurements

... on Step 7

Additional tabs of the *Connection Control* screen allow the setup and control of other aspects of the CMU. These settings are described in Chapter 4 of this manual.

☞ Chapter 4

... on Step 8

After *Reset*, all parameters are set to their default values. The parameters are displayed in the *Settings* window.

☞ Chapter 4

Additional measurement settings are provided in the *Modulation Configuration* pop-up window. The *Modulation Configuration* pop-up window is accessed by pressing the measurement softkey twice (or once if already selected). In this example, the measurement softkey is labeled *Mod.Qual. HPSK*.

User-defined parameters are saved for later sessions when the CMU is switched off.

Contents

3 Manual Control

This chapter gives a brief overview of the operating concept and structure of the user interface for 1xEV-DO access terminal tests. The CMU is designed for maximum operating convenience and flexibility. All instrument functions are grouped together in menus. Each menu provides configuration settings, displays a group of measured quantities, or a combination of both. Switching between the different menu groups and signalling modes is possible at any time.

In the following sections, 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)*. For information about the CMU's control elements, menu types and dialog elements within the menus refer to Chapter 3 of the CMU Operating manual.

Menu Structure

The menus used to control 1xEV-DOmeasurements can be arranged in different ways. From a functional point of view, they form the following groups:

- General configurations (Connection Control)
- Measurement groups *(Analyzer/Generator, Power, Modulation, Spectrum, Code Domain Power)*
- Configurations specific to the measurement groups

The CMU uses main menus, popup menus, graphical measurement menus and dialog windows of various size. Refer to Chapter 3 of the CMU Operating manual for discussions about menus.

Test Modes

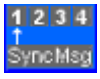
1xEV-DO measurements are performed in the test mode *Non-signalling*. The *Non-Signalling* mode is typically used for module tests or test of access terminals in a special "factory test mode".

Non-Signalling Mode In the *Non-Signalling* mode, the CMU generates an RF signal conforming to 1xEV-DO specifications and analyzes the signal transmitted by the device under test (DUT).

Status Symbols

The non-signalling mode is displayed in the headline above the measurements. The following symbols define the status of the current settings:

AT Channel



The CMU supports directly 4 AT channels for the measurements out of maximum 55 connected AT's

- The numbers represent the four supported AT channels. Active AT's are being highlighted in green color.
- The arrow points to the AT channel that will generate triggers.
- SyncMsg indicates if the Control Channel Sync message has been activated. If the SyncMsg has been activated the field will be highlighted in green color.

Generator

This field indicates the status of the Generator. If the Generator has been switched on this field will be highlighted in green color.

Manual Mode

This field indicates that the CMU is currently in manual mode.

Configurations

The CMU offers a wide range of settings for the signal generator and analyzer, the signalling procedures, and the individual measurements. Configurations may apply to a whole function group (*Connection Control*) or to a particular measurement.

Connection Control

The *Connection Control* softkey is located on the right side of the title bar of each main and measurement menu. Depending on the mode (non-signalling or signalling), it opens a popup menu with tabs configuring the following:

- The signal generators and analyzers of the instrument *(Analyzer* and *Generator*)
- The CMU receiver settings and input path configuration (included in *Analyzer, MS Signal)*
- The trigger settings (included in *Analyzer, MS Signal)*
- The RF connectors to be used and the external attenuation *(RF Input/Output)*
- The reference signal and the system clock *(Sync.)*

All settings made in the *Connection Control* menu apply to the whole function group. Many of them are suspended, however, by measurement-specific parameters while a measurement is active (see section *Measurement Environment* in Chapter 4).

Configurations of measurements

A popup menu offering specific settings is assigned to each measurement group *(Power, Modulation, Code Domain Power, and Receiver Quality).* The following parameters can be defined for many measurements:

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

These settings are explained in more detail section *General Settings* on page 3.4).

Configuration via hotkeys

The softkeys and associated hotkeys in the graphical measurement menus provide the most important configurations for the current measurement (refer to Chapters 3 and 4 of the CMU Operating manual). Settings made via hotkeys supersede the corresponding settings found in the measurement configuration menu.

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.
- Measurement curves (traces) are displayed in a Cartesian coordinate system, the time 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 indicated results are constantly updated. As shown in the table below, some of the measurement groups are different for the two test modes.

Table 3-1: Measurement Groups of 1xEV-DO

Analyzer/Generator	Shows the settings for the signals generated and analyzed by the instrument and presents an overview of the basic scalar power and modulation results.
Power	The Narrow Band Power is measured in different statistic modes.
Modulation	Shows the error vector magnitude, magnitude error and phase error of the transmitted waveform interval as a function of time. The carrier feedthrough, I/Q imbalance, frequency error, transmission time error, waveform quality and MS power error are displayed. The I/Q Analyzer shows the I- and Q-parts of the signal in various diagrams to visualize the quality of the incoming signal.
Spectrum	Shows the ACP Spectrum for 4 different frequency offsets in a bar diagram.
Code Domain Power	The CMU measures the power of the access terminal's channels.

General Settings

A number of settings can be made in several of the configuration menus assigned to the measurement groups *Analyzer/Generator, Power*, *Modulation, Spectrum and Code Domain Power*. In combination, these settings define the scope of the measurement, i.e. the number of waveform intervals 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 sub-groups which can be configured separately.

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

Statistic Count / Statistics Cycle

The statistic count is equal to the integer number of evaluation periods which form one statistics cycle. An evaluation period corresponds to the duration of a waveform interval (all TX measurements). Depending on the *repetition mode* (see below), a measurement may extend over one or several statistics cycles.

The *statistic count* is set in the *Control* tab of the configuration popup menus assigned to each measurement group.

Repetition Mode

The *repetition mode* defines how many statistics cycles are measured if the measurement is not stopped by a limit failure (see stop condition *On Limit Failure* below). Two modes are available for all measurements:

Single Shot The measurement is stopped after one statistics cycle

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:

Counting Repeated single shot measurement with a fixed number of statistics cycles

The *repetition mode* is set in the *Control* tab of the configuration popup-menus assigned to the individual measurement groups.

Note: *In contrast to other measurement settings, thee 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

For all TX measurements, two stop conditions can be selected:

None The measurement is performed according to its repetition mode, regardless of the measurement results,

On Limit Failure The measurement is stopped as soon as one of the limits is exceeded, regardless 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 each measurement group.

Display Mode

In graphical measurement diagrams, the *Display Mode* defines which of the measured and calculated traces is displayed if the measurement extends over several waveform intervals. In general, traces are evaluated at a set of fixed, equidistant test points (samples). After n waveform intervals, n measurement results per test point have been taken. After a single shot measurement extending over c waveform intervals, c measurement results per test point have been

taken.

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

Minimum At each test point, the minimum value of all waveform intervals measured is displayed.

Maximum At each test point, the maximum value of all waveform intervals measured is displayed.

Max./Min. At each test point, the extreme value of all waveform intervals 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 waveform intervals measured is displayed; see paragraph on *Calculation of average quantities* below.

Note the difference in the calculation of *Average* on one hand, *Minimum, Maximum* and *Max./Min.* on the other hand, if the measurement extends over more than one statistic count (repetition mode *Continuous,* measurement time longer than one statistic count).

The *Display Mode* is set in the *Control* tab of the configuration popup-menus assigned to the individual measurement groups.

Calculation of average quantities

The *Average* traces in the menus are obtained as follows:

Let c be the number of waveform intervals forming one statistics cycle (one *Statistic Count)* and assume that n waveform intervals 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 waveform intervals 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 *Power* and *Modulation* 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 comprising the trace.
- The waveform interval number ranging from 1 to the number n of the current waveform interval.

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. One particular example is:

In the *Modulation* menu quantities such as the *Frequency Error*, *Phase Error RMS, Phase Error Peak* etc. are first calculated for the current waveform interval and entered in the *Current* column of the output table*.* The results in the *Minimum/Maximum* column correspond to the extreme value of the *Current* results calculated over all waveform intervals measured. The results in the *Average* column correspond to the average of the *Current* results calculated according to the prescription in paragraph *Calculation of average quantities* above.

Contents

4 Functions and their Application

This chapter explains in detail all functions for the measurement of access terminals supporting the 1xEV-DO standard. The CMU 200 with Option K88 supports the networks listed in Table 1-1 (see Chapter 1).

The chapter is structured according to the provided measurements and configurations. In contrast to chapter 6, *Remote Control – Commands,* general measurement configurations are relegated to the end of each section.

The description of each softkey, select or input field is followed by the corresponding remote-control command(s). Similarly, 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 according to the following scheme:

Softkey Short function definition

Designation of select/input field

Definition of function.

Further description of the function: 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
...
```

Note: *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 found in Chapter 3 of the CMU200 operating manual.*

1xEV-DO Module Tests

The structure of this section is based on the configuration and measurement groups defined in the function group *IMT-2000 Mobile Station, 1xEV-DO*. The menus are described in the following order:

- Analyzer/Generator Measurement menu
- Power Measurement menu
- Modulation Measurements
- Code Domain Power Measurements
- Common settings for the function group *(Connection Control)*

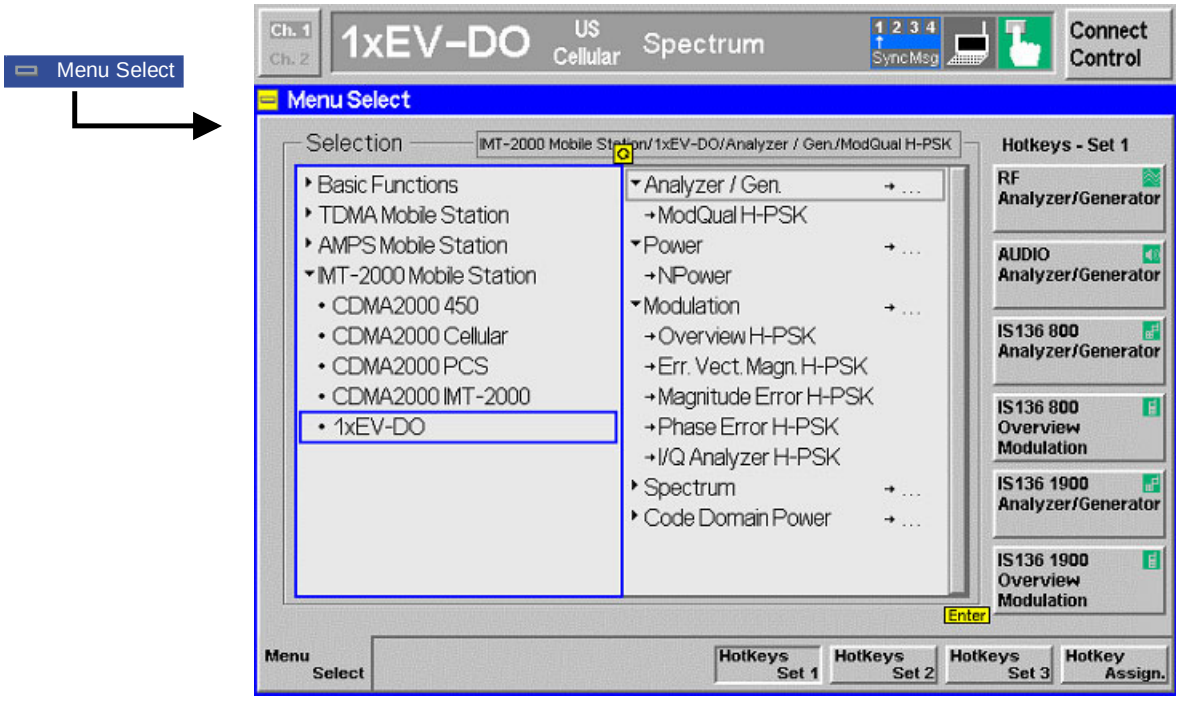


Figure 4-1 1xEV-DO applications

Analyzer/Generator Measurement

The *Analyzer/Generator* menu provides an overview over the 1xEV-DO function group, the current measurement status and the most important scalar parameters and measurement results.

The *Analyzer/Generator* menu is opened from the *Menu Select* menu (with associated key at the front of the instrument). The hotkeys associated to the *Menus* softkey switch over between the *Analyzer/Generator* menu and the remaining measurement menus of function group *1xEV-DO*.

In the softkey bar on the right side, the *Analyzer/Generator* menu provides different types of softkeys:

- The measurement control softkey *Mod. Qual. HPSK* controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Modulation Quality Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

Types of settings

The purpose of the *Analyzer/Generator* menu is to provide quick access to the most common *Modulation* measurements and to present the basic measurement results at a glance. All measurements prvovide two different types of settings:

- Common settings are valid for all applications of function group *1xEV-DO.* Changing common settings in any application will have an impact on all measurements and applications of the function group. All common settings are also provided in the *Connection Control* menu (see p. 4.47 ff.). Examples of common settings are the RF input level and trigger settings (softkey *Analyzer Level)* 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. 4.47 ff.). Examples of specific settings are the *Repetition* mode (to be set independently for all applications providing this mode).

Measurement results

The output fields in the left half of the *Analyzer/Generator* 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 f.

The results displayed in the *Analyzer/Generator* menu represent only a fraction of the modulation results that the CMU is able to acquire. A comprehensive set of test results is displayed in the *Modulation* measurement menus. In particular, the *Modulation* menus show many quantities as functions of time.

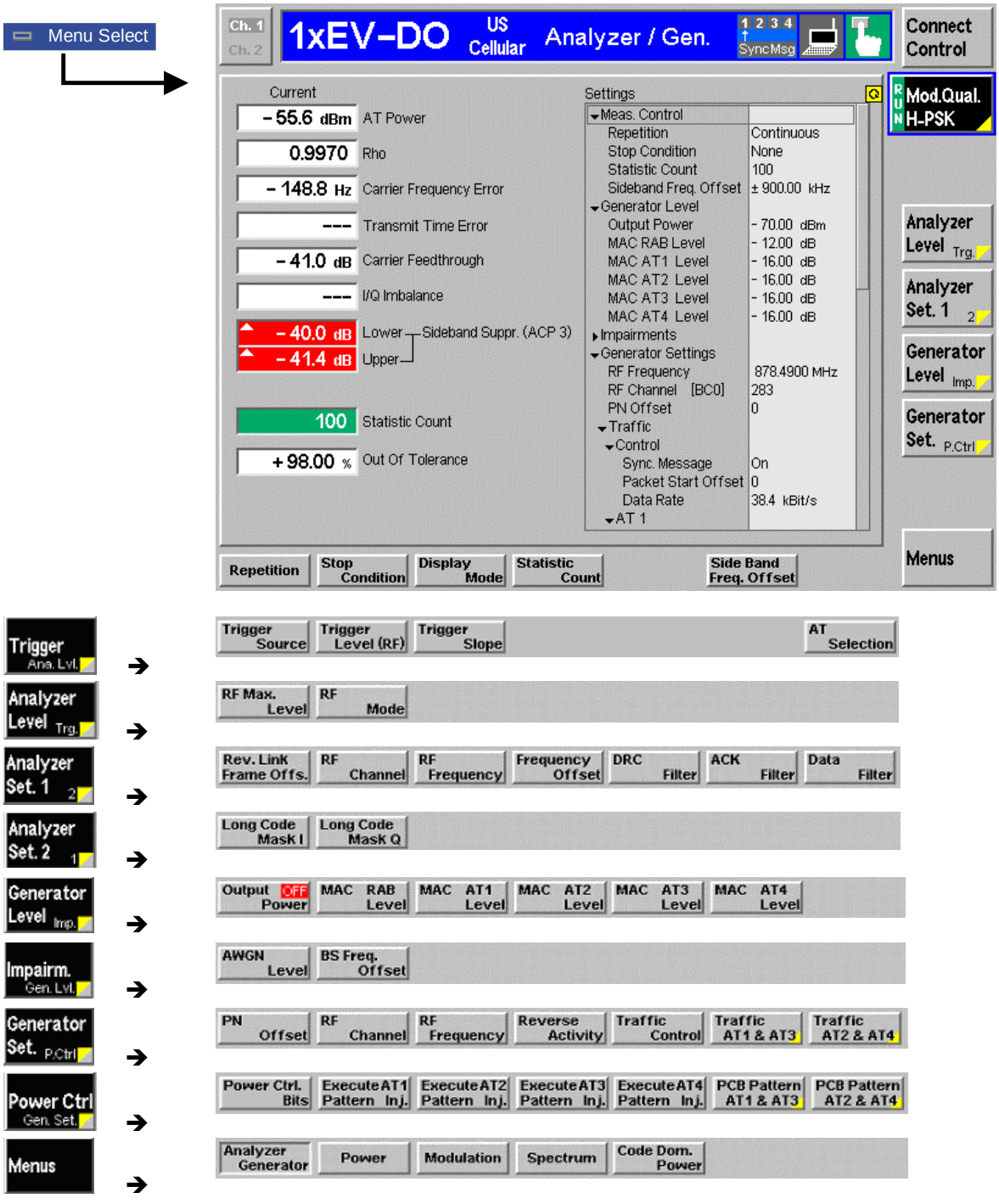


Figure 4-2 Measurement menu Analyzer / Generator

Softkey Selections

The *Analyzer/Generator* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The remaining softkeys select the application and provide application-specific settings.

Measurement Control

The *Analyzer/Generator* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys.

Mod. Qual. H-PSK

The *Mod. Qual. H-PSK* softkey controls this measurement and indicates its status *(RUN | HLT | OFF)*. To change the status, press the *Modulation* softkey once and then use the front panel keys *ON/OFF* or *CONT/HALT*.

Pressing the *Mod. Qual. H-PSK* softkey twice (once if already selected) opens the *Modulation Configuration* popup menu (see section *Analyzer/Generator Configuration* on p. 4.7 ff.).

Remote Control

```
INITiate:MODulation:OVERview:HPSK
ABORt:MODulation:OVERview:HPSK
STOP:MODulation:OVERview:HPSK
CONTinue:MODulation:OVERview:HPSK
FETCh[:SCALar]:MODulation:OVERview:HPSK:STATus?
```

Measurement configuration

Pressing the *Modulation* softkey twice (once if already selected) opens the *Modulation Configuration* popup menu (see page 4.7). Besides, the measurement control softkey provides hotkeys to define the scope of the measurement. All these settings are also provided in the configuration menu and described in more detail in section *Analyzer/Generator Configuration – Control* on page 4.7 ff.

Common settings

As outlined in section *Analyzer/Generator on p.* 4.3 ff., some of the hotkey/softkey combinations in the *Analyzer/Generator* menu are valid irrespective of the application. These common settings are also provided in the *Connection Control* menu; for a detailed description refer to p. 4.47 ff.

Softkeys

- The *Trigger/Analyzer Level* softkey defines the trigger settings for the measurements and controls the level in the RF signal path. The settings are provided in the *Trigger* and *Analyzer* tabs of the *Connection Control* menu; see sections *Trigger (Connection Control – Trigger)* on p. 4.63 ff. and *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Analyzer Settings 1/2* softkey defines the center frequency of the RF analyzer. The settings are provided in the *Analyzer* tab of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Generator Level/Impairment* softkey defines the levels in all physical channels of the generated forward 1xEV-DO signal and configures an additive noise signal. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.
- The *Generator Settings/Power Control* softkey defines the frequency of the generated forward 1xEV-DO signal, its modulation and an offset of the PN sequence. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.

Settings table

The *Settings* table in the right half of the *Analyzer/Generator* menu gives an overview of the measurement settings of the current application as defined by means of the softkey/hotkey combinations or in the configuration menus. It changes when a different application is selected. The roll-key scrolls and expands the *Setup* table.

Measurement Results

The results are displayed in various output fields in the left half of the measurement menu. The display mode *(Current, Min./Max.* or *Average)* can be selected with the softkey Display Mode which is visible when the Measurement Control softkey has been selected.

Display mode

Output fields

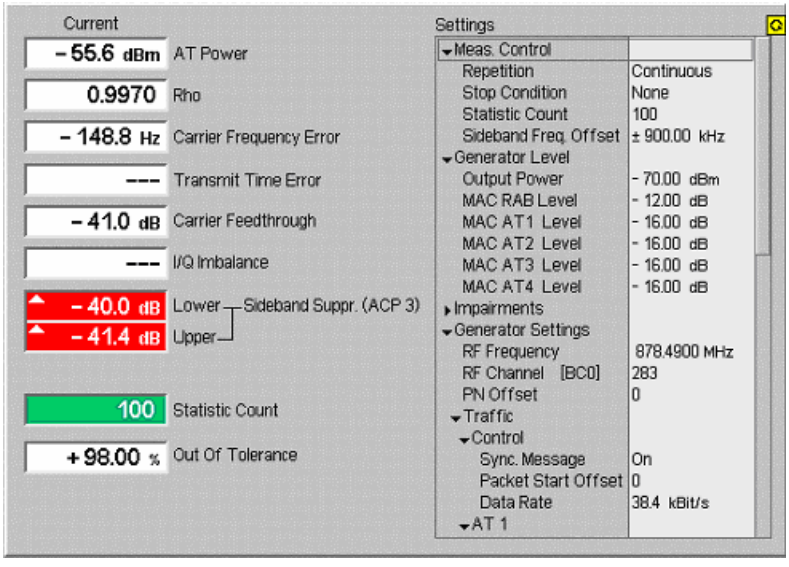


Figure 4-3 Display of results (Analyzer/Generator)

Filter settings for power measurements

The CMU measures and displays different power results, acquired with different measurement methods.

Most of the power measurements are performed using the baseband receiver filter specified in standard TIA/EIA/IS-856-2. In particular, this holds for *AT Power* displayed in the *Analyzer/Generator* menu. The power results listed in the table below are obtained with different measurement filters.

Table 4-7 Filer settings for power measurements

Value	Menu	Filter
AT Power	Analyzer/Generator, see below.	Receiver Filter according to 1xEV-DO standard
Sideband Suppression	Analyzer/Generator, see below.	30 kHz (Gaussian) spectrum analyzer filter
Wideband Power	Connection Control, AF/RF (see p. 4.61)	Wideband measurement

AT Power

AT Power is the total transmitted power level from the access termnal. The AT power is measured at the analyzer frequency *(RF Frequency,* typically set to the carrier frequency) using the receiver filter specified in standard TIA/EIA/IS-856-2.

In addition to the AT *Power*, the CMU measures the power at an offset frequency from the carrier; see *Sideband Suppression* below.

Rho

Rho is the modulation accuracy of the transmitted signal. Rho is obtained by comparing the transmitted signal to an ideal signal as defined in standard TIA-866.

Carrier Frequency Error *Carrier Frequency Error* is the difference between the nominal frequency of the selected channel and the measured frequency.

Transmit Time Error *Transmission Time Error* is the time offset between the access terminal's signal and the CMU's signal.

Carrier Feedthrough Carrier Feedthrough refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.

I/Q Imbalance *I/Q Imbalance* is the amplitude ratio between the in-phase (I) and quadrature (Q) components of the signal.

Sideband Suppression *Sideband Suppression* is a power measurement at a user–configurable offset frequency used for spurious measurements. In contrast to the AT *Power* the sideband suppression is measured with a 30 kHz (Gaussian) spectrum analyzer filter. The frequency offset is set via the *Side Band Freq. Offset* hotkey associated to the measurement control softkey.

Lower Sideband Suppr. Ratio of the sideband power at *RF Frequency – Side Band Freq. Offset* to the *AT Power* in dB

Upper Sideband Suppr. Ratio of the sideband power at *RF Frequency + Side Band Freq. Offset* to the *AT Power* in dB

Note: *In remote control the lower and upper sideband suppression can be measured at up to 4 different frequencies; see keywords* `...ACP1` *to* `...ACP4`.

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

Out of Tolerance *Out of Tolerance* is the percentage of waveform intervals that exceed the defined limits.

Remote control
```
READ[:SCALar]:MODulation:MQUality:HPSK?
FETCh[:SCALar]:MODulation:MQUality:HPSK?
SAMPle[:SCALar]:MODulation:MQUality:HPSK?
```

Analyzer/Generator Configuration

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

The popup menu *Modulation Configuration* is activated by pressing the measurement control softkey at the top right in the graphical measurement menu *Modulation* twice. It is possible to change between the tabs by pressing the associated hotkeys.

Analyzer/Generator Configuration – Control

The *Control* tab controls the Modulation measurement by determining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- The number of waveform intervals/evaluation periods forming a statistics cycle *(Statistic Count)*
- The type of result displayed *(Display Mode)*

- The frequency offset used for the sideband suppress power measurement *(Sideband Freq. Offset)*

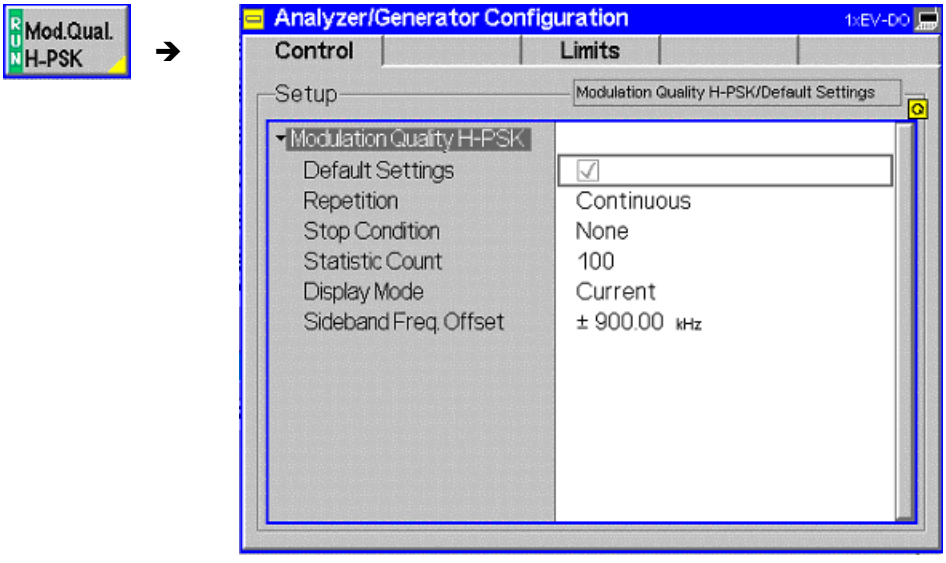


Figure 4-4 Modulation Configuration – Control

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:MODulation:MQUality:HPSK:CONTrol ON | OFF`

Repetition The *Repetition* parameter defines how often the measurement is repeated:

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 *Modulation* softkey.

Unless otherwise stated, a statistics cycle corresponds to the number of waveform intervals/evaluation periods set under *Statistic Count*.

Continuous Continuous measurement: The CMU continues the measurement until it is terminated explicitly (or until the stop condition for the measurement is met, see below). The measurement results are valid after one statistics cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the softkey *Mod.Qual.HPSK*.

Single shot should 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 measurement mode with a defined number of measurement cycles to be performed, see chapter 6 of this manual. The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control
```
CONFigure:MODulation:MQUality:HPSK:CONTrol
        CONTinuous | SINGleshot | 1 ... 10000,<StopCondition>,
                                        <Stepmode> etc.
```

Stop Condition

The *Stop Condition* field defines a stop condition for the measurement:

NONE Continue measurement irrespective of the results of the limit check

On Limit Failure Stop measurement as soon as the limit check fails (one of the tolerances is exceeded)

The *Stop Condition* setting is valid for both the *Single Shot* and *Continuous* repetition modes.

Remote control
```
CONFigure:MODulation:MQUality:HPSK:CONTrol
         <Repetition>,SONerror | NONE, <Stepmode> etc.
```

Display Mode

The *Display Mode* field defines which of the four measured and calculated statistical measurement results is displayed. The measurement results differ in the way the waveform interval Modulation *p(t)* at a fixed point in time *t* is calculated if the measurement extends over several waveform intervals; see section *Common Settings* in Chapter 3:

Current Measured value for current waveform interval

Minimum/Maximum Extreme value of a number of waveform intervals

Average Average value over a number of waveform intervals

The number of waveform intervals for calculation of the statistical values *Minimum/Maximum* and *Average* – and thus the result – depends on the repetition mode set. In detail, this implies:

Single shot Display of minimum/maximum and average value from the performed statistics cycle.

Continuous Display of minimum/maximum from all waveform intervals already measured. The average value, however, is calculated according to the rule in Chapter 3, section *General Settings*.

Remote control
no display mode set, the `READ...`, `FETCh...` and `SAMPle` commands retrieve all values.

Statistic Count

The input field *Statistic Count* defines the length of the statistics cycles in waveform intervals.

The settings *1* and *OFF* (press *ON/OFF* key) are equivalent. A statistics cycle determines the duration of single-shot measurements.

Remote control
```
CONFigure:MODulation:MQUality:HPSK:CONTrol
 <Statistics>, <Repetition>, <Stop Cond>, <Step Mode>
```

Side Band Freq. Offset

The *Side Band Freq. Offset* input field sets the frequency offset used for the *Sideband Suppression* power measurement; see section *Measurement Results* on p. 4.6 ff. The sideband suppression is measured at the two offset frequencies symmetrical to the *RF Frequency* (lower and upper sideband suppression).

In remote control up to 4 different frequency offsets can be defined so that up to 8 symmetrical sideband suppression values are available:

`CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>`, where <nr> = 1 to 4

Analyzer/Generator Configuration – Limits

The *Limits* tab defines upper and lower error limits for the measured values of all three *Modulation* measurement applications. The limits are set independently for the display modes *Current* and *Max./Min.* on one hand, *Average* on the other hand; see section *Analyzer/Generator Configuration – Control* on p. 4.7 ff. All measured values are described in section *Measurement Results* on p. 4.6 ff.

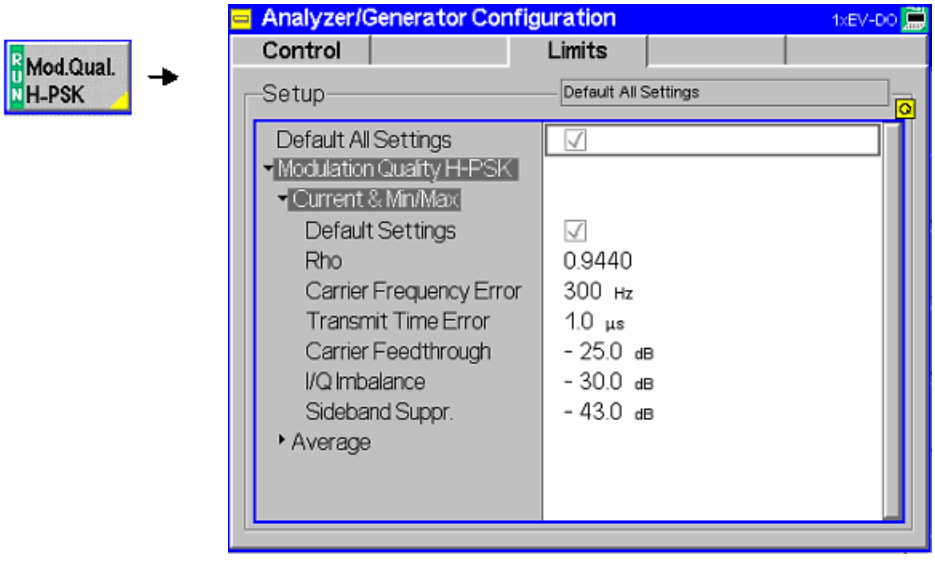


Figure 4-5 Modulation Configuration – Limits

Default All Settings

The *Default All Settings* switch assigns default values to all parameters of 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 and statistical modes are provided.

Remote control
`DEFault:MODulation:MQUality:HPSK:CMMax:LIMit ON | OFF`
`DEFault:MODulation:MQUality:HPSK:AVERage:LIMit ON | OFF`

Current & Max/Min

Current and Max/Min sets the limits for the measured values in the current waveform interval or of the extreme values of all measured waveform intervals *(Min/Max)*.

Remote control
`CONFigure:MODulation:MQUality:HPSK:CMMax:LIMit`

Average

Average sets the limits for the average value of the measured values obtained according to the averaging rules of Chapter 3, section *General Settings.*

Remote control
`CONFigure:MODulation:MQUality:HPSK:AVERage:LIMit`

Power Measurements

The *Power* menu provides access to the Narrow Band Power and the Open Loop measurement of the 1xEV-DO function group, the current measurement status and the most important scalar parameters and measurement results.

The *Power* menu is opened from the *Menu Select* menu (with associated key at the front of the instrument). The hotkeys associated to the *Menus* softkey switch over between the *Power* menu and the remaining measurement menus of function group *1xEV-DO*.

In the softkey bar on the right side, the *Power* menu provides different types of softkeys:

- The measurement control softkey *NPower* controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *NPower*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys RF Max. Level and RF Mode belong to the softkey Analyzer Level). The softkey/hotkey combinations provide test settings and switch over between different measurements.

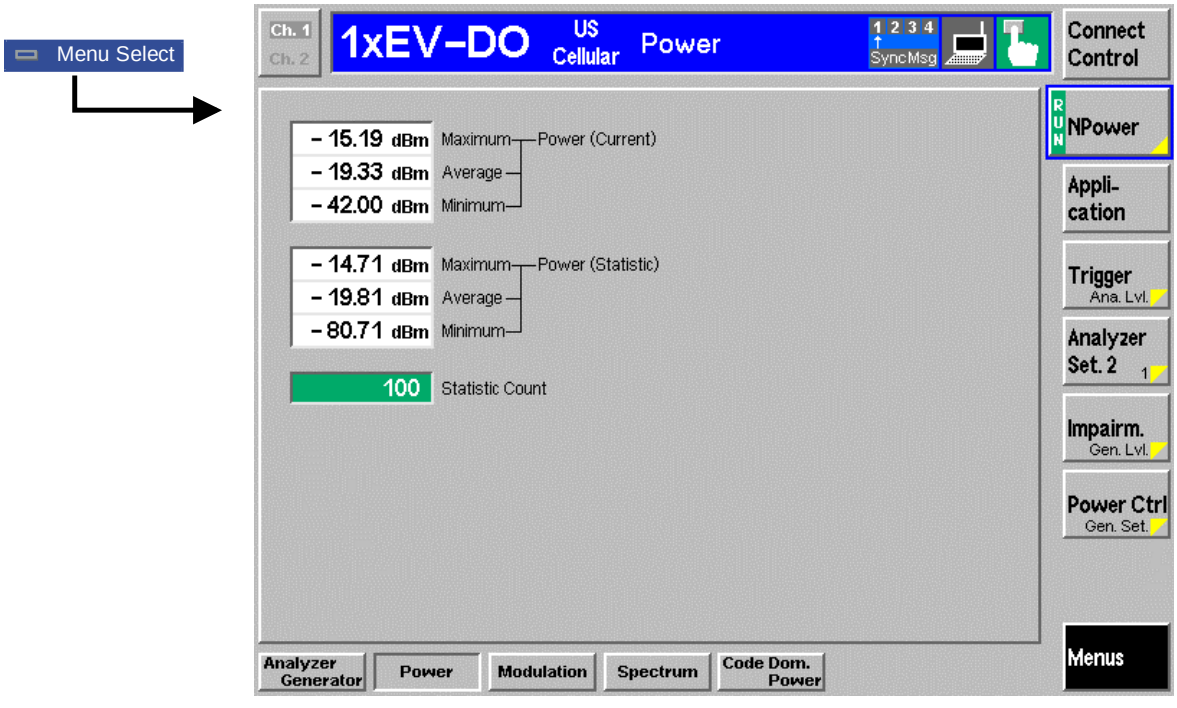


Figure 4-6 Measurement menu Power

Softkey Selections

The *Power* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The remaining softkeys select the application and provide application-specific settings.

Measurement Control

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

Appli-cation

Currently, there is only the application *NPower* available.

NPower

The *NPower* softkey controls the *NPower* measurement and indicates its status *(RUN | HLT | OFF)*. To change the status, press the *NPower* softkey once and then use the front panel keys *ON/OFF* or *CONT/HALT*.

Pressing the *NPower* softkey twice (once if already selected) opens the *NPower Configuration* popup menu (see section *Power Configuration* on p. 4.14 ff.).

Remote Control

```
INITiate:NPOWer
ABORt:NPOWer
STOP:NPOWer
CONTinue:NPOWer
FETCh[:SCALar]:NPOWer:STATus?
```

Measurement configuration

Pressing the *NPower* softkey twice (once if already selected) opens the *Power Configuration* popup menu (see page 4.14). Besides, the measurement control softkey provides hotkeys to define the scope of the measurement. All these settings are also provided in the configuration menu and described in more detail in section *Analyzer/Generator Configuration – Control* on page 4.7 ff.

Common settings

As outlined in section *Analyzer/Generator on p.* 4.3 ff., some of the hotkey/softkey combinations in the *Analyzer/Generator* menu are valid irrespective of the application. These common settings are also provided in the *Connection Control* menu; for a detailed description refer to p. 4.47 ff.

Softkeys

- The *Trigger/Analyzer Level* softkey defines the trigger settings for the measurements and controls the level in the RF signal path. The settings are provided in the *Trigger* and *Analyzer* tabs of the *Connection Control* menu; see sections *Trigger (Connection Control – Trigger)* on p. 4.63 ff. and *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Analyzer Settings 1/2* softkey defines the center frequency of the RF analyzer. The settings are provided in the *Analyzer* tab of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Generator Level/Impairment* softkey defines the levels in all physical channels of the generated forward 1xEV-DO signal and configures an additive noise signal. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.
- The *Generator Settings/Power Control* softkey defines the frequency of the generated forward 1xEV-DO signal, its modulation and an offset of the PN sequence. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.

Measurement Results

The results are displayed in various output fields in the left half of the measurement menu. The result fields are grouped in two statistic types *(Current* or *Average)* which are themselves divided in three types of results *(Average, Minimun and Maximum)*.

Display mode

Output fields

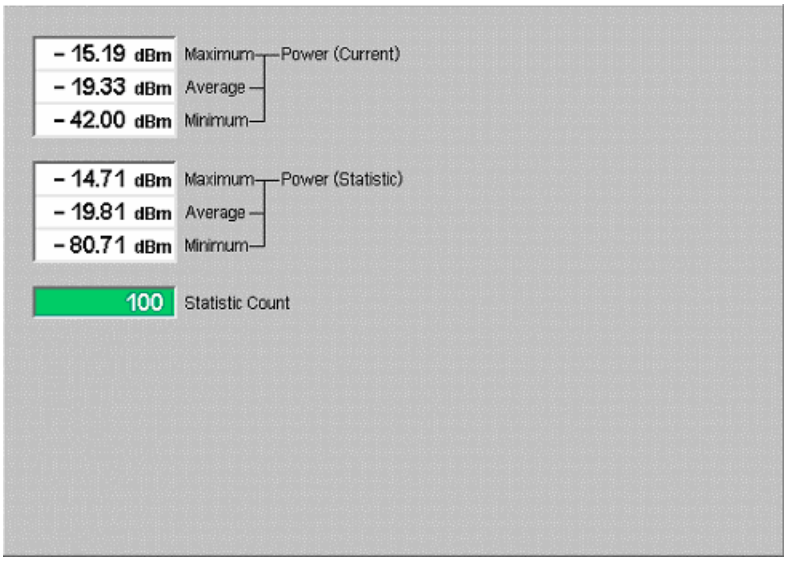


Figure 4-7 Display of results (NPower)

Filter settings for power measurements

The CMU measures and displays different power results, acquired with different measurement methods.

Most of the power measurements are performed using the baseband receiver filter specified in standard TIA/EIA/IS-856-2. In particular, this holds for *AT Power* displayed in the *Analyzer/Generator* menu. The power results listed in the table below are obtained with different measurement filters.

Table 4-7 Filer settings for power measurements

Value	Menu	Filter
AT Power	Analyzer/Generator, see below.	Receiver Filter according to 1xEV-DO standard

Power (Current) The Narrow Band Power is measured over a given capture buffer size which by default has a size of 4096 measurement shots.

- Average The Average is calculated on the base of the shots in this capture buffer size.

- Minimum The Minimum Power value shot in the capture buffer size.

- Maximum The Maximum Power value shot in the capture buffer size.

Power (Statistic) Statistic uses the Statistic Count to calculate the average over several capture buffers. e.g. with a Statistic Count of 100 the average is build over 409600 shots.

- Average This is the average of all the shots made in the Statistic Count period.

- Minimum The absolute minimum measured power over all the measurement shots in Statistic Count.

- Maximum The absolute maximum measured power over all the measurement shots in Statistic Count.

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

Remote control
```
READ[:SCALar]:NPOWer?
FETCh[:SCALar]:NPOWer?
SAMPle[:SCALar]:NPOWer?
```

Power Configuration

The popup menu *Power Configuration* contains a tab to determine the parameters controlling the Modulation measurement including the error tolerances.

The popup menu *Power Configuration* is activated by pressing the measurement control softkey at the top right in the graphical measurement menu *NPower* twice. It is possible to change between the tabs by pressing the associated hotkeys.

Power Configuration – Control

The *Control* tab controls the Modulation measurement by determining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- The number of evaluation periods forming a statistics cycle *(Statistic Count)*
- The power step control for the Open Loop Time Response measurement

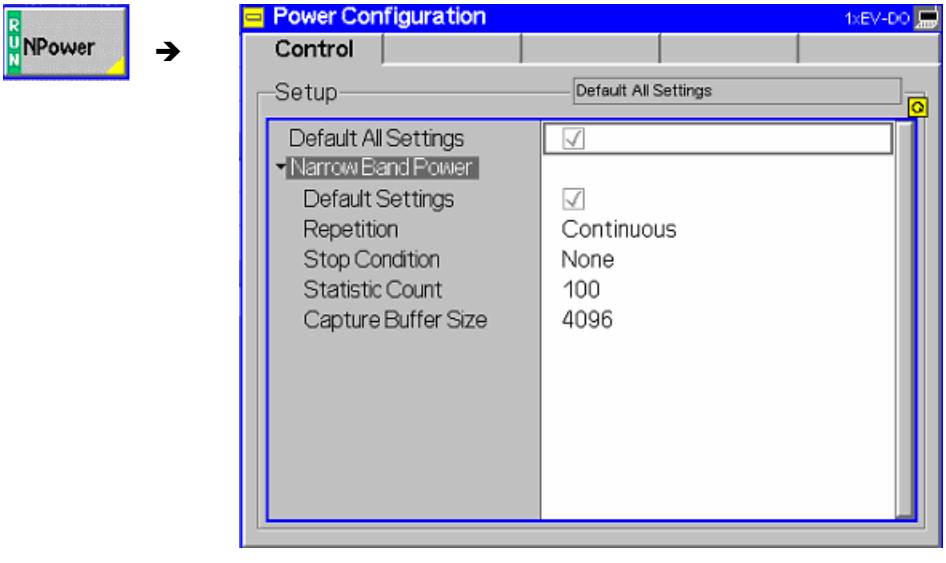


Figure 4-8 Power Configuration – Control

All settings may not be available for all power measurement applications. The statistical settings *Repetition, Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all measurements; they are described in section *Analyzer/Generator Configuration – Control* on p.4.7 ff.

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.

Capture Buffer Size *Capture Buffer Size* allows the user to select the buffer size for all measurements shot.

Remote Control `CONFigure:NPOWer:CONTrol:CBSize <CaptureBufferSize>`

Modulation Measurements

The menu group *Modulation* contains several applications to measure the modulation parameters such as frequency error, waveform quality of the access terminal, and matching of the respective tolerance limits. Measurement results are displayed with a graph and a table of measurement results. The popup menu *Modulation Configuration* configures the parameters of the modulation measurements.

The *Analyzer/Generator* menu is opened from the *Menu Select* menu (with associated key at the front of the instrument). The hotkeys associated to the *Menus* softkey switch over between the *Analyzer/Generator* menu and the remaining measurement menus of function group *1xEV-DO*.

- The measurement control softkey *Overview H-PSK* changes to *EVM H-PSK* etc.*,* depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Modulation Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

The CMU measures the H-PSK modulation accuracy by calculating the Phase Error, Magnitude Error, and Error Vector Magnitude of the modulated signal from the access terminal. *Figure 4-9* shows a representation of these signal errors compared to an ideal signal.

Phase Error (PE) is the measured phase difference of the I/Q components of the signal received (from the access terminal) and an ideal reference signal at the detection points.

Magnitude Error (ME) is the normalized magnitude (amplitude) difference of the I/Q components of the signal received from the access terminal and an ideal reference signal at the detection points.

Error Vector Magnitude (EVM) is the normalized magnitude of the calculated vector linking the measured I/Q values to the ideal signal's I/Q components at the detection points.

The In-phase and Quadrature reference components are based on an H-PSK waveform as specified in the IS-856-2 standards publication.

For a 1xEV-DO signal the composite Phase Error (PE), Magnitude Error (ME), Error Vector Magnitude (EVM), and Waveform Quality are calculated.

The measurement interval for is 616 chip intervals (≅ 0.5 ms). The graphical displays represents 616 chips.

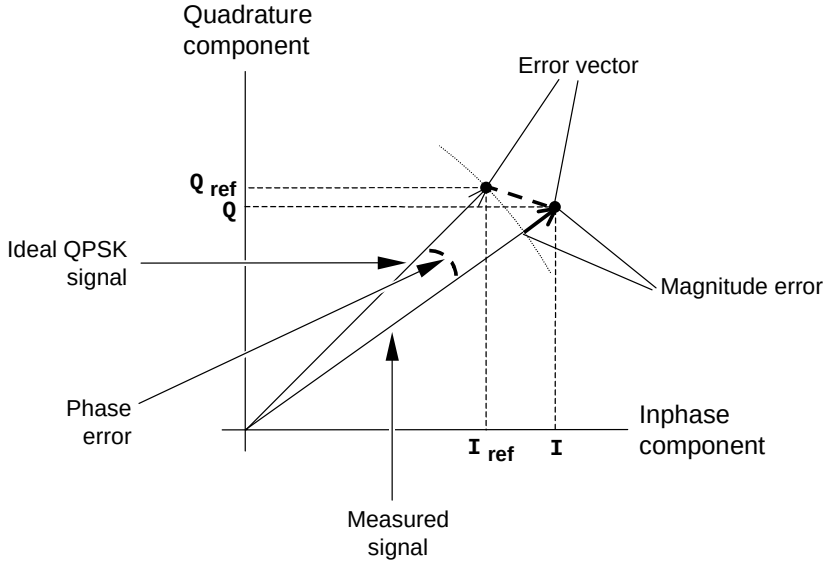


Figure 4-9 Modulation errors

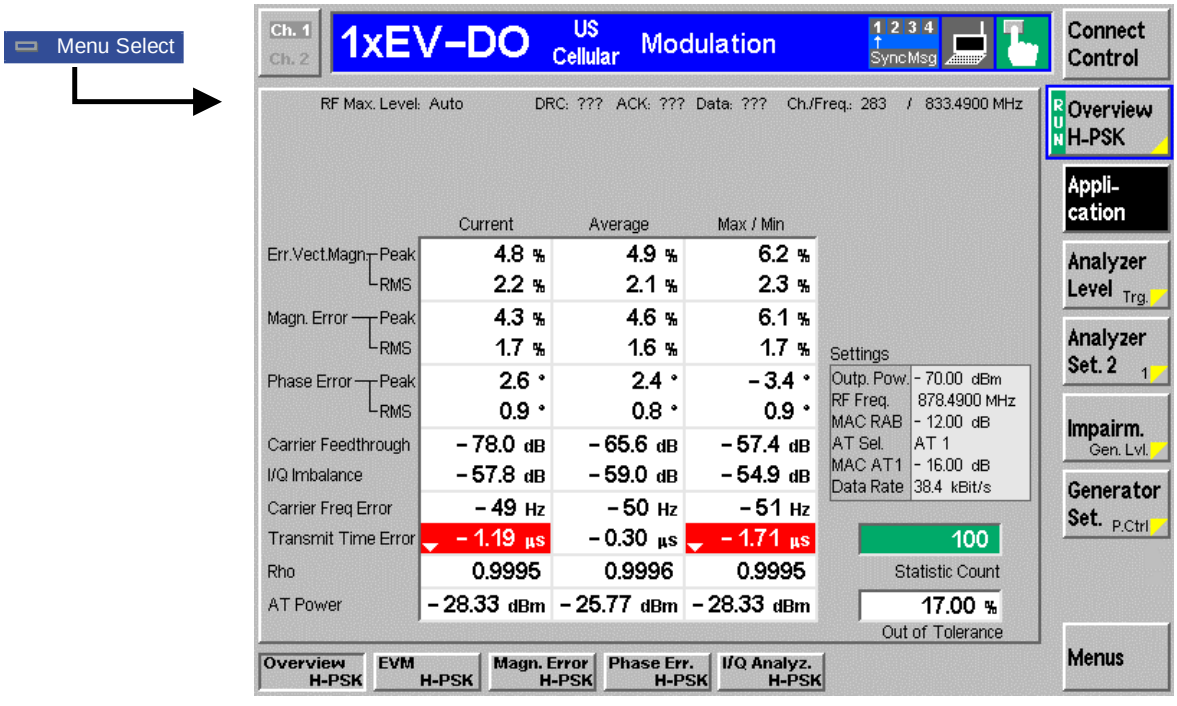


Figure 4-10 Measurement menu Modulation

Softkey Selections

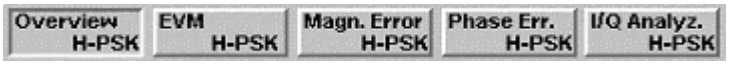
Each *Modulation* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The remaining softkeys select the application and provide application-specific settings.

Measurement Control

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

Appli-cation

The *Application* softkey activates a set of hotkeys to select a modulation application. When an application is selected, the corresponding measurement screen is displayed.



.

Overview H-PSK

The *Overview HPSK* hotkey displays the statistics for all modulation measurements. No graphical display is provided.

Remote Control

```
INITiate:MODulation:MQUality:HPSK
ABORt:MODulation:MQUality:HPSK
STOP:MODulation:MQUality:HPSK
CONTinue:MODulation:MQUality:HPSK
FETCh[:SCALar]:MODulation:MQUality:HPSK:STATus?
```

EVM H-PSK

The *Error Vector Magnitude H-PSK* hotkey displays the Error Vector Magnitude. The Error Vector Magnitude measurement is described in section *Measurement Results* on p. 4.19 ff.

Remote Control
```
INITiate:MODulation:EVMagnitude:HPSK
ABORt:MODulation:EVMagnitude:HPSK
STOP:MODulation:EVMagnitude:HPSK
CONTinue:MODulation:EVMagnitude:HPSK
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK:STATus?
```

Magn. Err. H-PSK

The *Magnitude Error H-PSK* hotkey displays the Magnitude Error measurement. The Magnitude Error measurement is described in section *Measurement Results* on p. 4.19 ff.

Remote Control
```
INITiate:MODulation:MERRor:HPSK
ABORt:MODulation:MERRor:HPSK
STOP:MODulation:MERRor:HPSK
CONTinue:MODulation:MERRor:HPSK
FETCh[:SCALar]:MODulation:MERRor:HPSK:STATus?
```

Phase Err. H-PSK

The *Phase Error H-PSK* hotkey displays the Phase Error measurement. The Phase Error measurement is described in section *Measurement Results* on p. 4.19 ff.

Remote Control
```
INITiate:MODulation:PERRor:HPSK
ABORt:MODulation:PERRor:HPSK
STOP:MODulation:PERRor:HPSK
CONTinue:MODulation:PERRor:HPSK
FETCh[:SCALar]:MODulation:PERRor:HPSK:STATus?
```

I/Q Analyz. H-PSK

The *I/Q Analyz.* hotkey displays the I/Q Analyzer measurement. The I/Q Analyzer measurement is described in section *Measurement Results* on p. 4.19 ff.

Remote Control
```
INITiate:MODulation:IQANalyzer:HPSK
ABORt:MODulation:IQANalyzer:HPSK
STOP:MODulation:IQANalyzer:HPSK
CONTinue:MODulation:IQANalyzer:HPSK
FETCh[:SCALar]:MODulation:IQANalyzer:HPSK:STATus?
```

Measurement configuration

Pressing the *Modulation* softkey twice (once if already selected) opens the *Modulation Configuration* popup menu (see page 4.7). Besides, the measurement control softkey provides hotkeys to define the scope of the measurement. All these settings are also provided in the configuration menu and described in more detail in section *Analyzer/Generator Configuration – Control* on page 4.7 ff.

Marker **Display**

The *Marker/Display* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.67 ff for detailed information about markers.

The softkey is only available for the following applications: *EVM H-PSK., Magn. Err H-PSK* and *Phase Err H-PSK.*

Display

The *Display* softkey is available for the application *I/Q Analyz* only. It allows to select the Zoom of the diagram and the displayed Waveform Type.

Common settings

As outlined in section *Analyzer/Generator on p.* 4.3 ff., some of the hotkey/softkey combinations in the *Analyzer/Generator* menu are valid irrespective of the application. These common settings are also provided in the *Connection Control* menu; for a detailed description refer to p. 4.47 ff.

Softkeys

- The *Trigger/Analyzer Level* softkey defines the trigger settings for the measurements and controls the level in the RF signal path. The settings are provided in the *Trigger* and *Analyzer* tabs of the *Connection Control* menu; see sections *Trigger (Connection Control – Trigger)* on p. 4.63 ff. and *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Analyzer Settings 1/2* softkey defines the center frequency of the RF analyzer. The settings are provided in the *Analyzer* tab of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Generator Level/Impairment* softkey defines the levels in all physical channels of the generated forward 1xEV-DO signal and configures an additive noise signal. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.
- The *Generator Settings/Power Control* softkey defines the frequency of the generated forward 1xEV-DO signal, its modulation and an offset of the PN sequence. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.

Settings table

The *Settings* table on the right side of the *Modulation* menu gives an overview of the measurement settings of the current application as defined by means of the softkey/hotkey combinations or in the configuration menus. It changes when a different application is selected. The roll-key scrolls and expands the *Setup* table.

Measurement Results

The modulation measurement screens are similar for the applications *EVM H-PSK, Magn. Err. H-PSK and Phase Err. H-PSK*. The *Overview H-PSK* application does not provide a graph. The application *I/Q Analyzer* will be described in section *I/Q Analyzer* on p. 4.22 ff.

EVM H-PSK, Magn. Err. H-PSK and Phase Err. H-PSK

The description of the graphs and common output data follows below. Information specific to an application is located within the application heading. Limits for all modulation measurements are defined in the *Modulation Control* configuration menu.

The measurement screens can be divided into three groups:

- Scalar measurement results (parameter lines and output tables)
- Graph (a trace plotted as a function of time)
- Settings overview

Parameter lines 1 and 2

Measurement graph

Output table

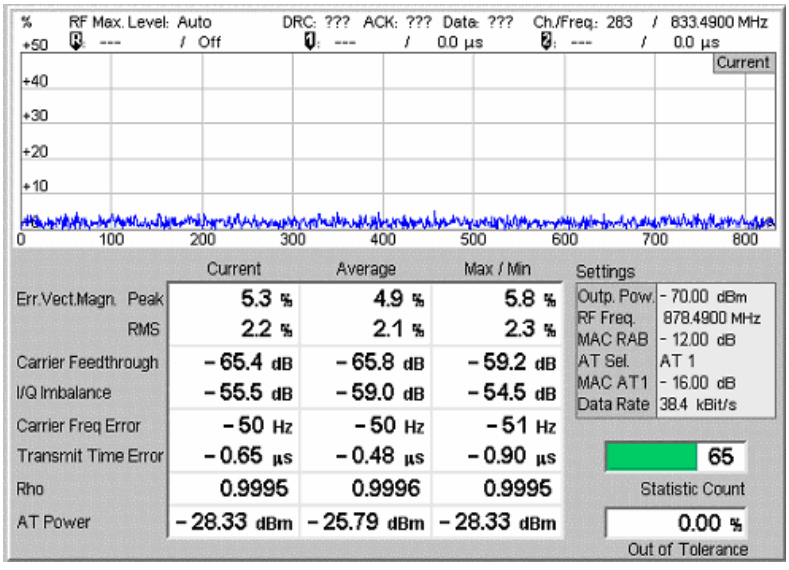


Figure 4-11 Modulation results display

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the *Settings* table below.

1st Line The first parameter line contains the following settings:

RF Max. Level	The total output power, either calculated as a function of the RF generator output level (Auto) or set manually.
DRC	The settings of the DRC channel filter
ACK	The settings of the ACK channel filter
Data	The settings of the Data channel filter
Ch./Freq	Channel and frequency set for the BS Signal

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

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Settings The values shown in the *Settings* table are defined in the *Control* tab of the *Connection Control* menu; see section *Modulation Configuration – Control* on p. 4.26 ff.

Measurement Graph The *Measurement Graph* is displayed as a continuous curve together with the limit lines and all active markers.

The graph in each measurement shows the respective measurement error as a function of time. The display mode for the graph *(Current, Average, Max/Min)* is indicated in the upper right corner of the screen.

Statistic Count The *Statistic Count* is the number of intervals since the start of the measurement. The bar graph represents a percentage of intervals measured based on the number of intervals *(Statistic Count)* set in the configuration menu.

Output Table

The output table contains a tabular overview of modulation related measurements. The first rows of data are specific to the selected modulation measurement. The remaining rows are identical for each modulation measurement.

Three values are given for each row:

Current	These are the current values of the measurement interval.
Max/Min	These are the extreme values (and their polarity) of all measurement intervals since the measurement started.
Average	These are the average values of a number of measurement intervals (defined by the *Statistic Count* setting; see section *General Settings* in Chapter 3).

Any values exceeding the defined limits appear with a red background. Limit values are set in the Limit tab of the *Modulation Configuration* menu.

Modulation Error

Refer to the respective measurement type for information about the data reported in these first two rows.

Phase Error	Measured phase difference of the I/Q components of the signal received (from the access terminal) and an ideal reference signal at the detection points.
Magnitude Error	Difference in magnitude (in percent) between the received signal waveform and an ideal HPSK signal waveform. The magnitude error is the difference in amplitude between the measured signal from the access terminal transmitter and an ideal signal waveform at the detection points.
Error Vector Magnitude	Calculated percentage of vector error (at the detection points) between the received signal and an ideal signal.

Carrier Feedthrough

Carrier Feedthrough refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.

I/Q Imbalance

I/Q Imbalance is the amplitude ratio between the in-phase (I) and quadrature (Q) components of the signal.

Carrier Freq Error

Carrier Frequency Error is the difference between the nominal frequency of the selected channel and the measured frequency.

Transmit Time Error

Transmission Time Error is the time offset between the access terminal's signal and the CMU's signal.

Rho

Rho is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal HPSK signal as defined in standard TIA-866.

AT Power

AT Power is the total transmitted power level from the access terminal.

Remote Control

```
READ[:SCALar]:MODulation:OVERview:HPSK?
FETCh[:SCALar]:MODulation:OVERview:HPSK?
SAMPle[:SCALar]:MODulation:OVERview:HPSK?

READ[:SCALar]:MODulation:EVMagnitude:HPSK?
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK?
SAMPle[:SCALar]:MODulation:EVMagnitude:HPSK?
```

```
READ[:SCALar]:MODulation:MERRor:HPSK?
FETCh[:SCALar]:MODulation:MERRor:HPSK?
SAMPle[:SCALar]:MODulation:MERRor:HPSK?

READ[:SCALar]:MODulation:PERRor:HPSK?
FETCh[:SCALar]:MODulation:PERRor:HPSK?
SAMPle[:SCALar]:MODulation:PERRor:HPSK?
```

Overview

The Overview application allows you to view all modulation measurements in a single output table (no graph of the measurements is provided).

The peak and the RMS values of the current measurement interval are displayed for each modulation application. The average values (positive or negative) are calculated over a user definable number of *Statistic Counts*. The Min/Max. values are the extreme values from the start of the measurement.

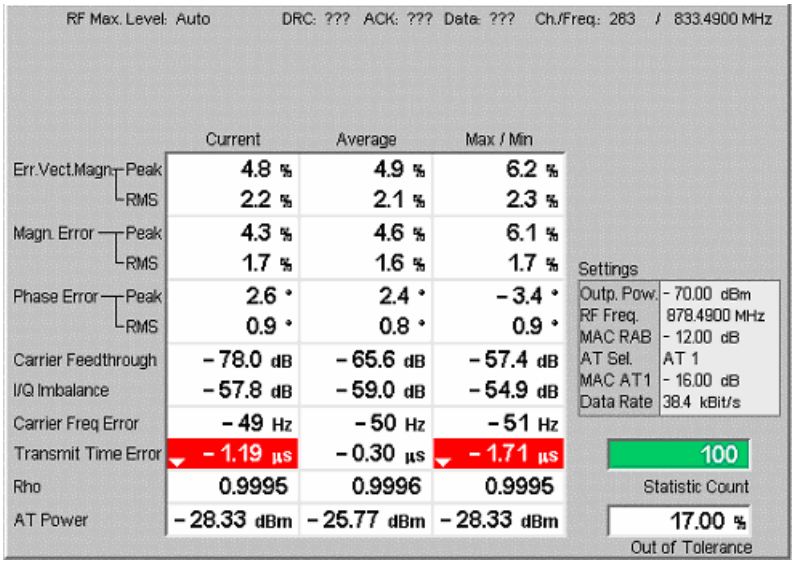


Figure 4-12 Overview display

I/Q Analyzer

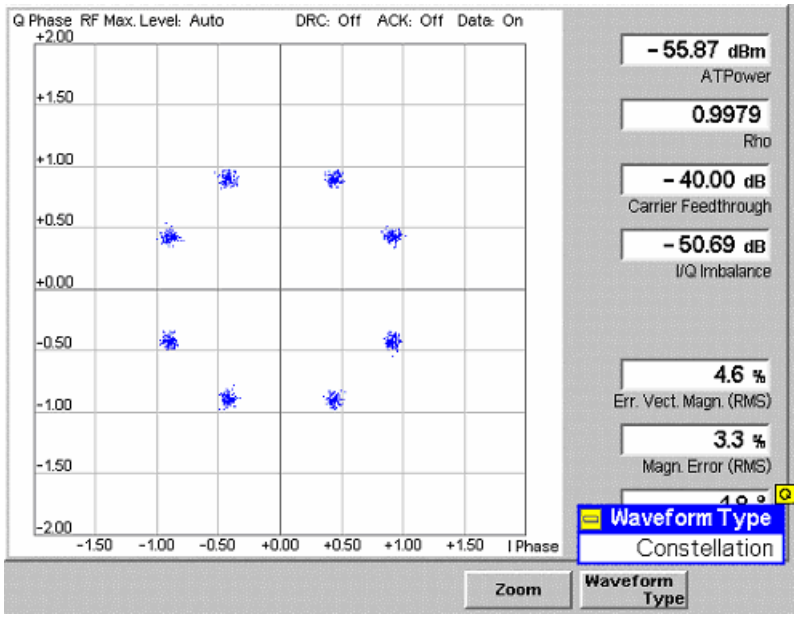
The I/Q Analyzer application displays I/Q diagrams to visualize the quality of the received measurements results. The benefit of this measurement is to easily identify issues with the received signals. To achieve this, the application I/Q-Analyzer can display the measurement results in 5 different diagrams:

- Constellation Diagram
- Vector Diagram
- I Phase Diagram
- Q Phase Diagram
- I Phase & Q Phase Diagram

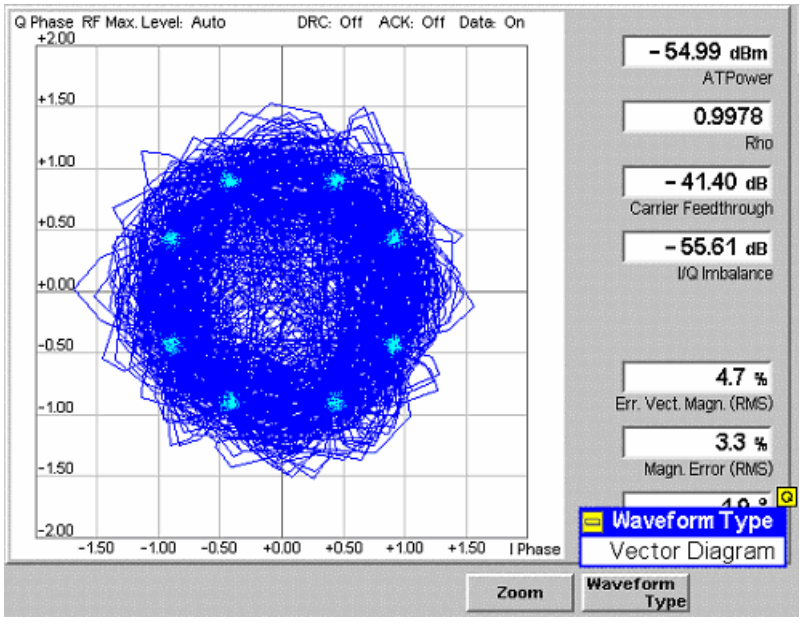
Constellation Diagram and Vector Diagram contain additional scalar information of the current measurement.

The settings of the *Code Channel Filters* (section Analyzer Control (Connection Control – Analyzer) on pg. 4.48) have a major influence on evaluation and display of the measurement results.

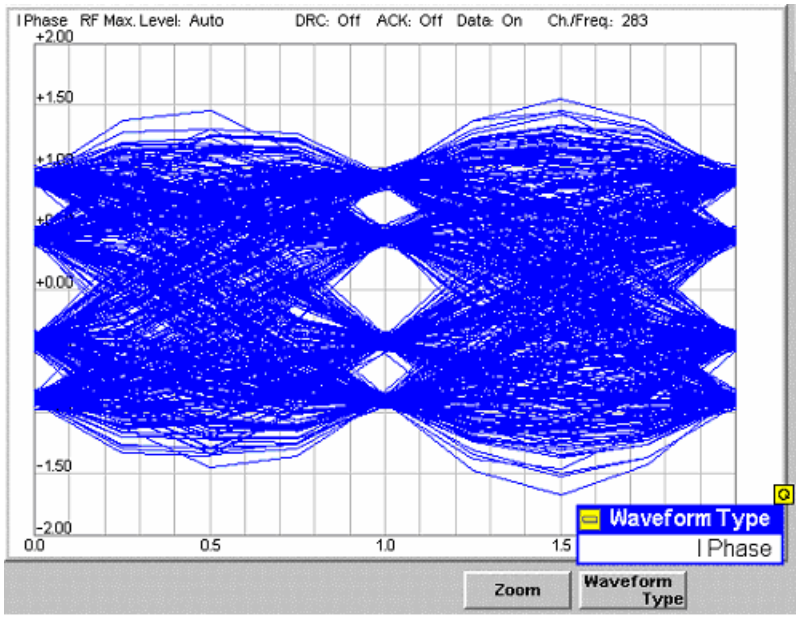
Constellation Diagram



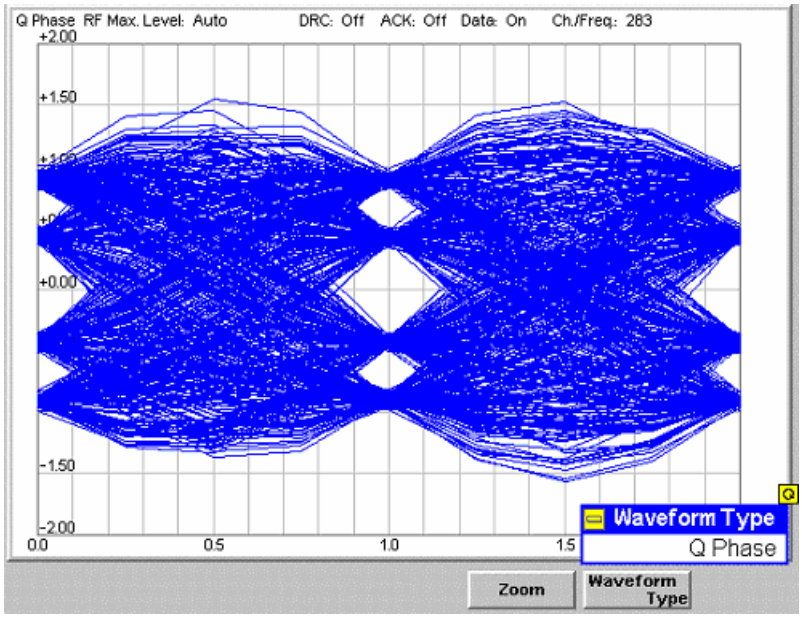
Vector Diagram



I Phase Diagram



Q Phase Diagram



I Phase & Q Phase Diagram

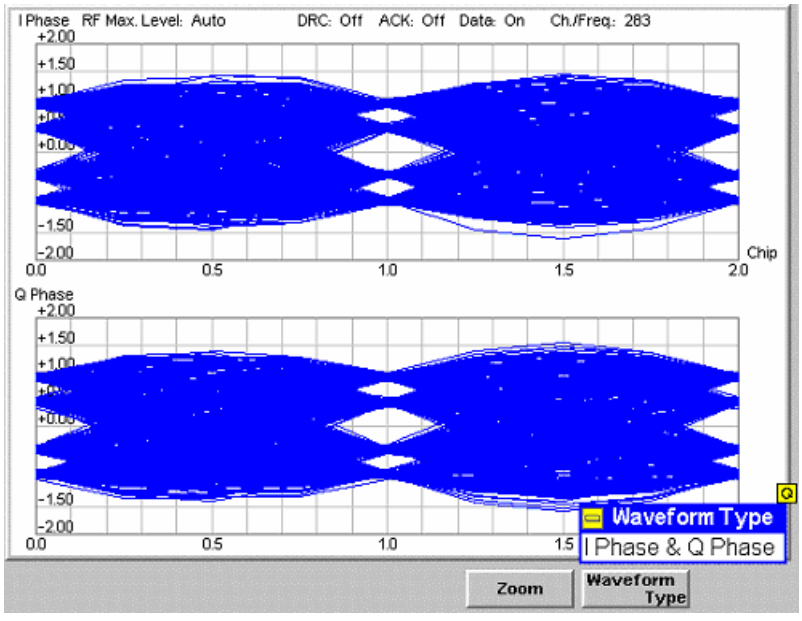


Figure 4-13 I/Q Analyzer displays

Diagram

Depending on the Setting of Waveform type, the different diagrams of the I/Q Analyzer are being displayed. The following diagrams can be displayed:

Constellation Diagram Displays the measurement shots of a full phase in a I/Q diagram. By the symmetry, the position of the measurement shots and their sharpness the quality of the current signal can be analyzed.

Vector Diagram Between the full phases three further measurement shots are being taken. These results are being connected by vectors and displayed in an I/Q diagram.

I Phase All measurment shots of the I Phase are being displayed on the base of two full measurement phases. The size of the eyes above the value of 1.0 visualizes the quality of the signal.

Q Phase Identical to the I Phase diagram, but displaying Q Phase results only.

I Phase & Q Phase Displays both I Phase and Q Phase diagrams (s.o.). This gives a good overview but the resolution is not as high as the specialized diagrams.

Output Table

The output table in the diagram types Constellation and Vector display the following results:

AT Power *AT Power* is the total transmitted power level from the access terminal.

Rho *Rho* is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal HPSK signal as defined in standard TIA-866.

Carrier Feedthrough	*Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.
I/Q Imbalance	*I/Q Imbalance* is the amplitude ratio between the in-phase (I) and quadrature (Q) components of the signal.
Error Vector Magnitude	Calculated percentage of vector error (at the detection points) between the received signal and an ideal signal.
Magnitude Error	Difference in magnitude (in percent) between the received signal waveform and an ideal HPSK signal waveform. The magnitude error is the difference in amplitude between the measured signal from the access terminal transmitter and an ideal signal waveform at the detection points.
Phase Error	Measured phase difference of the I/Q components of the signal received (from the access terminal) and an ideal reference signal at the detection points.

Modulation Configuration

The popup menu *Modulation Configuration* contains two tabs to define the parameters of the modulation measurements including the error tolerances.

Pressing the measurement softkey twice opens the popup menu *Modulation Configuration*. Press the associated hotkeys to change between tabs. Use the roll-key to expand or compress the list of settings displayed.

Modulation Configuration – Control

The *Control* tab controls the modulation measurement applications. The control configuration is divided into settings for the different modulation applications

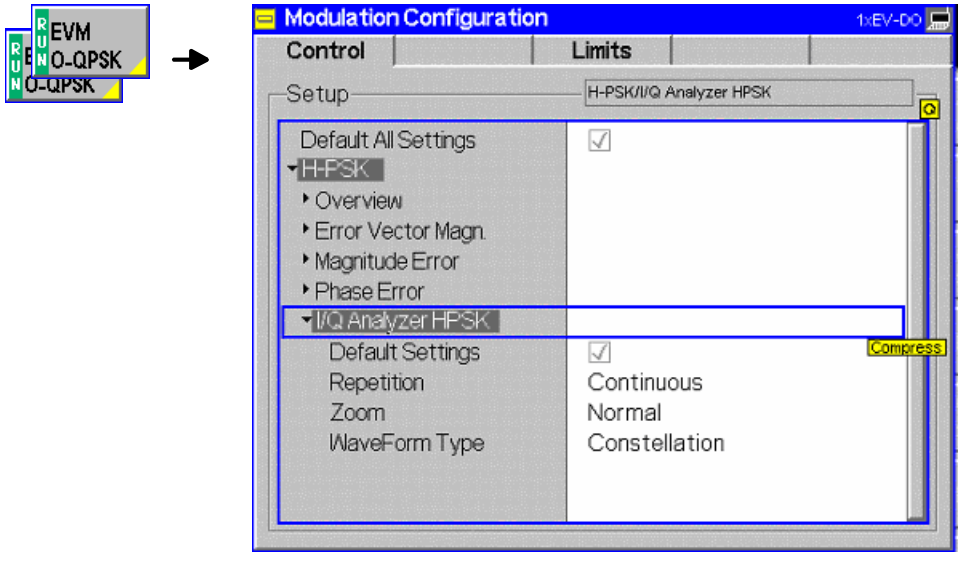


Figure 4-14 Modulation Configuration – Control

All settings may not be available for all modulation measurement applications. The statistical settings *Repetition , Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all

measurements; they are described in section *Analyzer/Generator Configuration – Control* on p. 4.7 ff. The *Display Mode* is available for measurement curves only.

Zoom — *Zoom* is available for the *I/Q Analyzer H-PSK only*. It can be used to zoom in and out of the diagram to closer study the diagram results.

Constellation — *WaveForm Type* is available for the *I/Q Analyzer H-PSK* only. *WaveForm Type* allows the user to select the different available diagrams of *I/Q Analyzer H-PSK*.

Modulation Configuration – Limits

The *Limits* tab defines the tolerance limits for each of the *Modulation* measurement applications, except the *I/Q Analyzer* which has no limit settings. Two sets of limits are configurable for each measurement: the *Current* and *Maximum/Minimum* measurement limits and the *Average* measurement limits.

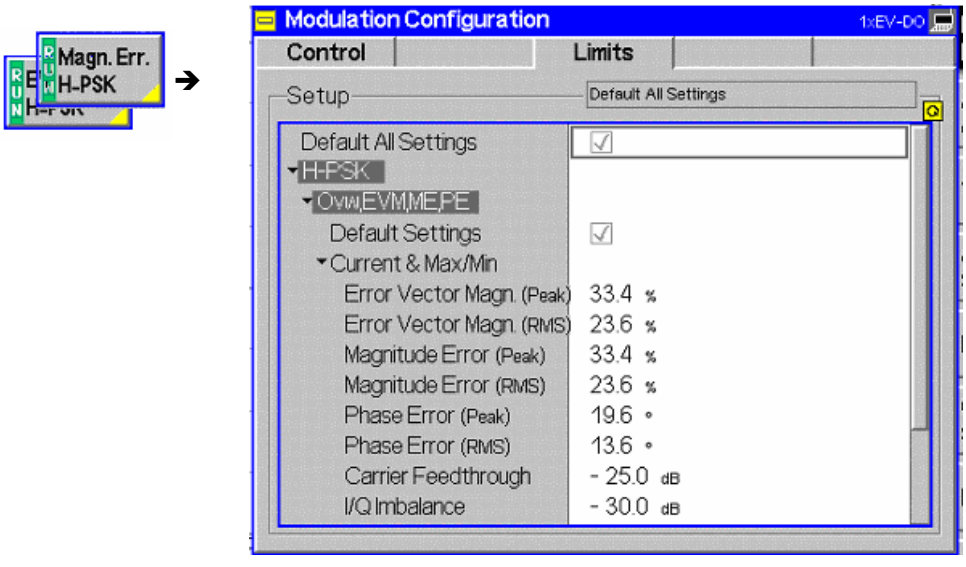


Figure 4-15 Modulation Configuration – Limits

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

Remote control
```
DEFault:MODulation:<Application>:LIMit  ON | OFF
```

Current & Max/Min — *Current and Max/Min* sets the limits for the measured values in the current waveform interval or of the extreme values of all measured waveform intervals (Min/Max).

Remote control
```
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]:VALue
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]:ENABle
CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:
SYMMetric[:COMBined]
```

Average

Average sets the limits are for the average value of the measured values derived from the last statistic cycle.

Remote control

```
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]:VALue
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]:ENABle
CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:
SYMMetric[:COMBined]
```

Spectrum Measurements

The *Spectrum* menu provides access to the ACP spectrum measurement of *1xEV-DO*. The measurement results are also available using the *Analyzer/Generator Measurement* on pg 4.3. This measurement however displays all results in a diagram.

The *Spectrum* menu is opened from the *Menu Select* menu (with associated key at the front of the instrument). The hotkeys associated to the *Menus* softkey switch over between the *Spectrum* menu and the remaining measurement menus of function group *1xEV-DO*.

In the softkey bar on the right side, the *Spectrum* menu provides different types of softkeys:

- The measurement control softkey *ACP* controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Spectrum Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Modulation* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

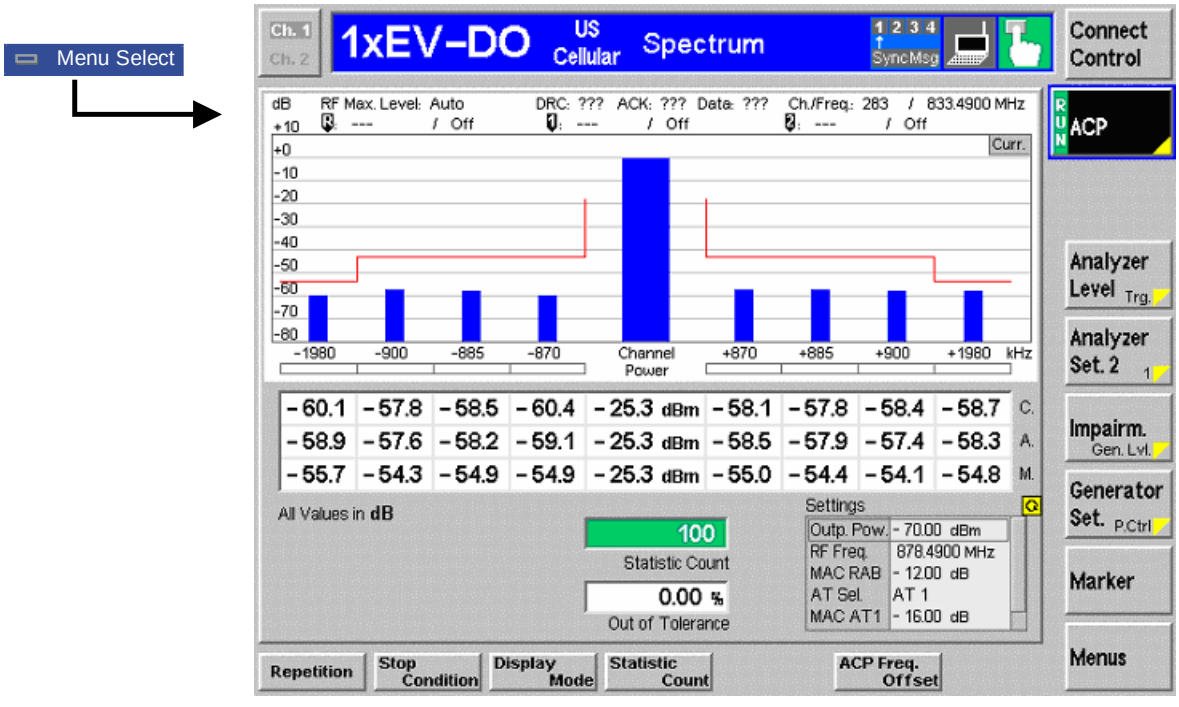


Figure 4-16 Measurement menu Spectrum

Softkey Selections

The *Spectrum* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The remaining softkeys select the application and provide application-specific settings.

Measurement Control

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

ACP

The *ACP* softkey controls the *ACP* measurement and indicates its status *(RUN | HLT | OFF)*. To change the status, press the *ACP* softkey once and then use the front panel keys *ON/OFF* or *CONT/HALT*.

Pressing the *ACP* softkey twice (once if already selected) opens the *Spectrum Configuration* popup menu (see section *Spectrum Configuration* on p. 4.33 ff.).

Remote Control

```
INITiate:SPECtrum:ACP
ABORt:SPECtrum:ACP
STOP:SPECtrum:ACP
CONTinue:SPECtrum:ACP
FETCh[:SCALar]:SPECtrum:ACP:STATus?
```

Measurement configuration

Pressing the *ACP* softkey twice (once if already selected) opens the *Spectrum Configuration* popup menu (see page 4.33). Besides, the measurement control softkey provides hotkeys to define the scope of the measurement. All these settings are also provided in the configuration menu and described in more detail in section *Spectrum Configuration* on p. 4.33 ff.

Common settings

As outlined in section *Analyzer/Generator on p.* 4.3 ff., some of the hotkey/softkey combinations in the *Analyzer/Generator* menu are valid irrespective of the application. These common settings are also provided in the *Connection Control* menu; for a detailed description refer to p. 4.47 ff.

Softkeys

- The *Trigger/Analyzer Level* softkey defines the trigger settings for the measurements and controls the level in the RF signal path. The settings are provided in the *Trigger* and *Analyzer* tabs of the *Connection Control* menu; see sections *Trigger (Connection Control – Trigger)* on p. 4.63 ff. and *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Analyzer Settings 1/2* softkey defines the center frequency of the RF analyzer. The settings are provided in the *Analyzer* tab of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Generator Level/Impairment* softkey defines the levels in all physical channels of the generated forward 1xEV-DO signal and configures an additive noise signal. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.
- The *Generator Settings/Power Control* softkey defines the frequency of the generated forward 1xEV-DO signal, its modulation and an offset of the PN sequence. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.

Settings table

The *Settings* table on the lower right side of the *Spectrum* menu gives an overview of the measurement settings of the current application as defined by means of the softkey/hotkey combinations or in the configuration menus. It changes when a different application is selected. The roll-key scrolls and expands the *Setup* table.

Measurement Results

The results are displayed in various output fields in the left half of the measurement menu. The display mode *(Current, Min./Max.* or *Average)* can be selected with the softkey *Display Mode* that is visible when the Measurement Control softkey has been selected.

Parameter lines 1 and 2

Measurement graph

Sideband Frequency Offset

Output table

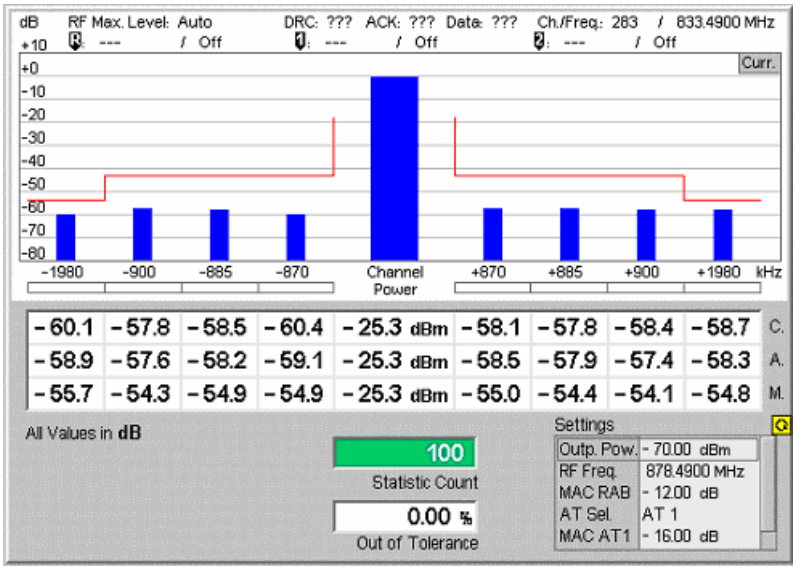


Figure 4-17 Display of results (Analyzer/Generator)

Filter settings for power measurements

The CMU measures and displays different power results, acquired with different measurement methods.

Most of the power measurements are performed using the baseband receiver filter specified in standard TIA/EIA/IS-856-2. In particular, this holds for *AT Power* displayed in the *Analyzer/Generator* menu. The power results listed in the table below are obtained with different measurement filters.

Table 4-7 Filter settings for power measurements

Value	Menu	Filter
AT Power	Analyzer/Generator, see below.	Receiver Filter according to 1xEV-DO standard
Sideband Suppression	Analyzer/Generator, see below.	30 kHz (Gaussian) spectrum analyzer filter

Parameter Lines

Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the *Settings* table below.

1st Line

The first parameter line contains the following settings:

RF Max. Level	The total output power, either calculated in adaption to the signal level (Auto) or set manually.
DRC	The settings of the DRC channel filter
ACK	The settings of the ACK channel filter
Data	The settings of the Data channel filter
Ch./Freq	Channel and frequency set for the BS Signal

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

- R — Level and time of reference marker
- 1 — Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
- 2 — Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Measurement Graph — The *Measurement Graph* is displayed as a set of vertical bar diagrams which represent ACP for the given Sideband Frequency Offset.

The display mode for the graph *(Current, Average, Max/Min)* is indicated in the upper right corner of the screen.

Channel Power — As a reference the *Channel Power* is displayed in the middle of the graph. The *Channel Power* is set according to the current settings of the *AT Power*.

Sideband Frequency Offset — This line displays the selected Sideband Frequency Offsets for each graph and table of this measurement. The offset can be configured using the *Spectrum Configuration – Control* on pg. *4.33.*

Settings — The values shown in the *Settings* table are defined in the *Control* tab of the *Connection Control* menu; see section *Modulation Configuration – Control* on p. 4.26 ff.

Statistic Count — The *Statistic Count* is the number of intervals since the start of the measurement. The bar graph represents a percentage of intervals measured based on the number of intervals *(Statistic Count)* set in the configuration menu.

Output Table — The output table contains a tabular overview of the measurement results for the selected Sideband Frequency Offset.

Each column contains three different measurement result:

- *Current* — These are the current values of the measurement interval.
- *Max/Min* — These are the extreme values (and their polarity) of all measurement intervals since the measurement started.
- *Average* — These are the average values of a number of measurement intervals (defined by the *Statistic Count* setting; see section *General Settings* in Chapter 3).

Remote Control

```
READ[:SCALar]:SPECtrum:ACP?
FETCh[:SCALar]:SPECtrum:ACP?
SAMPle[:SCALar]:SPECtrum:ACP?
```

Spectrum Configuration

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

Pressing the measurement softkey twice opens the popup menu *Spectrum Configuration*. Press the associated hotkeys to change between tabs. Use the roll-key to expand or compress the list of settings displayed.

Spectrum Configuration – Control

The *Control* tab controls the modulation measurement applications. The control configuration is divided into settings for the different modulation applications

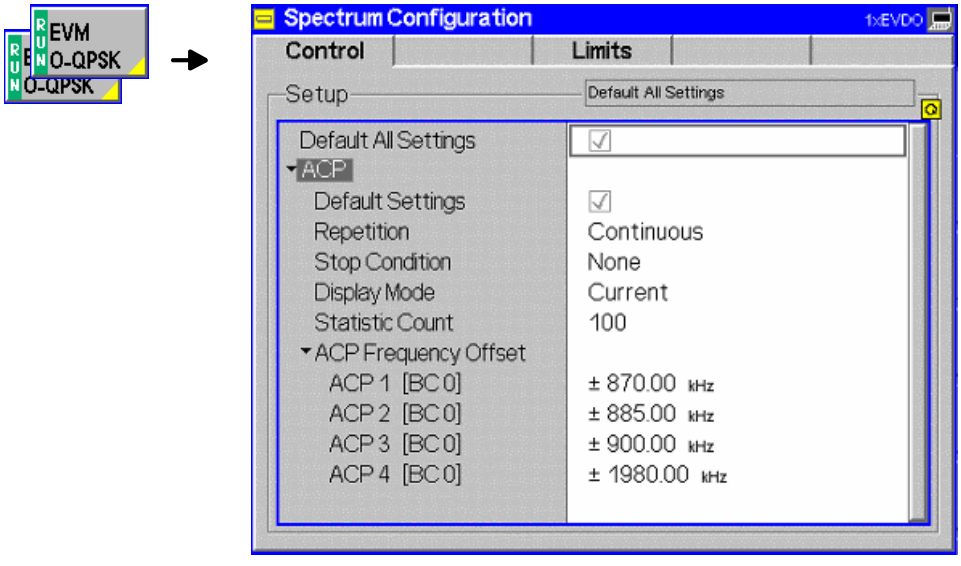


Figure 4-18 Modulation Configuration – Control

The statistical settings *Repetition , Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all measurements; they are described in section *Analyzer/Generator Configuration – Control* on pg. *4.7* ff.

ACP Frequency Offset *ACP Frequency Offset* allows the user to select the Frequency Offset from the selected Channel/Frequency. The selected *ACP Frequency Offset* will be displayed in the diagram under the measurement bars.

ACP1…4 *ACP 1..4* are the symmetrical offsets. The measurement supports up to 4 different offsets between 0 kHz and 2000 kHz.

Remote Control
```
CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP1[?]
CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP2[?]
CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP3[?]
CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP4[?]
```

Spectrum Configuration – Limits

The *Limits* tab defines the tolerance limits for each of the *Spectrum* measurement application.

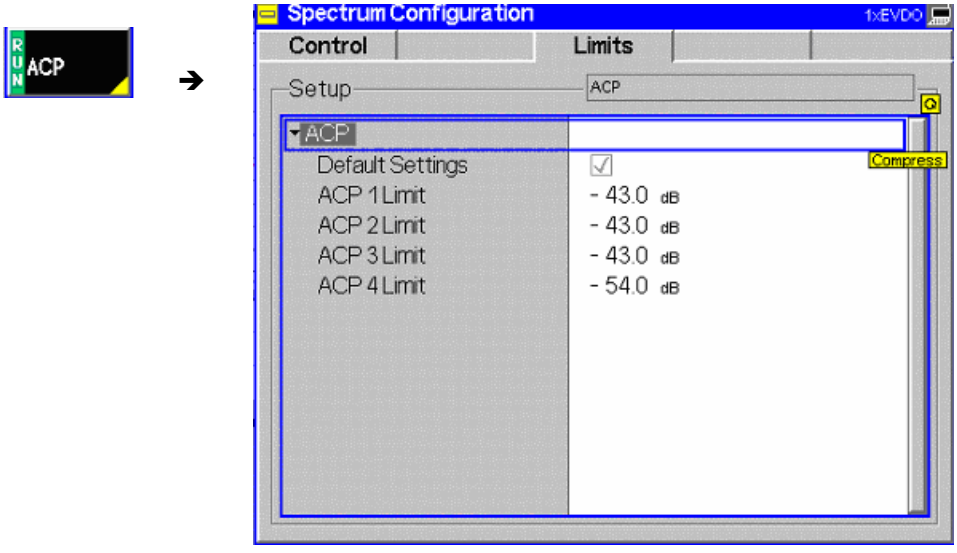


Figure 4-19 Modulation Configuration – Limits

ACP 1..4 Limit *ACP 1..4 Limit* sets the limit for each ACP Frequency offset. The limits are used symmetrical for the positive and the negative offset.

Remote control

```
CONFigure:SPECtrum:ACP:LIMit:ACP1[?]
CONFigure:SPECtrum:ACP:LIMit:ACP2[?]
CONFigure:SPECtrum:ACP:LIMit:ACP3[?]
CONFigure:SPECtrum:ACP:LIMit:ACP4[?]
```

Code Domain Power Measurements

The menu group *Code Dom. Power* contains the functions to measure the Code Domain Power (CDP), Peak Code Domain Error Power (PCDEP), and Channel Power.

The *Code Dom. Power* menu is opened from the *Menu Select* menu or from any other measurement menu in *1xEV-DO* using the hotkey *Menu – Code Domain Power* (see Figure 4-20). The initial screen returns to the *Code Dom. Power* application last accessed.

In the softkey bar on the right side, the *Code Domain Power* menu provides different types of softkeys:

- The measurement control softkey *CDP H-PSK* changes to *PCDEP H-PSK* and *Ch. Power H-PSK*, depending on the application selected. This softkey controls the measurement, indicates its status *(RUN | HLT | OFF)* and opens the configuration menu *Code Dom. Power Configuration*. The hotkeys associated to the measurement control softkey define the scope of the *Code Domain Power* measurement.
- The other softkeys on the right side are combined with various hotkeys (e.g. the hotkeys *RF Max. Level* and *RF Mode* belong to the softkey *Analyzer Level).* The softkey/hotkey combinations provide test settings and switch over between different measurements.

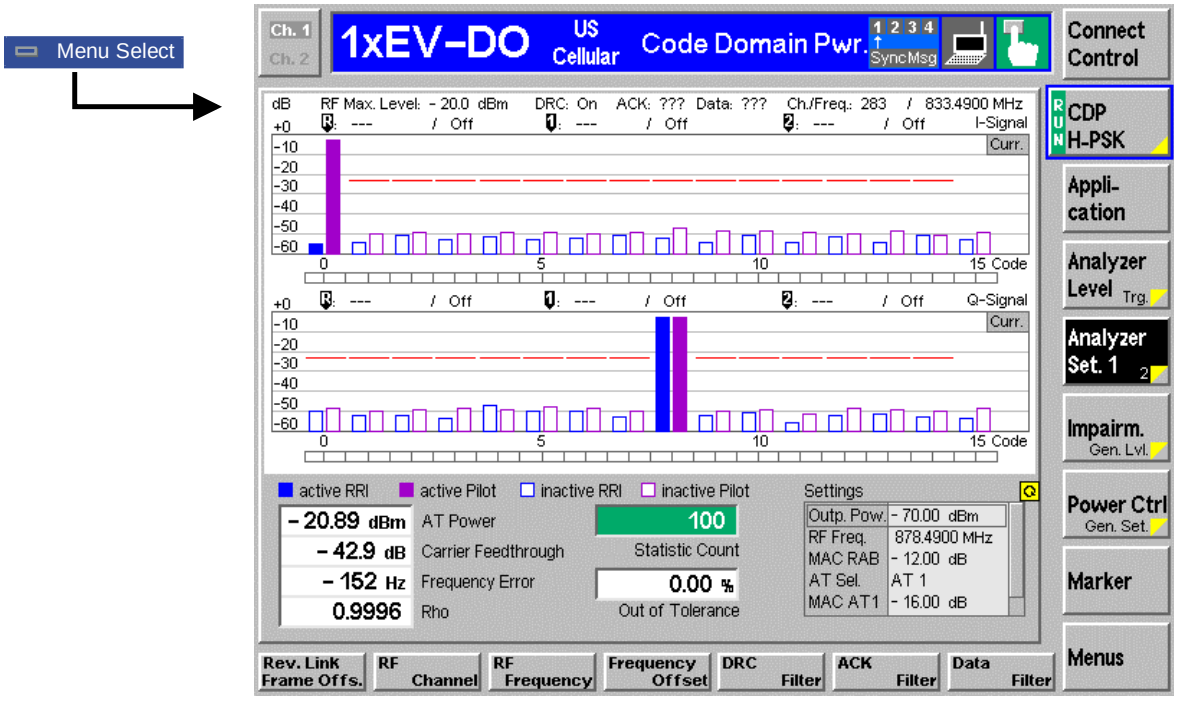


Figure 4-20 Code Domain Power measurement menu

Softkey Selections

Each *Code Dom. Power* application is controlled by means of the measurement control softkey below the *Connect. Control* softkey and the associated hotkeys. The remaining softkeys select the application and provide application-specific settings.

Measurement Control

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

Appli-cation

The *Application* softkey activates a set of hotkeys to select a modulation application. When an application is selected, the corresponding measurement screen is displayed.

CDP H-PSK

The *CDP H-PSK* hotkey changes the power measurement application to measure the Code Domain Power of the access terminal.

Remote Control

```
INITiate:CDPower:CDPW
ABORt:CDPower:CDPW
STOP:CDPower:CDPW
CONTinue:CDPower:CDPW
FETCh[:SCALar]:CDPower:CDPW:STATus?
```

PCDEP H-PSK

The *PCDEP H-PSK* hotkey changes the power measurement application to measure the Peak Code Domain Error Power of the access terminal.

Remote Control

```
INITiate:CDPower:PCDep
ABORt:CDPower:PCDep
STOP:CDPower:PCDep
CONTinue:CDPower:PCDep
FETCh[:SCALar]:CDPower:PCDep:STATus?
```

Ch. Power H-PSK

The *Ch. Power H-PSK* hotkey changes the power measurement application to measure the Channel Power of the access terminal.

Remote Control

```
INITiate:CDPower:CHPW
ABORt:CDPower:CHPW
STOP:CDPower:CHPW
CONTinue:CDPower:CHPW
FETCh[:SCALar]:CDPower:CHPW:STATus?
```

Measurement configuration

Pressing the *CDP/PCDEP/Ch.Power* softkey twice (once if already selected) opens the *Code Dom. Power Configuration* popup menu (see page 4.7). Besides, the measurement control softkey provides hotkeys to define the scope of the measurement. All these settings are also provided in the configuration menu and described in more detail in section *Analyzer/Generator Configuration – Control* on page 4.7 ff.

Marker Display

The *Marker/Display* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.67 for detailed information about markers.

The softkey is only available for the following applications: *EVM H-PSK., Magn. Err H-PSK* and *Phase Err H-PSK.*

Result Order

The *Result Order* softkey is available for the applications *CDP H-PSK and PCDEP H-PSK* only. It allows the measurement results to be displayed in the Hadamard order or the BitReversed order.

Common settings

As outlined in section *Analyzer/Generator on p.* 4.3 ff., some of the hotkey/softkey combinations in the *Analyzer/Generator* menu are valid irrespective of the application. These common settings are also provided in the *Connection Control* menu; for a detailed description refer to p. 4.47 ff.

Softkeys

- The *Trigger/Analyzer Level* softkey defines the trigger settings for the measurements and controls the level in the RF signal path. The settings are provided in the *Trigger* and *Analyzer* tabs of the *Connection Control* menu; see sections *Trigger (Connection Control – Trigger)* on p. 4.63 ff. and *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Analyzer Settings 1/2* softkey defines the center frequency of the RF analyzer. The settings are provided in the *Analyzer* tab of the *Connection Control* menu; see section *Analyzer Control (Connection Control – Analyzer)* on p. 4.48 ff.
- The *Generator Level/Impairment* softkey defines the levels in all physical channels of the generated forward 1xEV-DO signal and configures an additive noise signal. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.
- The *Generator Settings/Power Control* softkey defines the frequency of the generated forward 1xEV-DO signal, its modulation and an offset of the PN sequence. The settings are provided in the *Generator* tab of the *Connection Control* menu; see section *Connection Control – Generator* on p. 4.51 ff.

Settings table

The *Settings* table on the right side of the *Code Domain Power* menu gives an overview of the measurement settings of the current application as defined by means of the softkey/hotkey combinations or in the configuration menus. It changes when a different application is selected. The roll-key scrolls and expands the *Setup* table.

Measurement Results

The CMU measures the code power of the access terminal's physical channels, resulting in the Code Domain Power measurement. Three applications are available for Code Domain Power measurements.

Code Domain Power (CDP) is the power of the individual Walsh code channels of the access terminal. The screen displays a bar graph of the power level of the individual channels. Both I and Q signal power is displayed. The evaluation is done in code class 16.

Peak Code Domain Error Power (PCDEP) is the measured I/Q signal compared to an ideal reference signal.

Channel Power (Ch. Power H-PSK) is the power of the reverse physical channels of both the I and Q signal.

Each Channel is divided into an *RRI* and a *Pilot* channel using a time slicing mechanism. *RRI* and *Pilot* channels are measured separately and are displayed in independent bars over the corresponding channel number.

Measurement results are explained for each application.

Code Domain Power

Code Domain Power measures the individual power level of each code channel and presents the results as bar graphs. Both the I-Signal and Q-Signal power levels are displayed.

The measurement screen for Code Domain Power can be divided into three groups:

- Scalar measurement results (parameter lines)
- Bar Graph
- Measurements and Settings

Parameter lines 1 and 2

Measurement bar graphs

Measurements and Settings

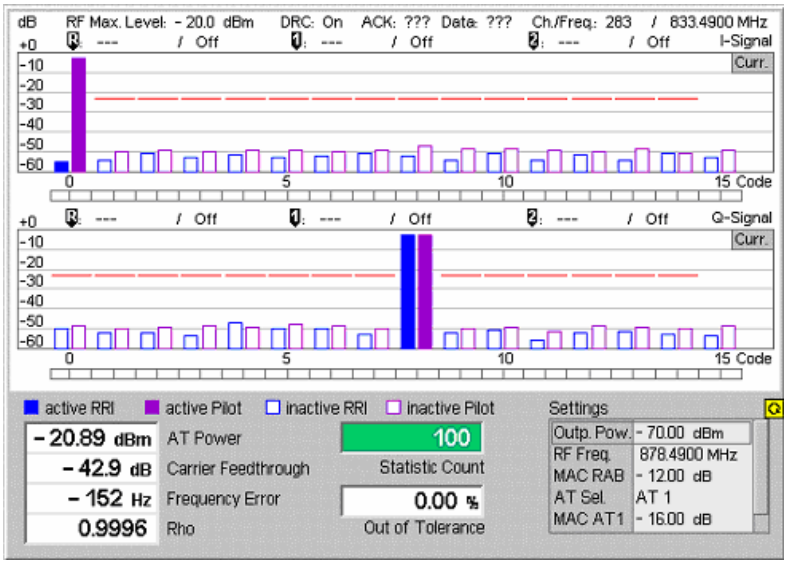


Figure 4-21 Display of measurement results (Code Domain Power screen)

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the *Settings* table below.

1st Line The first parameter line contains the following settings:

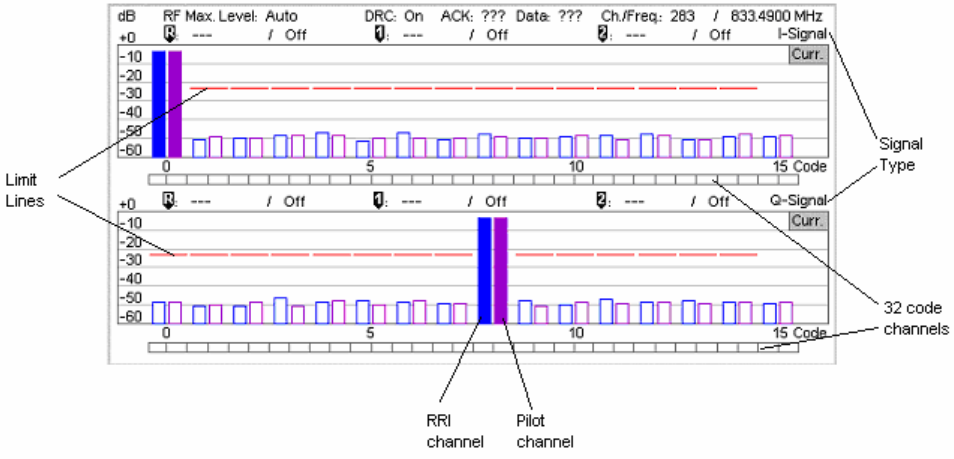
RF Max. Level	The total output power, either calculated in adaption to the signal level (Auto) or set manually.
DRC	The settings of the DRC channel filter
ACK	The settings of the ACK channel filter
Data	The settings of the Data channel filter
Ch./Freq	Channel and frequency set for the BS Signal

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

R	Level and time of reference marker
1	Level and time of marker 1 (setting *absolute*) and/or difference from reference marker (setting *relative*)
2	Level and time of marker 2 (setting *absolute*) and/or difference from reference marker (setting *relative*)

Measurement Bar Graphs The *Measurement bar graph* is displays the power of each channel together with the limit lines and all active markers.

- The bar graph either shows the current, average, or maximum levels as set in the configuration menu.
- The limit lines provide a quick reference point to view channels exceeding set limits. The limit line level is set in the configuration menu.
- The *active* channels are indicated with a solid bar graph while the *inactive* are outlined (see the legend below the diagrams).



Measurements and Settings

The area below the bar graphs displays the results of power and waveform quality measurements. Measurements in red indicate they exceed the limit set in the configuration menu.

AT Power	*AT Power* is the total transmitted power level from the access terminal.
Carrier Feedthrough	*Carrier Feedthrough* refers to the origin offset, which is the magnitude of the RF carrier relative to the magnitude of the modulated carrier.
Frequency Error	*Frequency Error* is the difference between the nominal frequency of the selected channel and the measured frequency.
Rho	Rho is the ratio of the correlated power to the total power. The correlated power is a calculated vector between a corrected signal and an ideal reference. The corrected signal is created by removing phase, frequency, and timing offsets.
Statistic Count	*Statistic Count* defines the length of the statistic cycles in waveform intervals/evaluation periods.
Out of Tolerance	*Out of Tolerance* is the percentage of waveform intervals that exceed the defined limits.
Settings	The Settings window lists the most important settings made in either the Configuration Menu or the hotkeys.

Remote Control

```
READ[:SCALar]:CDPower:CDPW?
FETCh[:SCALar]:CDPower:CDPW?
SAMPle[:SCALar]:CDPower:CDPW?
```

Peak Code Domain Error Power

Peak Code Domain Error Power (PCDEP) displays the error signal over the code domain channels. The error is the difference between the measured signal and the ideal reference signal.

Besides all settings and results are analogous the *Code Domain Power* results described in section *Code Domain Power* on p. 4.37 ff.

Parameter lines 1 and 2

Measurement bar graphs

Measurements and Settings

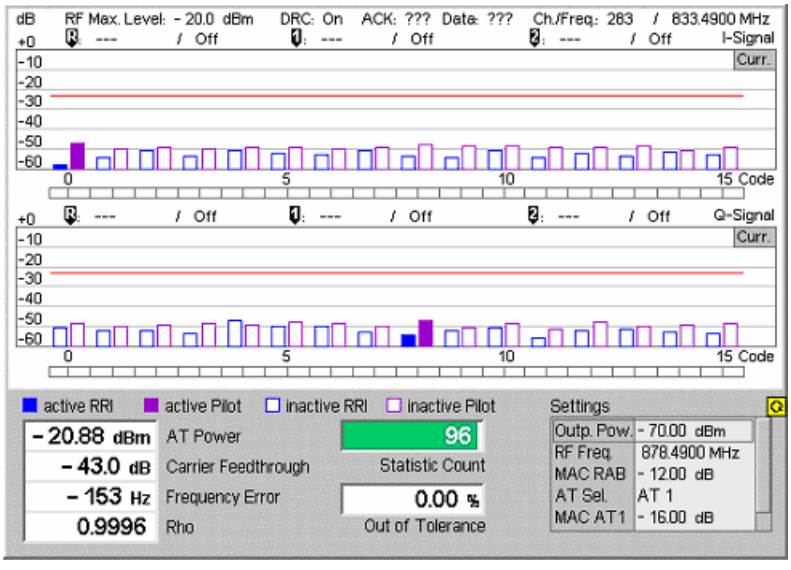


Figure 4-22 Display of measurement results (Code Domain Error Power screen)

Channel Power

Channel Power (Ch. Power H-PSK) is the power of the reverse physical channels of both the I and Q signal.

The measurement screen for Code Domain Channel Power can be divided into three groups:

- Scalar measurement results (parameter lines)
- Bar Graph
- Measurements and Settings

Parameter lines 1 and 2

Measurement graph

Measurements and settings

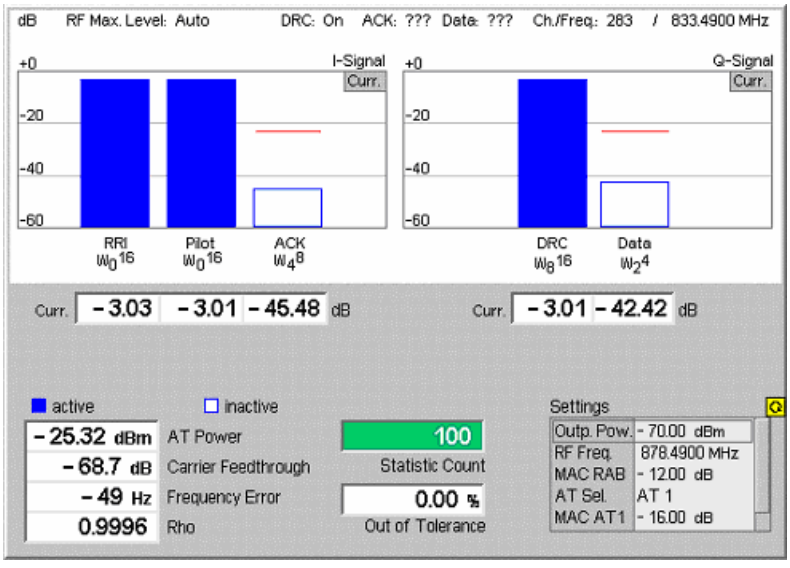


Figure 4-23 Display of measurement results (Channel Power screen)

Parameter Lines and Settings

Scalar measurement results and settings are indicated in the parameter line above the test diagram and in the *Settings* table below.

The first parameter line and the *Settings* table is identical to the *Code Domain Power* application; see section *Code Domain Power* on p. 4.37 ff. The second parameter line is omitted as no markers are available.

Measurement Bar Graphs

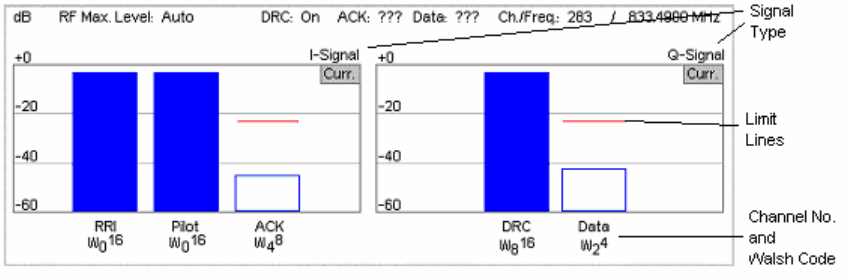
The *Measurement bar graph* is displays the power of each channel together with the limit lines.

The bar graph either shows the current, average, or maximum levels as set in the configuration menu.

The limit lines provide a quick reference point to view channels exceeding set limits. The limit line level is set in the Configuration Menu.

The *active* channels are indicated with a solid bar graph while the *inactive* are outlined (see the legend below the diagrams).

Below each bar graph is its measured value.



Measurements and Settings

This area displays the results of power and waveform quality measurements. Measurements in red indicate they exceed the limit set in the Configuration Menu.

The values are identical to the *Code Domain Power* application; see section *Code Domain Power* on p. 4.37 ff.

Remote Control

```
READ[:SCALar]:POWer:CHPW?
FETCh[:SCALar]:POWer:CHPW?
SAMPle[:SCALar]:POWer:CHPW?
```

Code Domain Power Configuration

The popup menu *Code Domain Power Configuration* contains tabs to define the parameters of each code domain power application including the error tolerances.

Pressing the measurement softkey twice (once if already selected) opens the popup menu *Code Domain Power Configuration*. Use the hotkeys at the bottom of the screen to change between the tabs. Use the roll-key to expand or compress the list of displayed settings.

Code Domain Power Configuration – Control

The *Control* tab controls each of the measurement applications. Each application lists the available settings for controlling the measurement.

The control settings consist of *Common Settings* (settings that affect all code domain power applications) followed by settings specific to an application.

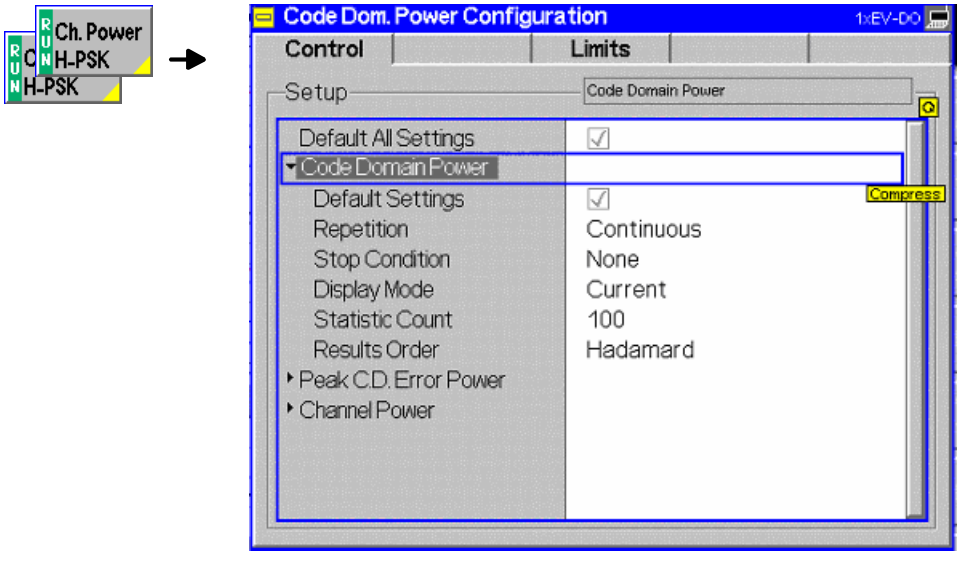


Figure 4-24 Code Domain Power Configuration – Control

All settings may not be available for all CDP measurement applications. The statistical settings *Repetition , Stop Condition, Statistic Count,* and *Display Mode* have the same meaning in all measurements; they are described in section *Analyzer/Generator Configuration – Control* on pg. 4.7 ff. The *Display Mode* applies to the values in the bar graphs only.

Code Domain Power/
Peak C.D. Error Power/

Results Order

Results Order defines the method used to display the code channels. This setting is only available for *Code Domain* and *Peak Code Domain Error* measurement applications.

Hadamard The code channels are displayed in the order determined by the Hadamard matrix. The codes are numbered as Walsh codes W_n^{SF}, where SF is the *Spreading Factor;* see below.

The reverse 1xEV-DO channels use fixed Walsh codes with SFs ranging from 2 to 32; see standard TIA/EIA/IS-856-2 and *Table 4-1* below. The Walsh code numbers n can be read directly from the measurement bar graphs. Channels with a SF < 32 (<16, if a *Spreading Factor* of 16 is selected) and therefore higher data rate are displayed with several active bars. .

Bit reverse The code channels are displayed in the order defined by the Orthogonal Variable Spreading Factor (OVSF) code tree so that related code channels are adjacent to each other. This ensures that high data rate channels with smaller SF are always displayed as one contiguous block.

Remote Control

```
CONFigure:CDPower:CDPW:CONTrol:RORDer
CONFigure:CDPower:PCDEP:CONTrol:RORDer
HADamard | BITReverse
```

Table 4-1 Walsh codes for reverse 1xEV-DO channels

Channel Type	Walsh Function
RRI	I-Signal W_0^{16}
Pilot	I-Signal W_0^{16}
ACK	I-Signal W_4^{8}
DRC	Q-Signal W_8^{16}
Data	Q-Signal W_2^{4}

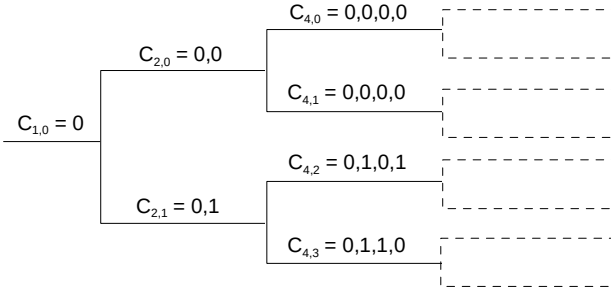
Walsh codes and OVSF codes

According to standard TIA/EIA/IS-856-2, 1xEV-DO channels are spread using orthogonal Walsh functions W_n^{SF} that are serially constructed from a SF x SF Hadamard matrix. Hadamard matrices can be generated by means of the following recursive procedure:

$$H_1 = 0, \quad H_2 = \begin{matrix} 0 & 0 \\ 0 & 1 \end{matrix}, \quad H_{2N} = \begin{matrix} H_N & H_N \\ H_N & \overline{H}_N \end{matrix};$$

where N is a power of 2 and $\overline{H}_N$ denotes the binary complement of H_n.

Orthogonal Variable Spreading Factor codes provide an alternative scheme of generating codes that preserve orthogonality between channels with different rates and spreading factors. According to standard 3GPP TS 25.213, they are generated using the following code tree:



For a given spreading factor SF, Walsh codes and OVSF codes can be derived from each other by assigning code numbers in binary format. The Walsh code no. n is equal to the OVSF code number m and vice versa, provided that m and n have inverse binary representation (n is converted into m by reversing the order of bits in the binary representation of n). For numbers with symmetrical binary representation (e.g 00 or 1001), the Walsh code and OVSF code numbers are equal.

E.g. for spreading factor SF = 4, the two schemes provide the following codes:

Hadamard (Walsh codes)						**Bit reverse (OVSF codes)**					
Code (SF = 4)				Code number		Code (SF = 4)				Code number	
				Dec.	Binary					Dec.	Binary
0	0	0	0	0	00	0	0	0	0	0	00
0	1	0	1	1	01	0	0	1	1	1	01
0	0	1	1	2	10	0	1	0	1	2	10
0	1	1	0	3	11	0	1	1	0	3	11

To obtain the *Bit reverse* representation from the *Hadamard* representation, the codes no. 01 and 10 (binary) must be interchanged.

Code Domain Power Configuration – Limits

The *Limits* tab defines tolerance limits for each of the Code Domain Power measurement applications.

The limits settings consist of both Common settings (settings that affect all code domain power applications) and then settings specific to an application.

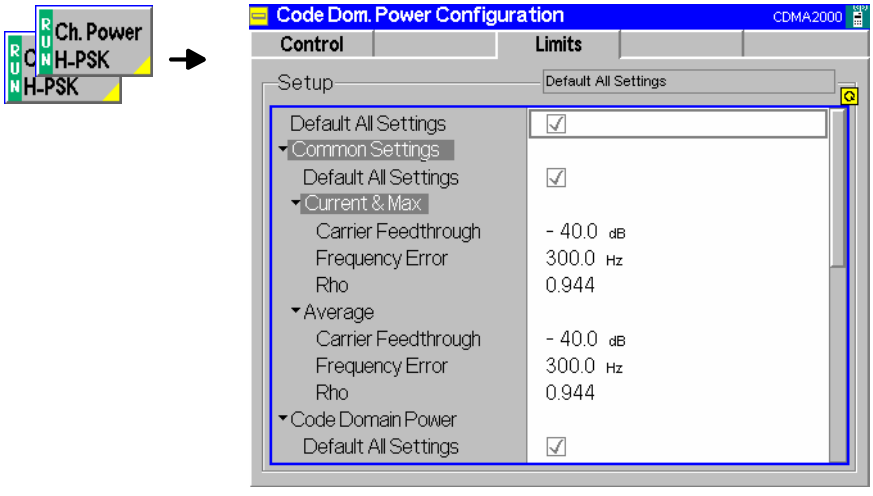


Figure 4-25 Code Domain Power Configuration – Limits

Default All Settings

The *Default All Settings* switch assigns default values to all parameters of the modulation *Limits* tab (the default values are quoted in the command description in chapter 6 of this manual). Additional default switches are provided for common limit settings and for the individual applications.

Remote control
`DEFault:CDPower:<Application>:LIMit ON | OFF`

Common Settings

Common Settings are settings that affect all code domain power applications.

Current & Max

Sets the limits used when the display is set to the *Current* or *Min/Max* display mode.

Carrier Feedthr.

Upper limit for the difference between magnitude of the RF carrier and the modulated carrier.

Frequency Error

Upper limit for the difference between the measured and the expected frequency of the signal.

Rho

Upper limit of the ratio of the correlated power and the total power.

Remote Control

```
CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric
[:COMBined]
<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho Limit>
```

Average

Sets the limits used when the display is set to the Average display mode. The available settings are the same as described for the Current & Max display mode.

Remote Control

```
CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric
[:COMBined]
<Carrier Feedthrough Limit>, <Freq Error Limit>, <Rho Limit>
```

CDP

CDP contains the limit settings applicable to the *Code Domain Power*.

IQ Leakage Check

The *IQ Leakage* check allows to set if the leakage of an active channel is being checked by the limit on the opposite Signal phase. If *IQ Leakage Check* is on and the Q-Signal of a channel which is active on the I-Signal (or vice versa) exceeds the limit, a limit violation will be displayed.

Current & Max — Sets the limits used when the display is set to the Current or Min/Max display mode.

CDP Limit — Value (and placement) of the limit line displayed on the measurement screen.

Remote Control
```
CONFigure:CDPower:CDPW:CMax:LIMit:ASYMmetric
[:COMBined]
<CDP Limit Y>
```

Average — Sets the limits used when the display is set to the Average display mode. The available settings are the same as described for the Current & Max display mode.

Remote Control
```
CONFigure:CDPower:CDPW:AVERage:LIMit:ASYMmetric
[:COMBined]
<CDP Limit Y>
```

PCDEP — *PCDEP* contains the limit settings applicable to the *Peak Code Domain Error Power*. The available settings are the same as described for the *CDP*.

Remote Control
```
CONFigure:CDPower:PCDEP:CMax:LIMit:ASYMmetric
[:COMBined]
CONFigure:CDPower:PCDEP:AVERage:LIMit:ASYMmetric
[:COMBined]
<CDP Limit Y>
```

CHP — *CHP* contains the limit settings applicable to the *Channel Power*. The available settings are the same as described for the *CDP*.

Remote Control
```
CONFigure:CDPower:CHPW:CMax:LIMit:ASYMmetric
[:COMBined]
CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric
[:COMBined] <CDP Limit Y>
```

Connection Control

The *Connection Control* menu consists of tabs to configure the inputs and outputs of the CMU and the respective signals in the function group *1xEV-DO,* define the network standard, the trigger settings and the routing of I/Q and IF signals.

The menu group is activated using the softkey *Connect Control* to the right of the header of the measurement menu. The individual tabs *(Standard, Analyzer, Generator, AF/RF* ⊶, *Sync., Trigger, I/Q-IF)* can be accessed using the hotkeys at the bottom of the screen.

Network Standard (Connection Control – Standard)

The popup menu *Standard* defines which network and standard is used for testing.

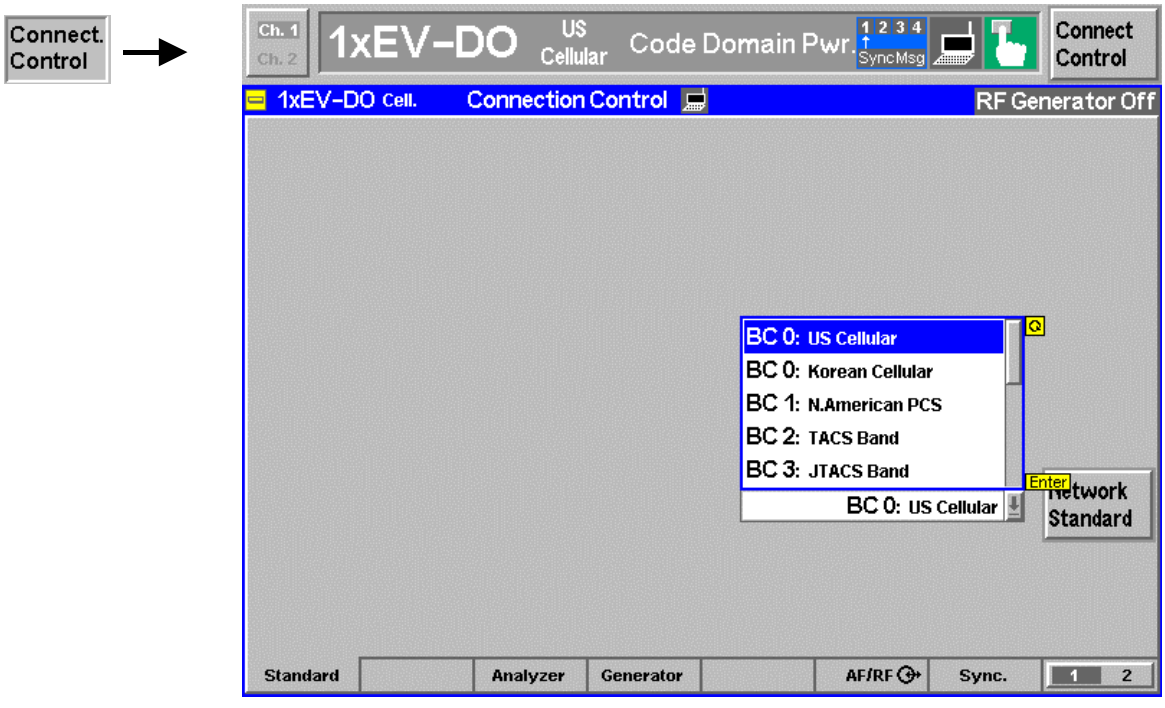


Figure 4-26 Connection Control – Standard

Refer to Table 1-1 in Chapter 1 for a list of the supported 1xEV-DO networks.

Analyzer Control (Connection Control – Analyzer)

The *Analyzer* tab configures the RF input path by defining the analyzer level and frequency.

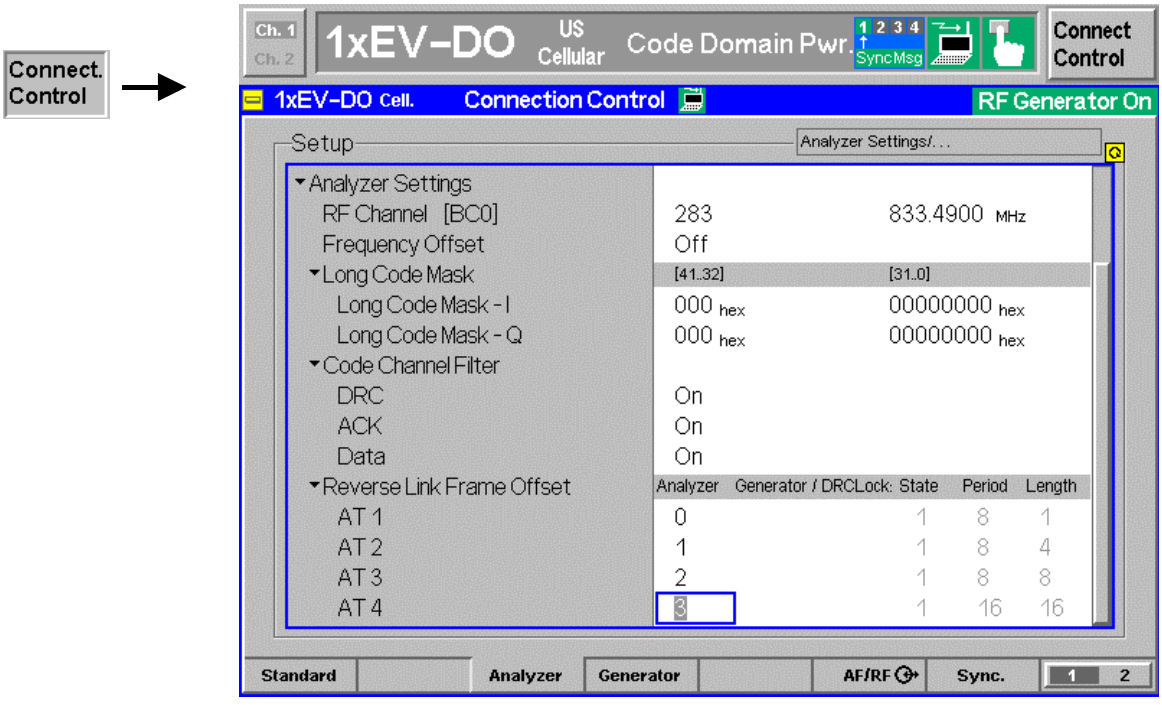


Figure 4-27 Connection Control – Analyzer Settings

Default All Settings

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

Remote control
`DEFault:RFANalyer`

Analyzer Level – RF Mode

The *Analyzer Level* table section sets the maximum input level that can be measured. Two alternative *RF Modes* for defining this value are provided:

Manual Manual input of maximum input level in the *RF Max. Level* field

Auto Automatic setting of maximum input level *(autoranging)* according to the peak power (PEP) of applied signal

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

Analyzer Level – RF Manual Max. Level

The maximum expected input level can be entered in the *RF Max. Level* input field. Input levels exceeding the *RF Manual Max. Level* overdrive the input path and cause invalid results ("– – –").

Remote control
`[SENSe:]LEVel:MAXimum <Level>`

External input attenuation

The range of *RF Max. Level* values depends on the RF input used. If an external input attenuation is reported to the instrument to compensate for a known path loss

(see section *AF/RF Connectors (Connection Control – AF/RF)* on page 4.58), 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.

Error messages

If the *RF Max. Level* is too high or too low, a window with the error message *"<Max_Level> is out of range. <permissible max. value> is limit*." and three fields will appear:

Accept	The permissible max. value is accepted as *RF Max. Level*,
Re-edit	*RF Max. Level* is entered once again,
Cancel	The last valid input value is maintained.

When switching over to another input, the current value of *RF Max. Level* 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.

Note: *A maximum input level can be entered even if automatic level setting (autoranging) is selected. The entered level is used as a start value for the autoranging routine and is also important to ensure safe switchover to manual setting.*

Analyzer Settings – RF Channel [<>]

RF Channel defines the base station channel number (and frequency) of the generated RF signal. The brackets contain the current bandclass of the selected network.

The default settings for the channel numbers depend on the network selected. Changing the *RF Channel* also changes the *RF Frequency* setting.

Table 1-1 in Chapter 1 lists the networks and standards supported by the CMU with the 1xEV-DO options.

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

Frequency Offset

Frequency Offset determines a frequency offset to impair the RF analyzer signal.

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

Long Code Mask I/Q

Longcode Mask determines the used *I/Q-Long Code Masks* for the 1xEV-DO signal. In order of the measurements to work both long code masks have to be set according to the R-Signal

Remote control
```
[SENSe:]RFANalyzer:LCMask:I:LSB <HexString[8chars]>
[SENSe:]RFANalyzer:LCMask:I:MSB <HexString[3chars]>
[SENSe:]RFANalyzer:LCMask:Q:LSB <HexString[8chars]>
[SENSe:]RFANalyzer:LCMask:Q:MSB <HexString[3chars]>
```

Code Channel Filter DRC

Code Channel Filter DRC determines if the Analyzer should analyze the incoming signal based on the presence of the DRC channel.
As the DRC, ACK, and Data code channels are not continuously present, the

measurement system allows the user to specify the conditions under which the measurement is performed. If these filters are specified in such a manner that the AT never generates, no measurements will be made. On the other hand, if one (or more) filter settings are „Don't care", measurements will be made both with the channel is present and when it is not present. This may lead to confusing and/or rapidly changing results.
The following table shows the expected behavior according to the settings and the real signal.

Code Channel Setting AT	Code Channel Setting CMU	Expected Result
OFF	OFF	Valid Result
OFF	DON'T CARE	Valid Result
OFF	ON	No Result
ON	OFF	No Result
ON	DON'T CARE	The *I/Q Analyzer* will display results from two (or more) different types of waveforms. This can cause the display to appear very confused or erratic (for example it seems to be toggling or blinking).
ON	ON	Valid Result

If the actual setting is unknown, it is a good idea to set all three Code Channels to "DON'T CARE" and analyze the result using the *I/Q Analyzer* measurement (*I/Q Analyzer* on pg. *4.22*) to determine the current setting of the incoming signal.

Remote control
`[SENSe:]RFANalyzer:CCFilter:DRC ON | OFF | DCARe`

Code Channel Filter ACK

Code Channel Filter ACK determines if the Analyzer should analyze the incoming signal based on the presence of the ACK channel.

Remote control
`[SENSe:]RFANalyzer:CCFilter:ACK ON | OFF | DCARe`

Code Channel Filter Data

Code Channel Filter Data determines if the Analyzer should analyze the incoming signals based on the presence of the DRC channel.

Remote control
`[SENSe:]RFANalyzer:CCFilter:DATA ON | OFF | DCARe`

Reverse Link Frame Offset AT1-4

Reverse Link Frame Offset AT1-4 specifies the Frame Offset timing of the Reverse Link signal from the specified access terminal. Since the 1xEV-DO option does not actually control the access terminal, it is the responsibility of the operator to ensure that the value established by this command matches the frame offset that is used by the access terminal. In addition, this value affects the timing of the *Rev Frame Trigger* for the specific user.
The Generator Settings for *DRC Lock State*, *DRC Lock Period* and *DRC Lock Length* are displayed in the same line for each Access Terminal.

Remote control
`[SENSe:]RFANalyzer:AT$4$:RLINk:FROFfset <Value>|MIN|MAX|DEF`

Connection Control – Generator

The popup menu *Generator* provides the settings for:

- 1xEV-DO Generator [Option B88]
- IQ-Access Interface Setup [Option B82]

Generator and IQ-Access-Board can be switched alternately to ON or OFF or both to OFF. In order to switch the IQ-Access-Board on, the hardware option B-82 has to be installed in the CMU.

Generator Control (Connection Control – Generator)

The Generator control tab allows the setting of all signals generated by the CMU.

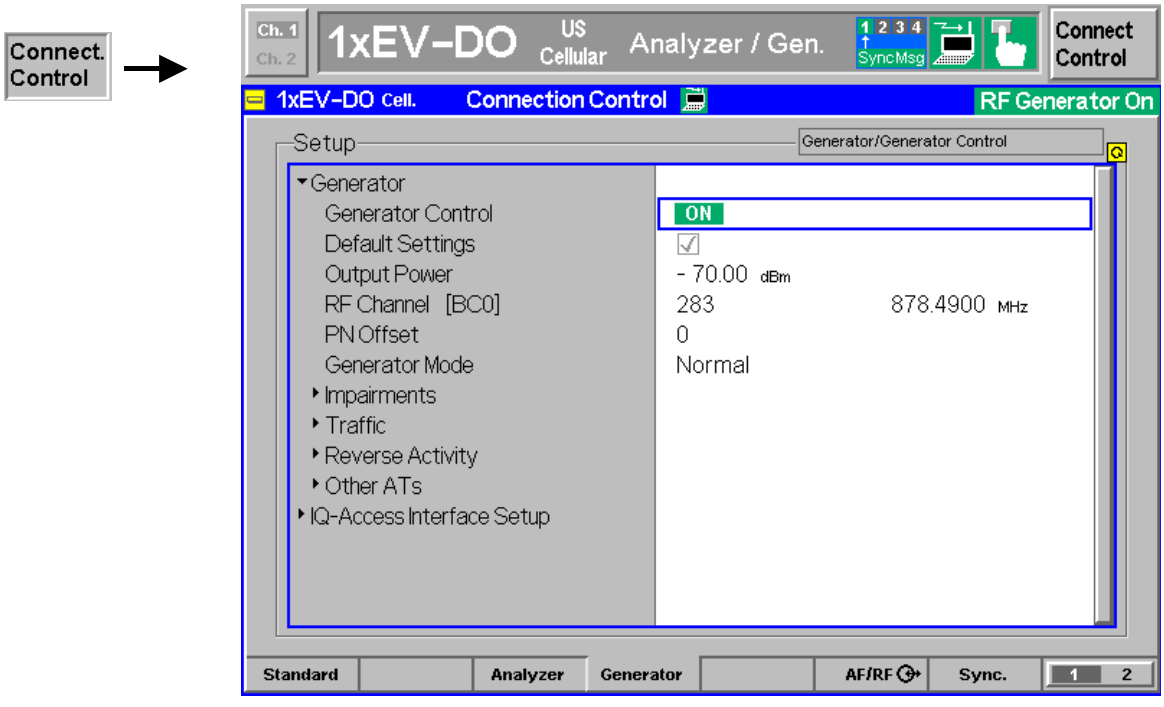


Figure 4-28 Connection Control – Generator (table)

Generator Control

The *Generator Control* switch indicates the operating status of the RF generator *(ON* or *OFF)*. Selecting the *Generator* switch and the *ON/OFF* key switches the generator on or off. The *IQ-Access Interface Control* switch will be toggled with the Generator Control switch, since both modules can't operate at the same time.

Remote control
```
INITiate:RFGenerator
ABORt:RFGenerator
FETCh:RFGenerator:STATus?
```

Default Settings

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

Remote control
```
DEFault:RFGenerator ON | OFF
```

Output Power *Output Power* displays the total 1xEV-DO output power generated by the CMU

Remote control
`SOURce:RFGenerator:POWer:OUTPut[?]`

RF Channel [<>] The *RF Channel* sets the base station channel number (and frequency) of the generated RF signal. Changing the RF Channel resets the RF Frequency setting.
The default settings for the channel numbers are dependent on the network selected.

Remote control
`SOURce:RFGenerator:FREQuency [:RF]:UNIT[?]`
`SOURce:RFGenerator:FREQuency[:RF][?]`

PN Offset *PN Offset* sets the offset of the PN sequence. Changing the PN offset changes the timing of the short code spreading, the contents of the Sync message on the Control Channel.

Remote control
`SOURce:RFGenerator:PROPerty:PNOFfset[?]`

Generator Mode *Generator Mode* sets the operating mode of the generator. Possible values are *Normal* and *Continuous Pilot*.
In *Continuous Pilot* mode, the 1xEV-DO generator will generate a continuous pilot signal. The pilot signal will fill the entire slot. During this special mode, all other commands will be accepted and processed as normal, but the changes to the signal output will not occur until this special mode is disabled.

Remote control
`SOURce:RFGenerator:PROPerty:PNOFfset[?]`

Impairments–AWGN Level *AWGN Level* turns on or off the Additive White Gaussian Noise generator and sets the level for modulation. This provides noise to more closely simulate actual operating conditions in the network.

Note: The total output power of the CMU is the sum of the Forward 1xEV-DO signal plus the AWGN signal. The CMU automatically limits the AWGN signal level so that the maximum possible total output power of the CMU's RF connector is not exceeded.

Remote control
`SOURce:IMPairments:LEVel:AWGN <AWGN Level>`

Impairments–BS Freq. Offset *BS Freq. Offset* adjusts the carrier frequency of the CMU/base station. If the *RF Frequency* has been set to a frequency which doesn't apply to the actual selected *RF Channel*, the setting of *BS Freq. Offset* is disabled.

Remote control
`SOURce:IMPairments:FOFFset[:RF] <Freq. Offset>`

Traffic – Control – Sync. Message Enable

Sync. Message Enable allows the generator to create a synchronization message on the Control Channel.

Remote control
```
INIT:RFGenerator:SNCMessage
ABORt:RFGenerator:SNCMessage
FETCh:RFGenerator:SNCMessage:STATus?
```

Traffic – Control – Packet Start Offset

Packet Start Offset defines when the generator should create the Sync message on the Control Channel. The offset value is measured in the number of slots from the first slot of the Control Channel Cycle, the range of values is 0 to 3, inclusive.

Remote control
```
SOURce:RFGenerator:SNCMessage:PSOFfset[?]
```

Traffic – Control – Data Rate

Sync. Message defines the type of synchronization message on the traffic channel. It specifies a choice between the DRC Indexes 1 and 2. The table for the assignment of the DRC Indexes to the data rate and the number of slots can be found below in this table in the description of the Data Rate for the AT1-AT4 channels.

Remote control
```
SOURce:RFGenerator:SNCMessage:DRINdex[?]
SOURce:RFGenerator:SNCMessage:DRATe?
```

Traffic – AT1..4 – Access Terminal Enable

The CMU supports the generation of data for up to 4 access terminals at the same time. *Access Terminal Enable* specifies the ON/OFF state of the each of the four data streams.

Remote control
```
INIT:RFGenerator:AT$4$:MAC:INDex
ABORt:RFGenerator:AT$4$:MAC:INDex
FETCh:RFGenerator:AT$4$:MAC:INDex:STATus?
```

Traffic – AT1..4 – MAC Index

MAC Index specifies the MAC Index of the specified access terminal. MAC Index values of 5 to 63, inclusive are permitted. Each of the four access terminals must use a unique MAC Index.

Remote control
```
SOURce:RFGenerator:AT$4$:MAC:INDex[?]
```

Traffic – AT1..4 – MAC AT x Level

MAC AT 1 Level specifies the level relative to the generator output power for each of the AT channels. The range of level values are –7.0 to –25.0 dB, inclusive.

Remote control
```
SOURce:RFGenerator:AT$4$:MAC:LEVel[?]
```

Traffic – AT1..4 – Send Packets

Send Packets starts the transmission of Traffic Packets to the specified access terminal by pressing the *ENTER* button on the CMU keyboard. The *State* field can have the states OFF and RUN. The *Progress* field shows the progress of transmission.

Remote control
```
INIT:RFGenerator:AT$4$:PSTReam
ABORt:RFGenerator:AT$4$:PSTReam
FETCh:RFGenerator:AT$4$:PSTReam:STATus?
```

Traffic – AT1..4 – Packet Count

Packet Count specifies the number of packets to be sent to the specified access terminal. If “infinite” is selected a continuous stream of packets will be sent.

Remote control
`SOURce:RFGenerator:AT$4$:PCOunt[?]`

Traffic – AT1..4 – Packet Start Offset

Packet Start Offset specifies the amount of time (in slots) from the end of the last packet (sent to the specified access terminal) to the start of the next packet (sent to the specified access terminal. Values of 0 to 255, inclusive are permitted.

Remote control
`SOURce:RFGenerator:AT$4$:PSOFfset[?]`

Traffic – AT1..4 – Data – Rate

Rate specifies the DRC Index of the forward traffic for a specific access terminal. The data rate and the number of slots within the packet are specified by the DRC Index, as described in the following table:

Index	Rate [kBit/s]	#Slots
1	38.4	16
2	76.8	8
3	153.6	4
4	307.2	2
5	307.2	4
6	614.4	1
7	614.4	2
8	921.6	2
9	1228.8	1
10	1228.8	2
11	1843.2	1
12	2457.6	1

Remote control
`SOURce:RFGenerator:AT$4$:DRINdex[?]`
`SOURce:RFGenerator:AT$4$:DRATe?`

Traffic – AT1..4 – Data - Pattern

Pattern specifies a data pattern to be used within the forward link packets to a specific access terminal. The data consists of 32 bits, or 4 bytes. This pattern is repeated within the packet. The most significant bit is the first bit within the packet.

Remote control
`SOURce:RFGenerator:AT$4$:PATTern[?]`

Traffic – AT1..4 – Power Control – Power Ctrl. Bits

Power Control Bits defines how the power control bits are sent from the CMU to the specified access terminal. The power control bits control the access terminal's total output power (when the access terminal is using closed loop power control).

Range Test	The CMU sends a sequence of *up* power bits followed by a sequence of *down* power bits. The number of bits up and down are configurable.
All Up	The CMU sends only *up* power control bits.
All Down	The CMU sends only *down* power control bits. This may cause the access terminal's power level to decrease to a level too low for measurements to be made.
Hold	The CMU sends alternating *up/down* power control bits.
Pattern	A user defined pattern of power control bits will be sent by the CMU. This pattern is divided in 4 areas of power control bits which are described in the following *Pattern* parameters below. For each area a user defined number of *Up* or *Down* bits can be defined and sent by the CMU.
External (AUX3/4 – Pin 6)	The state of Pin 6 of the CMU AUX3/4 connector is sampled at the start of the slot and used as the power control bit.

Remote control
`SOURce:RFGenerator:AT$4$:PCBits[?]`

Traffic – AT1..4 – Power Control – Range Test – Range Test Count

Range Test Count sets the number of Power Control Bits to be used to perform the Range test. E.g. a value of 100 means that 100 *UP* bits are sent followed by 100 DOWN bits.

Remote control
`SOURce:RFGenerator:AT$4$:PCBits:RTES:NOBits[?]`

Traffic – AT1..4 – Power Control – Pattern – Inject Pattern

Inject Pattern starts the injection of a power control bit pattern into the Power Control Bit stream. The configuration of the pattern is defined by the configuration fields below. This is the same pattern as may be selected by the pattern mode described above.
After activation, the button *Inject Pattern* remains disabled until the complete pattern has been sent. Only then can another pattern be sent.
The injection of the pattern starts only at the end of the current power control sequence.

Remote control
`PROCedure:RFGenerator:AT$4$:PCBits:PATTern <InjectStatus>`

Traffic – AT1..4 – Power Control – Pattern – Area 1..4 – Number of Bits

Number of Bits defines the number of bits in the Area of the user defined pattern for a specific access terminal.

Remote control
`SOURce:RFGenerator:AT$4$:PCBits:PATTern:AREA$1..4$:NOBits[?]`

Traffic – AT1..4 – Power Control – Pattern – Area 1..4 – Polarity

Polarity defines the orientation of all power control bits in this area of the pattern for a specific access terminal.
Possible values are *Up* or *Down.*

Remote control
`SOURce:RFGenerator:AT$4$:PCBits:PATTern:AREA$1..4$:POLarity[?]`

Traffic – AT1..4 – DRCLock – DRCLock State

The state of the *DRCLock* indicates to the access terminal the ability of the base station to receive its DRC channel. If the *DRCLOCK* state is 0, the access terminal will not request data from base station.
Possible values are 0 and 1. The default value is 0.
In the same line the current Analyzer Settings for the *Reverse Link Frame Offset* are displayed.

Remote control
`SOURce:RFGenerator:AT$4$:DRCLock:STATe[?]`

Traffic – AT1..4 – DRCLock – DRCLock Period

DRCLock Period defines period of DRCLock bit transmissions, in terms of slots. Possible values are OFF, 8 and 16. When DRCLock Period is set to OFF, the DRCLock bits are not transmitted.

Remote control
`SOURce:RFGenerator:AT$4$:DRCLock:PERiod[?]`

Traffic – AT1..4 – DRCLock – DRCLock Length

DRCLock Length defines how often the *DRCLock* bit will be transmitted, before it is updated with the DRCLock State. Possible values are 1, 4, 8, 16, and 32 and are expressed in terms of DRCLock Periods.

Remote control
`SOURce:RFGenerator:AT$4$:DRCLock:LENGth[?]`

Reverse Activity – MAC RAB Level

MAC RAB Level specifies the level for the reverse activity channel relative to the generator output power. The range of level values are –7.0 to –25.0 dB, inclusive.

Remote control
`SOURce:RFGenerator:RAB:MAC:LEVel[?]`

Reverse Activity – RAB State

RAB State sets the value for the bit within the Reverse Activity channel. This channel is an indicator to the access terminal from the access network to reduce the transfer rates used on the reverse link. A value of zero, indicates normal network conditions, a value of 1 indicates that the access terminal may need to reduce its reverse link transfer rates. Possible values are 0 and 1.

Remote control
`SOURce:RFGenerator:RAB:STATe[?]`

Reverse Activity – RAB Offset

RAB Offset defines the starting position of the Reverse Activity (RA) bit. The starting position is specified in RABLength/8 units. The RA bit starts when the equation (SystemTime mod RABLength = RABOffset) is satisfied, with SystemTime expressed in units of slots. Possible values are 0 to 7, inclusive.

Remote control
`SOURce:RFGenerator:RAB:OFFSet[?]`

Reverse Activity – RAB Length

RAB Length defines the length (in slots) of a Reverse Activity (RA) bit.
Possible values are 8, 16, 32 and 64.

Remote control
`SOURce:RFGenerator:RAB:LENGth[?]`

Other AT's – Count

Other AT's – Count defines the number of additional MAC Indexes that are in use within the MAC. No traffic is generated for these MAC Indexes, they are used only to construct a realistic MAC.
Possible values are 1 to 55, inclusive.

Remote control
`SOURce:RFGenerator:OAT:COUNt[?]`

Generator Control (Connection Control – Generator – IQ-Access Interface)

The Generator control tab – IQ-Access Interface Setup allows the setting of all the settings for the IQ Access board.

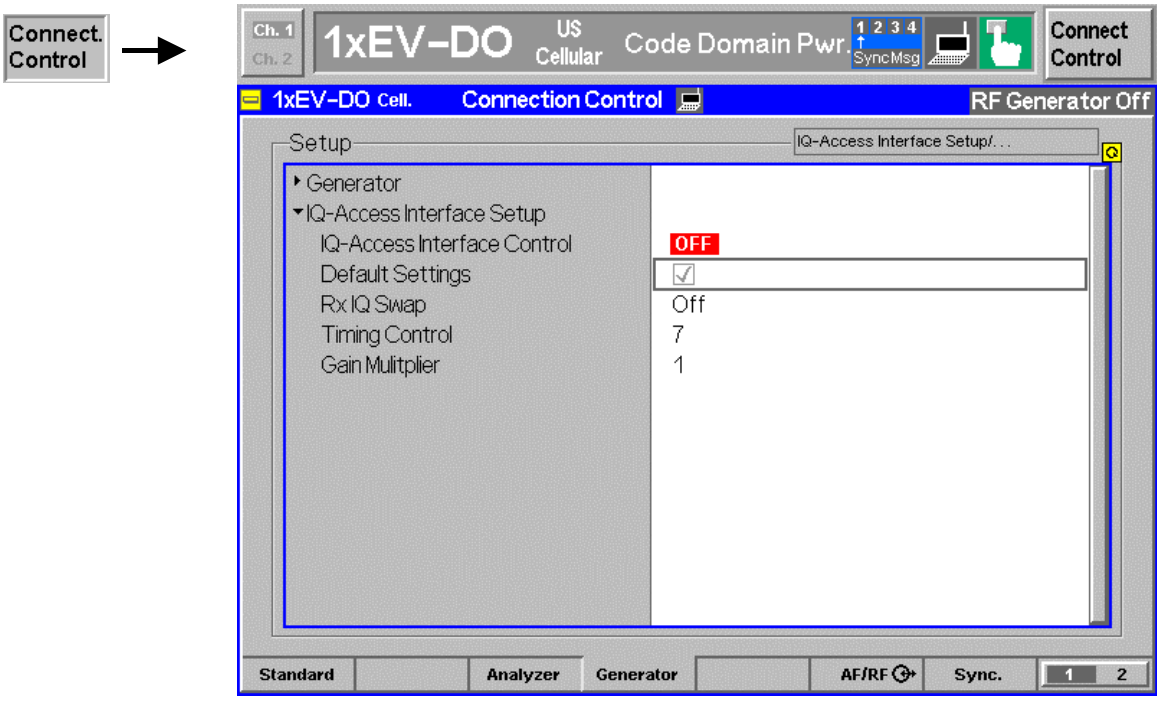


Figure 4-29 Connection Control – IQ-Access Interface Setup

IQ-Access Interface Control

The *IQ-Access Interface Control* controls the IQ-Access board operation. Pressing the *IQ-Access Interface Control* softkey switches the IQ-Access board ON or OFF. The *IQ-Access Interface Control* switch will be toggled with switching the *Generator* Control.

Remote control
```
INITiate:IQACcess
ABORt:IQACcess
FETCh:IQACcess:STATus?
```

Default Settings

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

Remote control
```
DEFault:IQACcess:CONTrol[?]
```

Rx IQ Swap

Rx IQ Swap allows to switch the I/Q channels of the Receiver. This is useful if the signaling unit permutes the signals.

Remote control
```
CONFigure:IQACcess:RXSWap[?]
```

Timing Control

Timing Control sets the timing and clock polarity control over Tx I/Q data.
Bits 0-2 supply timing information.
If bit 3 is set to “1”, external data is clocked on the negative edge of the CHIP16 clock, if set to “0”, then the positive edge of the clock is used.

Remote control
```
CONFigure:IQACcess:GMULtiplier[?]
```

Gain Multiplier

Gain Multiplier sets the gain multiplier value for Tx I/Q data supplied to the access board. Possible values are 0, 1, 2, 4, 8 and 16.

Remote control
```
CONFigure:IQACcess:TCONtrol[?]
```

AF/RF Connectors (Connection Control – AF/RF)

The *AF/RF* ⊶ tab configures the connectors for RF signals. This includes defining:

- The RF input and output of the CMU (*RF Output*, *RF Input*).
- External attenuation at the connectors (*Ext. Att. Output*, *Ext. Att. Input*).

The tab also controls the wideband peak power measurement *(Wideband Power)* and indicates the result.

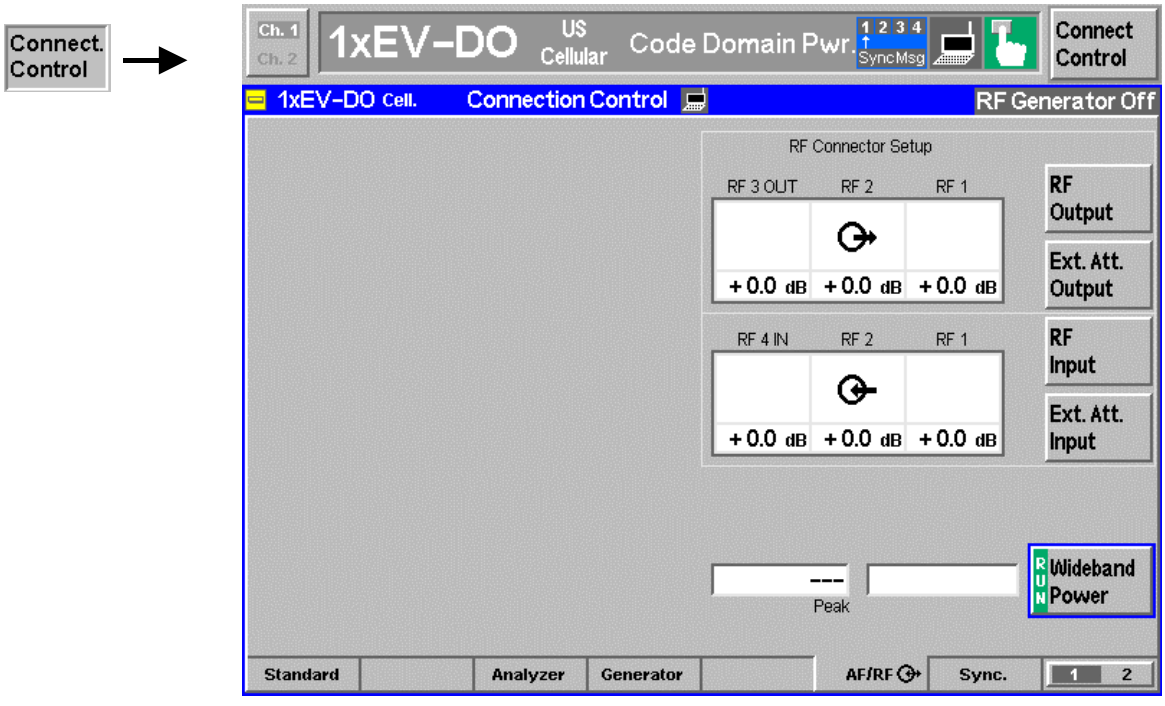


Figure 4-30 Connection Control – RF connectors

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 the RF output connector. The symbol ⊶ indicates the selected RF output.

Note: Input and output connectors can be arbitrarily combined. The bi-directional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time. The front panel LEDs are on (lit) if the generator is switched on or the modulation test is started.

Remote control

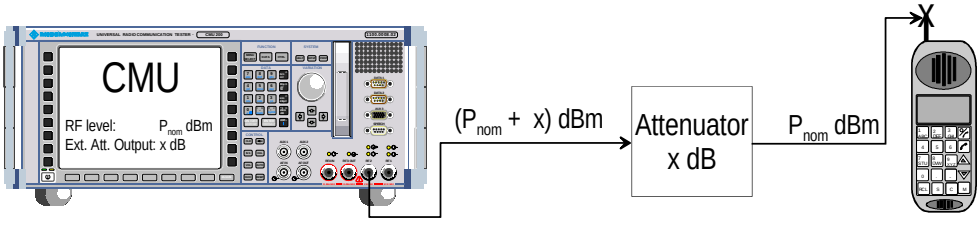
```
OUTPut[:STATe] RF1 | RF2 | RF3
```

Ext. Att. Output

The *Ext. Att. Output* softkey defines an external attenuation (or gain, if the value is negative) at the selected RF output.

External attenuation is required if attenuation (such as a cable) is included in the test setup path, 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 device under test (DUT), the generator level is therefore shifted with respect to the actual level at the output connector of the 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 defines which of the three connectors RF 1, RF 2, or RF 4 IN is to be used as the RF input connector. The symbol ⊕ indicates the selected RF input.

Note: Input and output connectors can be arbitrarily combined. The bi-directional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time. The front panel LEDs are on (lit) if a measurement is active.

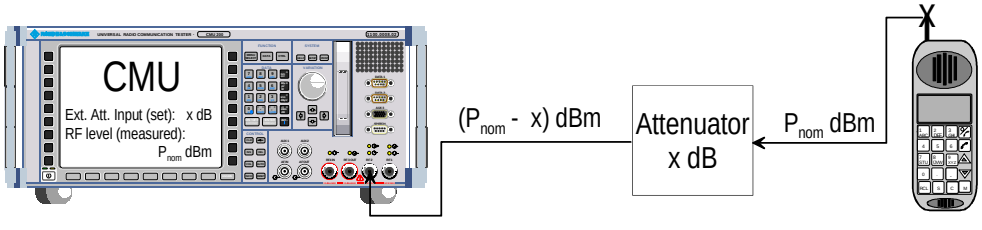
Remote control
`INPut[:STATe] RF1 | RF2 | RF4`

Ext. Att. Input

The *Ext. Att. Input* softkey sets 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 CMU or if 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 CMU. The level ranges for the input connectors are shifted as well.



Remote control
`[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]`

Wideband Power

The *Wideband Power* softkey controls the wideband power measurement and indicates its status *(RUN | HLT | OFF)*. The status can be changed after softkey selection (pressing once) by means of the *ON/OFF* key or the *CONT/HALT* key. The measurement result is in units of dBm. The analog bar to the right of the softkey shows the measured power relative to the *RF Max. Level* (see section *AF/RF Connectors (Connection Control – AF/RF)* on page 4.58*:* The display range is between *RF Max. Level – 10 dB* and *RF Max. Level + 10 dB*.

The wideband power measurement is performed at the RF Frontend of the CMU and yields the peak power of the input signal inside a wide frequency range. It is most accurate in the input level range around 0 dBm (typically –10 dBm to +30 dBm on RF2). The main purpose of the wideband power measurement is to indicate whether an input signal is available and whether it is advisable to change the *Max Level* settings.

Remote control
```
INITiate:WPOWer
FETCh:WPOWer:STATus?
READ[:SCALar]:WPOWer?
FETCh[:SCALar]:WPOWer?
SAMPle[:SCALar]:WPOWer?
```

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)

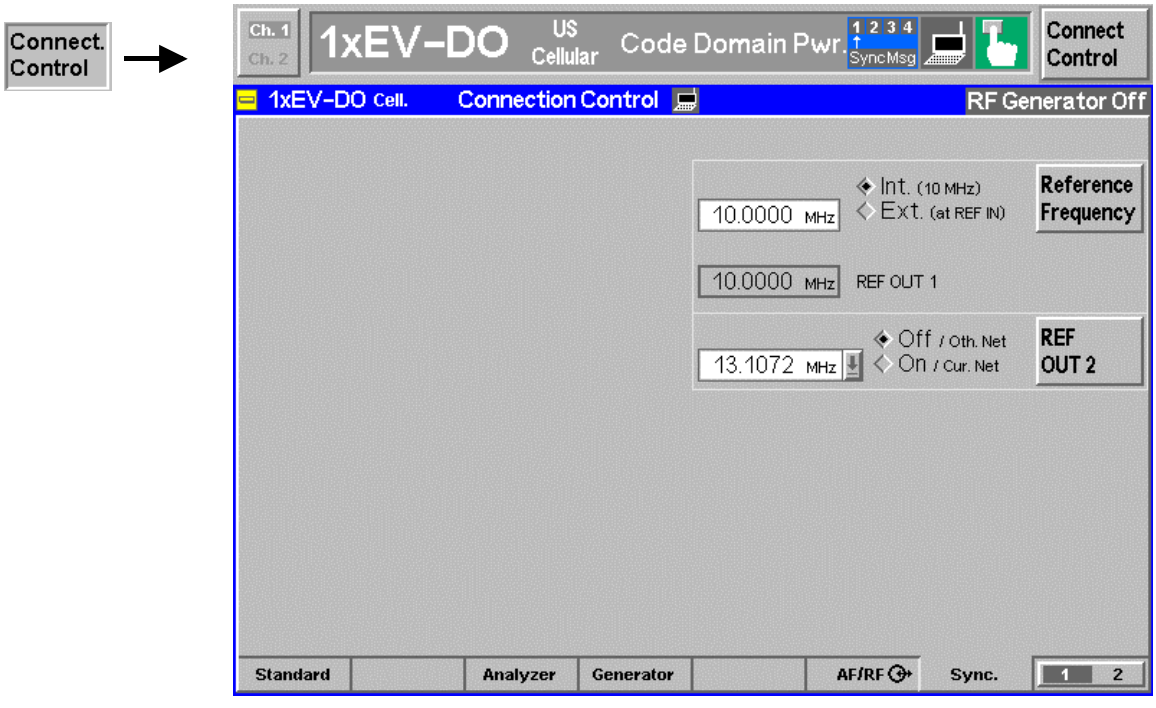


Figure 4-31 Connection Control – Synchronization

Reference Frequency

The *Reference Frequency* softkey determines the source and the frequency of the reference signal. Two selections are available.

Int. (10 MHz) The internal 10 MHz clock signal (TCXO or OCXO, CMU-B11/-B12) is used for synchronization. This signal is available at the REF OUT 1 connector at the rear of the instrument.

Ext. (at REF IN) An external reference signal is to be supplied to the *REF IN* connector. The frequency of the external reference signal must be entered in the input field.

The reference signal used is available at the *REF OUT 1* output connector at the rear of the instrument making it available for use by other instruments.

Notes:

With external synchronization selected, a warning message cycles on and off if no synchronization has been performed e.g. because of 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 to the CMU base system and the query `[SENSe:]SYNChronize:FREQuency:REFerence:LOCKed?` *returns the value* `ON`*.*

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 CMU input. A possible remedy is to use a lowpass filter or an attenuator pad directly at the CMU input. Correct synchronization may be checked by comparing the signal REF OUT 1 or REF OUT 2 with the input signal.

This configuration is valid in all CMU function groups.

Remote control
The commands for the reference frequency are part of the CMU base system (see CMU200/300 operating manual):

```
CONFigure:SYNChronize:FREQuency:REFerence:MODE
      INTernal | EXTernal
CONFigure:SYNChronize:FREQuency:REFerence <Frequency>
[SENSe:]SYNChronize:FREQuency:REFerence:LOCKed?
```

REF OUT 2

The *REF OUT 2* softkey configures a network-specific system clock available at the *REF OUT 2* output connector at the rear of the instrument. The associated field allows selection between two settings:

OFF (other network) The clock frequency of another active function group is made available at the REF OUT 2 connector instead of the current function group. The REF OUT 2 must be switched on in the other function group.

On (current network) The network-specific system clock of the current function group is available at the REF OUT 2 output connector.

The clock frequency can be used to synchronize other instruments.

Remote control

```
SOURce:DM:CLOCk:STATe ON | OFF
SOURce:DM:CLOCk:FREQuency <Frequency>
```

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 trigger condition for the measurement and the routing of output trigger signals.

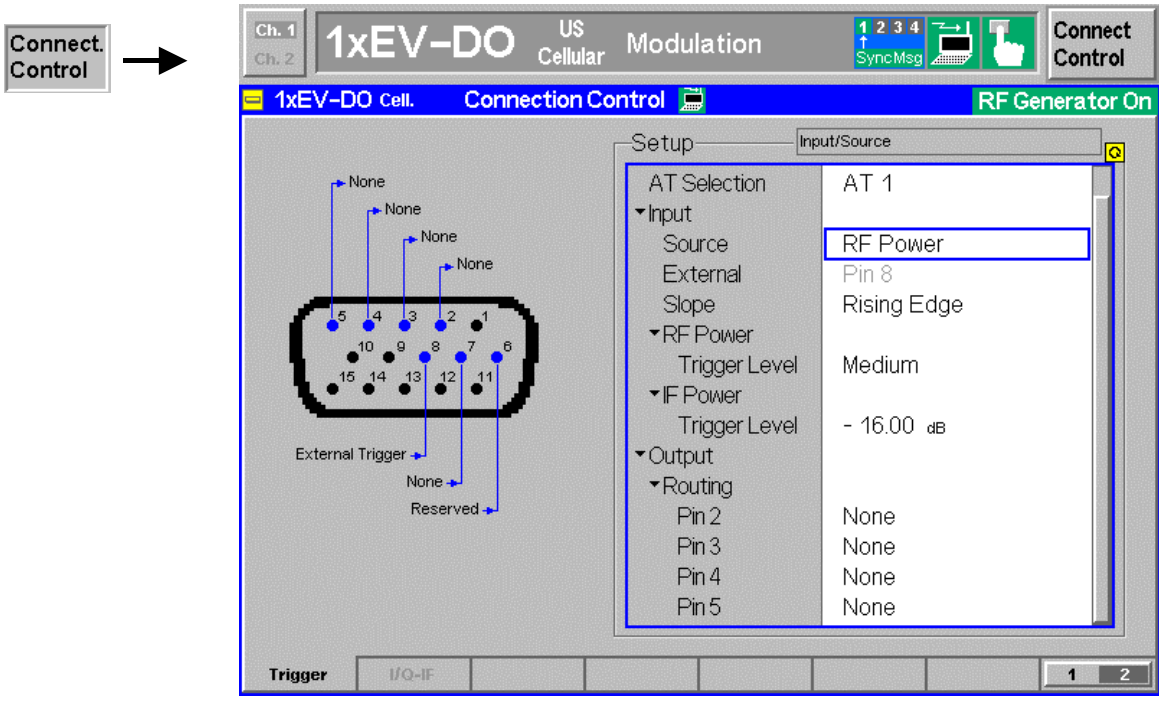


Figure 4-32 Connection Control – Trigger

Default Settings The *Default Settings* checkbox assigns the default setting to all functions in the *Trigger* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote control
`DEFault:TRIGger[:SEQuence][?]`

AT Selection Only one Access Terminal at a time can be supported by the Trigger. *AT Selection* allows to choose one of the four supported Access Terminals.

Remote control
`TRIGger:SELect:AT[?]`

Input – Source *Source* sets the CMU200 to use its internal signal trigger source or use an external trigger supplied via the AUX 3 connector on the front panel.

The trigger setting affects the results of the *Transmit Time Error* measurement as described here.

Free Run	No trigger. Timing error results are not possible.
Internal	Timing error results are possible when DUT is correctly synchronized with the CMU. An output frame trigger signal can be routed to pins 2 to 5 of AUX 3; see below.
External	Timing error results are possible if an external trigger

signal is provided and the DUT is correctly synced with the CMU.

RF Power	Timing error results are not possible.
IF Power	Timing error results are not possible.

Remote control
`TRIGger[:SEQuence]:SOURce[?]`

Input – External *External* indicates that the external trigger signal is to be applied to *Pin 8* of the AUX 3 connector. This holds for all three modulation schemes.

Input – Slope Allows the setting of which edge of the trigger signal should be interpreted as the actual trigger. The possible values are “Falling Edge” and “Rising Edge”.

Remote control
`TRIGger[:SEQuence]:SLOPe[?]`

Input – RF Power – Trigger Level Sets the RF Power level a signal burst has to reach to be interpreted as a incoming trigger. A setting too high results in no trigger at all, a setting to low doesn’t allow the measurement to identify any trigger. In both cases the measurement results will be invalid.

Remote control
`TRIGger[:SEQuence]:THReshold:RFPower[?]`

Input – IF Power – Trigger Level Sets the IF Power level a signal burst has to reach to be interpreted as a incoming trigger. A setting too high results in no trigger at all, a setting to low doesn’t allow the measurement to identify any trigger. In both cases the measurement results will be invalid.

Remote control
`TRIGger[:SEQuence]:THReshold:IFPower[?]`

Output – Routing The *Routing* functions select the type of periodic pulse signal (or no signal, setting *NONE)* to be applied to pins 2, 3, 4,and 5 of the AUX 3 connector. The output frame trigger is available if the *Internal* trigger source is selected and the RF generator is switched on. It consists of a high-pulse TTL signal with its rising edge at the beginning of the frames of the forward signal.

The CMU provides output trigger signals with the following periodicity:

None	---
PP2S	2.00 s
Ctrl. Channel	426.67 ms
Ctrl. Slot	*<variable>*
AT Rev. Frame	26.67 ms
AT Fwd. Slot	*<variable>*
Slot	1.67 ms
PwrCtrlPattern	*<variable>*
Injection	*<variable>*

All signals can be selected for each of the pins 2 to 5. The current AUX 3 pin

assignment (including the external trigger input at pin 8) is shown in the diagram to the left of the trigger *Setup* table.

Remote control
`TRIGger:OUTPut:PIN<nr>:SIGNal <Frame_Period>`

I/Q-IF Interface (Connection Control – I/Q-IF)

The *I/Q-IF* 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 *I/Q-IF* tab configures the signal paths for I/Q and IF signals. With option CMU-B17, *I/Q and IF Interfaces,* I/Q and IF signals can be used in the framework of *RF* measurements and in many network tests. For a detailed description of rear panel connectors for I/Q and IF input/output signals, test scenarios and application examples refer to the CMU200/300 operating manual.

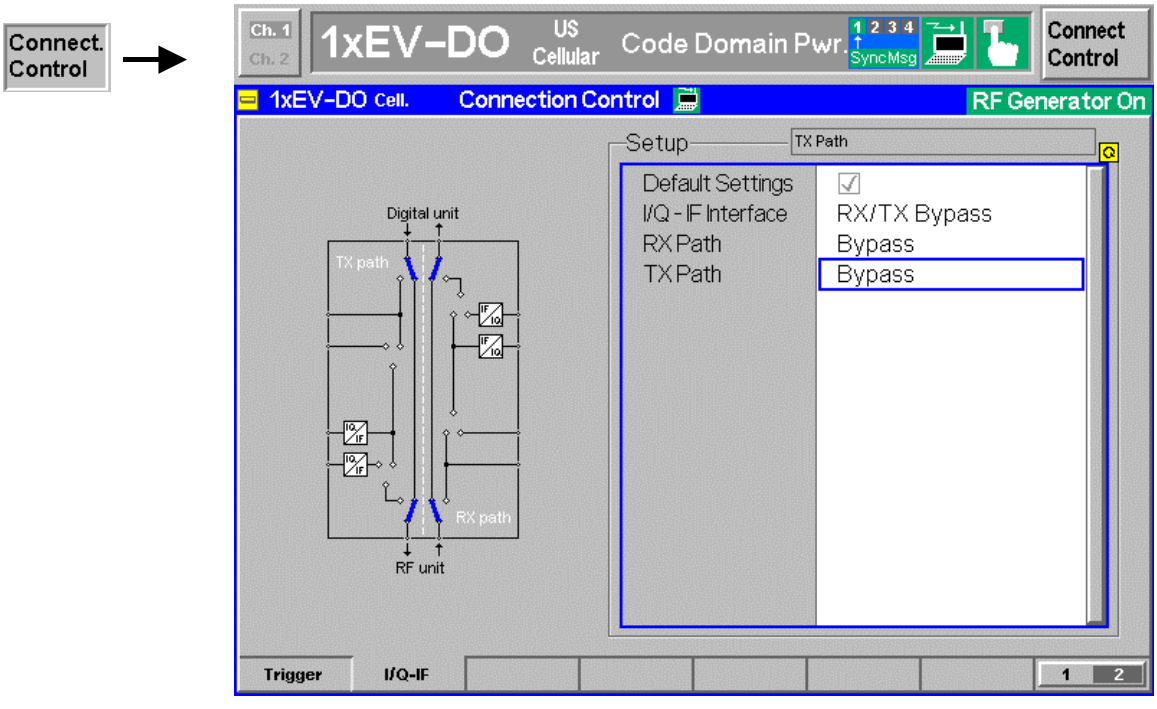


Figure 4-33 Connection Control – I/Q-IF

Default Settings The *Default Settings* checkbox assigns the default setting to all functions in the *I/Q-IF* tab.

Remote control `IQIF:DEFault ON | OFF`

I/Q-IF Selects the I/Q-IF test scenario, overwriting the current *RX Path* and *TX Path* settings. Six different predefined test scenarios with fixed RX and TX path are provided; see *Table 4-8 below.*

Additional scenarios may be defined by selecting any other combination of RX and TX paths. When this is done *I/Q-IF* is set to *User-defined.* The circuit diagram to the left of the *Setup* table shows the current RX and TX signal paths.

Remote control
```
CONFigure:IQIF:RXTXcombined
        BYP | BYIQ | XOIO | IOIO | IOXO | FPAT | UDEF
```

RX Path Selects the RX signal path, leaving the *TX Path* unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then *I/Q-IF* is set to the predefined scenario; otherwise it is set to *User-defined*.

The circuit diagram to the left of the *Setup* table shows the current RX and TX signal paths.

Remote control
```
CONFigure:IQIF:RXPath
        BYP | BYIQ | XOIO | IOIO | IOXO | FPAT | UDEF
```

RX Path Selects the TX signal path, leaving the *RX Path* unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then *I/Q-IF* is set to the predefined scenario; otherwise it is set to *User-defined*.

The circuit diagram to the left of the *Setup* table shows the current RX and TX signal paths.

Remote control
```
CONFigure:IQIF:TXPath
        BYP | BYIQ | XOIO | IOIO | IOXO | FPAT | UDEF
```

Table 4-8 I/Q-IF scenarios and path settings

I/Q-IF	**RX Path**	**TX Path**	**Remark/Application** (see also CMU manual)
RX/TX Bypass	Bypass	Bypass	No I/Q or IF inputs/outputs connected Direct signal analysis and transmission with full measurement accuracy
Byp. w. I/Q-OF OUT	Bypass w. I/Q-IF OUT	Bypass w. I/Q-IF OUT	No I/Q or IF inputs connected Analysis of received and transmitted signal via I/Q or IF
I/Q IN/OUT	I/Q IN/OUT	I/Q IN/OUT	Insertion of signal to be analyzed and transmitted on I/Q level
IF IN_I/Q IN/OUT	IF IN_I/Q IN/OUT	IF IN_I/Q IN/OUT	Additional processing of received and transmitted signal on IF level (filters etc.) and analysis via I/Q
IF IN/OUT	IF IN/OUT	IF IN/OUT	Insertion of signal to be analyzed and transmitted on IF level
Fading	Bypass	I/Q IN/OUT	Direct analysis of received signal Modification (fading) of transmitted signal by means of an external fading simulator (SMIQ, ABFS)
User-defined	Any combination of RX Path and TX Path not listed above		Any combination of RX and TX test cases listed above

Marker Control

Markers are references available with any application displaying a graph of the measurement. This section gives a detailed explanation of how to control each marker type. Marker information specific to an application is located with the application.

Marker

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

Markers Graphical tools for marking points on the measurement curve and for numerical output of measured values.

The markers are turn activated by pressing the hotkey and pressing the *ON/OFF* key, or entering a value. Values can be entered directly with the keypad or with the *Variation* knob.

The coordinates of the three markers are indicated in the format *Ordinate value (level)/abscissa value (time)* in a parameter line above the test diagram. The position of the reference marker is expressed in absolute units (level in dBm or percentage and time in symbols). The delta markers are expressed as absolute or relative values (relative position from the reference marker).

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

Ref R

The *Ref* R hotkey displays the status (On | Off) of the reference marker. Pressing the hotkey displays a popup menu to switch the reference marker on or off (use the *ON/OFF* key or the *Variation* knob).

The reference marker is represented by the symbol R in the test diagram. The marker position (abscissa) is determined in the input field *Ref. Marker*. The marker can be positioned to arbitrary time values. If its position is outside the diagram area it will be invisible and its coordinates will be "- - - / <abscissa_value>". The marker is switched off in the default setting *(OFF).* The marker level is defined by the measurement curve at the marker position.

Delta 1

The *Delta* 1 hotkey displays the status (On | Off) of delta marker 1. Pressing the hotkey displays a popup menu to switch the delta marker 1 on or off (use the *ON/OFF* key or the *Variation* knob).

Delta marker 1 is represented by the symbol 1 in the test diagram. The marker position (abscissa) is defined in the input field *Delta Marker 1*. The marker can be positioned to arbitrary time values. If its position is outside the diagram area it will be invisible and its coordinates will be "<abscissa_value> / - - -". The marker is switched off in the default setting *(Off).* The marker level is defined by the trace at the marker position.

Pressing the hotkey twice displays the *Delta 1 Config* popup display. It defines whether the position of delta marker 1 is measured and indicated in absolute units (of the horizontal scale) or relative to the reference marker.

Delta 2

The *Delta* 2 hotkey switches the delta marker 2 on or off (use the *ON/OFF* key).

The functions and control are identical to delta marker 1.

D-Line

The *D-Line* hotkey activates and controls the position of the D-Line in the test diagram.

The D-line is a horizontal, colored auxiliary line in the test diagram used for marking a level value and for measuring level differences.

Press the hotkey once to turn the D-Line on or off (using the *ON/OFF* key). The level of the D-line is determined by entering an absolute or relative value with either the keypad or *Variation* knob.

Press the hotkey twice to open the *D-Line Config* popup to set the absolute or relative D-Line display.

In the Absolute setting, the D-Line is expressed in the vertical scale units and is limited to the value range of the vertical scale. In the Relative setting, the D-Line value is relative to the maximum vertical scale.
The default setting is Off.

Contents

5 Remote Control – Basics

This chapter gives a survey of the basic features and concepts of 1xEV-DO remote control commands. Remote control can be described in terms analogous to the ones used in Chapter 3 for the classification of menus and settings for the graphical user interface. In the following, we will particularly point out the similarities and differences between manual and remote control.

Structure and Order of Commands

Chapter 6 of this manual gives a description of all 1xEV-DO remote control commands, including their parameters, default values and ranges of all numerical parameters.

Addressing

The CMU200 uses extended addressing. The instrument is assigned a primary address while each function group and test mode is identified via a secondary address. This allows the same remote commands to be used in several function groups and modes:

```
ibwrt(h_EVDO1xAT_NSig, "INITiate:NPOWer")
ibwrt(h_CDMA2KPCSMS_Sig, "INITiate:NPOWer")
```

provided that the variables `h_EVDO1xAT_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 1xEV-DO network tests described in this manual:

EVDO1XAT_NSig

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 CMU200 base unit operating manual) are identified by the third-level keyword of each command (as in `MODulation:EVMagnitude`). Chapter 6 is organized as follows:

1xEV-DO:

- General purpose commands that are identical or almost identical in every function group (`OPTion, STATus:OPERation, RESet, MMEMory, IQIF`)
- General configurations that are valid for the entire 1xEV-DO function group (second-level keywords `NETWork, LEVEL, INTernal, EXTernal, RFANalyzer, RFGenerator, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`)
- Measurement groups: (second/third-level keywords `WPOWer, NPOWer, MODulation:MQUality, MODulation:OVERview, MODulation:EVMagnitude, MODulation:PERRor, MODulation:MERRor, MODulation:IQANalyzer, CDPower:CDPW, CDPower:PCDep, CDPower:CHPW, SPECtrum:ACP`).

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. A list of all commands is annexed to Chapter 6.

SCPI Conformity In view of the particular requirements of 1xEV-DO measurements not all commands could be taken from the SCPI standard. However, the syntax and structure of all commands is based on SCPI conventions. For a detailed description of the SCPI standard refer to Chapter 5 of the operating manual for the CMU basic unit.

SPCI confirmed and SPCI approved commands are explicitly marked in Chapter 6.

Remote Control All commands may be used for control of the CMU via the GPIB interface or serial (RS-232) interface.

Measurement Control

The commands in the measurement groups `WPOWer, NPOWer, POWer..., MODulation..., CDPower...` have an analogous structure and syntax. The measurements are controlled according to common concepts which are explained in detail in Chapter 5 of the CMU operating manual. The following sections show how the general concepts are applied to 1xEV-DO measurements.

Measurement Groups

The measurement groups are referred to as *measurement objects* (keyword <meas_obj>) in remote control. Most measurement objects correspond to a measurement group or application in manual control. For 1xEV-DO measurements, the following measurement objects are defined:

Table 5-1 Measurement objects in 1xEV-DO.

1xEV-DO	
Meas. Object	**Measurement group Application**
`WPOWer`	*Wide-band Power measurement.*
`NPOWer`	*Narrow-band Power measurement.*
`MODulation:MQUality`	*Modulation Quality measurement (H-PSK)* AT power, waveform quality, frequency error, transmit time error, carrier feedthrough, I/Q imbalance and sideband suppression. Statistical results and the results of the limit check can be evaluated.
`MODulation:OVERview`	*Modulation Overview measurement (H-PSK)* H-PSK scalar modulation results. Summary of phase error, error vector magnitude and magnitude error of the AT transmitter output signal. The frequency error, average and RMS error, statistical results and the results of the limit check can be evaluated.

1xEV-DO	
Meas. Object	**Measurement group Application**
MODulation:**EVMagnitude**	*Modulation Error Vector Magnitude measurement (H-PSK)* Modulation waveform interval as a function of time of the AT transmitter output signal (H-PSK). The frequency error, average and RMS error, statistical results and the results of the limit check can be evaluated.
MODulation:MERRor	*Modulation Magnitude Error measurement (H-PSK)* Modulation waveform interval as a function of time of the AT transmitter output signal (H-PSK). The frequency error, average and RMS error, statistical results and the results of the limit check can be evaluated.
MODulation:PERRor	*Modulation Phase Error measurement (H-PSK)* Modulation waveform interval as a function of time of the AT transmitter output signal (H-PSK). The frequency error, average and RMS error, statistical results and the results of the limit check can be evaluated.
MODulation:IQANalyzer	*Modulation IQ Analyzer (H-PSK)* Analysis of the AT signal in the I/Q plane.
CDPower:CDPW	*Code Domain Power measurement (H-PSK)* Code Domain Power in 16 code domain channels contributing to the reverse link 1xEV-DO signal. The slots for the Pilot and the RRI channel are evaluated within the same measurement shot. The AT power, carrier feedthrough, frequency error and rho factor, statistical results and the results of the limit check can be evaluated.
CDPower:PCDep	*Peak Code Domain Error Power measurement (H-PSK)* Peak Code Domain Error Power in 16 code domain channels contributing to the reverse link 1xEV-DO signal. The slots for the Pilot and the RRI channel are evaluated within the same measurement shot. The AT power, carrier feedthrough, frequency error and rho factor, statistical results and the results of the limit check can be evaluated.
CDPower:CHPW	*Channel Power measurement (H-PSK)* Channel Power of the reverse link physical channels of both the I and Q signal. The slots for the Pilot and the RRI channel are evaluated within the same measurement shot. The AT power, carrier feedthrough, frequency error and rho factor, statistical results and the results of the limit check can be evaluated.
SPECtrum:ACP	*Adjacent Channel Power Spectrum measurement* Power as a function of the offset frequency related to the Channel Power. Statistical results and the results of the limit check can be evaluated.

Measurement Statistics

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 two repetition modes *Single Shot and Continuous* are available (*Counting* is not available in manual control, see chapter 3).

Generally four different traces are determined within one measurement:

- The result in the current period
- The maximum result
- The minimum result
- The average result (evaluated over a set number of waveform intervals)

The four results can be queried independently.

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 burst.	`CONFigure:<meas_obj>:CONTrol:STATistics` **`1 ... 1000 | NONE`** `(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`
Repetition Mode Single Shot	The measurement is stopped after one statistics cycle. All remote control measurements default to single shot.	`CONFigure:<meas_obj>:CONTrol:REPetition` **`SINGleshot`**`, <StopCondition>, <Stepmode>` `(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`
Continuous	The measurement is continued until stopped explicitly or by a limit failure. Average results are calculated according to the rules described in chapter 3.	`CONFigure:<meas_obj>:CONTrol:REPetition` **`CONTinuous`**`, <StopCondition>, <Stepmode>` `(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`

Counting	Repeated single shot measurement with configured statistics cycles.	`CONFigure:<meas_obj>:CONTrol:REPetition`
		`1 ... 10000``, <StopCondition>, <Stepmode>`
		`(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`
		
		A counting measurement with 1 evaluation period is equivalent to a single shot measurement..

Traces	The specifiers `CURRent, MMAX,` and `AVERage` denote the traces for the current evaluation period, the extreme value, and the average of a set of evaluation periods. They correspond to the *Display Mode* set in the measurement configuration menus.
	
	In general all four 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:<meas_obj>:<disp>?`
		`READ:SUBarrays:<meas_obj>:<disp>?`
		`...`
		
		`<disp> = CURRent | AVERage | MAXimum | MINimum | MMAX` (not all modes are available for all measurements)
		
		`(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`
		
		Limit matching:
		`CALCULATE[:SCALar]:<meas_obj>:<disp>:MATChing:LIMit? <Response>`
		....
		
		`<Response>` contains the limit matching identifiers for all three traces

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]:<symmetry>:<Spec.>:VALue`
		`<disp> = CURRent | AVERage | MMAX | CAMMax`
		where CAMMax denotes a limit valid for all measurement curves (current and average and min/maximum)
		`(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`
		`<symmetry> = SYMMetric | ASYMmetric`
		for symmetric or asymmetric upper and lower limits
		`<Spec.> = UPPer | LOWer | [: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:<meas_obj.>:MATChing:LIMit?` `(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`
	Possible results of the scalar limit check are listed on the right side.	`NMAU` not matching, underflow `NMAL` not matching, overflow `INV` measured value invalid `OK` no limit failure

	The result of the limit check depends on the statistics settings (see section *Measurement Statistics* on page 5.3).	`CALCULATE:ARRay:<meas_obj>:<disp> :MATChing:LIMit? ....`
		where `<disp> = :CURRent | :AVERage | :MMAXimum | :MAXimum | :MINimum`
		`(<meas_obj> = NPOWer | MODulation:MQUality | MODulation:EVMagnitude | CDPower:CHPW | ...)`

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. This section is devoted to the particular features concerning 1xEV-DO measurements.

The CMU offers 30 independent `STATus:OPERation:SUM1|2:CMU<nr>` sub-registers (<nr>=1 ... 15) which are implemented in hierarchical form. The bits of the 30 STATus:OPERation registers are set only after the registers are assigned to a function group and measurement mode.

In the EVENt part, the STATus:OPERation register contains information on which actions the instrument has executed since the last readout. All fife parts of the registers can be read using one of the commands of the subsystem `STATus:OPERation:SUM1|2:CMU<nr>:...`

Note: *Symbolic status register evaluation by means of the commands `STATus:OPERation:SYMBolic:ENABle` and `STATus:OPERation:SYMBolic[:EVENt]?` is a convenient alternative method of retrieving status information. See also section* Symbolic Status Event Register Evaluation *in chapter 5 of the CMU operating manual and chapter 6 of this manual.*

1xEV-DO access terminal tests comprise the *Non-Signalling factory test mode*. The secondary address of the 1xEV-DO function group must be used to access the correct status registers. The bit assignment is as follows:

Table 5-4 1xEV-DO bits used in the STAT:OPER:SUM1|2:CMU<nr> sub-registers

Bit-No.	Description	Symbol in `STAT:OPER:SYMB...`	Firmware Version
0	**Forward traffic (AT1) packet stream completed** This bit is set when all packets specified in the *Packet Count* parameter are sent to the access terminal°1	PS1C	V3.40
1	**Forward traffic (AT2) packet stream completed** This bit is set when all packets specified in the *Packet Count* parameter are sent to the access terminal°2	PS2C	V3.40
2	**Forward traffic (AT3) packet stream completed** This bit is set when all packets specified in the *Packet Count* parameter are sent to the access terminal°3	PS3C	V3.40
3	**Forward traffic (AT4) packet stream completed** This bit is set when all packets specified in the *Packet Count* parameter are sent to the access terminal°4	PS4C	V3.40
4	**Measurement Invalid** This bit is set when a measurement returns invalid results.	MINV	V3.40
11	**RF Input Overdriven** This bit is set if the RF input level at connector RF1, RF2 or RF 4 IN is larger than the specified RF Max. Level plus an appropriate margin.	RFIO	V3.40
12	**RF Input Underdriven** This bit is set while the RF input level at connector RF1, RF2 or RF 4 IN falls below the measurement range controlled by the specified RF Max. Level.	RFIU	V3.40

Special Terms and Notation

Below we list some particular features in the syntax of the 1xEV-DO 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; all of them are described along the same scheme. 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, the default units and unit rings
3. Detailed description of the command, signalling state required for command execution (in Signalling mode), required firmware version

Detailed lists of default values are annexed to the command description.

Order of commands

The commands are arranged according to their function. The general purpose

of a command is described by the keyword in the second level. 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:MODulation:PERRor:HPSK:CONTrol:STATistics
          <Statistics>
```

Commands with the keyword *MODulation* in the second level belong to the modulation measurement. The keywords in the third, fourth and fifth level indicate that the command defines the number of bursts forming a statistics cycle in the measurement of the AT phase error.

Combined measurements

To limit the number of remote control commands in an application program, all scalar results of a measurement group are usually measured together and returned in a common list. Arrays (e.g. the traces for `CDPOWer` and `MODulation` measurements) are returned as comma-separated lists of values; 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

Many commands are supplemented by a parameter or a list of parameters. Parameters either provide alternative options (setting a or setting b or setting c ..., see special character "|"), or they form a comma-separated list (setting x,y).

<Par_Name>

Alternative settings are described by a common name (literal) written in angle brackets (<>). This literal serves as a description of the parameters only; in an application program it must be replaced by one of the settings given in the detailed parameter description.

Example:
```
CONFigure:MODulation:PERRor:HPSK:CONTrol:STATistics
        <Statistics>
        with       <Statistics>  = 1 ... 10000 | NONE
```
possible command syntax: `CONF:MOD:PERR:CONT:STAT  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. Either the short form or the long form are allowed; mixed forms are not generally recognized. 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:LEVel ON | OFF
```

[ ] *Key words* in square brackets can be omitted when composing the command header (see Chapter 5 of the CMU Operating 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.

[?] Remote control commands that can also be used as a query are indicated with [?] at the end of the command. As a query, the “?” (question mark) must be part of the command.

{ } Braces or curly brackets enclose one or more parameters that may be included zero or more times.

<nr> This symbol stands for a numeric suffix, e.g. an enumeration index for input and output connectors.

List of Commands

Command: The *Command* column of the table contains all remote control commands arranged according to their function (configurations or measurement objects).

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 one of the two preceding categories)

Contents

6 Remote Control – Commands

This chapter contains all remote-control commands for the 1xEV-DO function group. The commands are presented in tabular form with their parameters and the ranges of values. The structure of this chapter is analogous to that of the reference part for manual operation (Chapter 4).

Within the 1xEV-DO function group, the general configurations are presented first and then the individual measurement groups (test objects) are presented.

General notes on remote control in the 1xEV-DO function group can be found in Chapter 5. An introduction to remote control according to SCPI standard and the status registers of the CMU is given in Chapter 5 of the operating manual for the CMU basic instrument.

Note: *Remote control commands that can also be used as a query are indicated with [?] at the end of the command. As a query, the "?" (question mark) must be part of the command.*

Otherwise the command documentation follows SCPI conventions (see also Chapter 5): Keywords and parameters enclosed in square brackets are optional and can be omitted without changing the effect of the command.

General Commands

The commands listed in this section describe the global CMU features that are supported in the 1xEV-DO function group. These commands are identical or almost identical in all CMU function groups that support the corresponding feature.

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, V3.40:SP00 2003-04-05" EVDO1xAT_NSig"	–	–	V3.40
Command description			
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.			

SYSTem:VERSion:SW:MMI?			MMI Software Version
Response	Def. Value	Default unit	FW vers.
Example: "1.00C[3.40:SP00]"	–	–	V3.40
Command description			
This command returns the information about the current version of the 1xEV-DO MMI module. This command may be helpful for driver development as the MMI module determines the GPIB command set. This command is always a query.			

Partial Reset

The *RESet* subsystem restores the (factory) default values for the 1xEV-DO function group (unless the secondary address of another function group is used). It corresponds to the 1xEV-DO path in 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.	V3.40

Configuration File Management

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>",	Name of the config. file to be created	–	–	V3.40
INTernal | EXTernal	Storage device of the config. file	INTernal	–	

Command description

This command saves the configuration of the 1xEV-DO function group (unless the secondary address of another function group is used) 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>",	Name of the config. file to be recalled	–	–	V3.40
INTernal | EXTernal	Storage device of the config. file	INTernal	–	

Command description

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.

I/Q-IF Interface

The subsystem *IQIF* configures the signal paths for I/Q and IF signals provided by option CMU-B17, *I/Q and IF Interfaces*. It corresponds to the *I/Q-IF* tab in the second plane of the *Connection Control* menu.

Hint: *How to make sense out of parameter names*

In all path configurations except bypass, both the I/Q and IF output are connected (to either the RF Unit, the Digital Unit or one of the I/Q-IF inputs). The paths differ in the connection of the input branches: The qualifier IO denotes a connected input (with connected output), XO denotes a disconnected input (with connected output). Many parameters of the IQIF commands are composed of two IO/XO qualifiers, the first one standing for the IF signal, the second for the I/Q signal.

Example: *The parameter IOXO denotes a connected IF input and a disconnected IF output, while both output branches are connected.*

For more information see Chapter 4 and the application examples in the CMU200/300 operating manual.

CONFigure:IQIF:RXTXcombined[?] <*Scenario*> I/Q-IF

<*Scenario*>	Description of parameters	Def. value	Def. unit	FW vers.
BYP	RX/TX Bypass, `RXPath = BYP, TXPath = BYP`	BYP	–	V3.40
BYIQ	Bypass w. I/Q-OF OUT, `RXPath = TXPath =BYIQ`			
XOIO	I/Q IN/OUT, `RXPath = TXPath = XOIO`			
IOIO	IF IN_I/Q IN/OUT, `RXPath = TXPath = IOIO`			
IOXO	IF IN/OUT, `RXPath = TXPath = IOXO`			
FPAT	Fading Path, `RXPath = BYP, TXPath = XOIO`			
UDEF	User-defined scenario, can not be set but may be returned by the query `CONF:IQIF:RXTX?`			

Description of command

This command selects the I/Q-IF test scenario, overwriting the current RX and TX path settings (see commands `CONFigure:IQIF:RXPath` and `CONFigure:IQIF:TXPath` below). Six different predefined test scenarios with fixed RX and TX path are provided. Additional scenarios may be defined by selecting any other combination of RX and RX paths.

Note: *`UDEF` is not provided as a setting parameter. If the RX/TX path combination defined via `CONFigure:IQIF:RXPath` and `CONFigure:IQIF:TXPath` doesn't correspond to any of the predefined scenarios, then a user-defined scenario is set implicitly, i.e. the query `CONF:IQIF:RXTX?` returns the value `UDEF`.*

CONFigure:IQIF:RXPath[?] <*Path*> RX Path

<*Path*>	Description of parameters	Def. value	Def. unit	FW vers.
BYP	Bypass	BYP	–	V3.40
BYIQ	Bypass w. I/Q-IF OUT			
XOIO	I/Q IN/OUT			
IOIO	IF IN_I/Q IN/OUT			
IOXO	IF IN/OUT			

Description of command

This command selects the RX signal path, leaving the TX path (see command `CONFigure:IQIF:TXPath` below) unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then `CONFigure:IQIF:RXTXcombined` is set to the predefined scenario; otherwise it is set to `UDEF`.

CONFigure:IQIF:TXPath[?] <*Path*> TX Path

<*Path*>	Description of parameters	Def. value	Def. unit	FW vers.
BYP	Bypass	BYP	–	V3.40
BYIQ	Bypass w. I/Q-IF OUT			
XOIO	I/Q IN/OUT			
IOIO	IF IN_I/Q IN/OUT			
IOXO	IF IN/OUT			

Description of command

This command selects the TX signal path, leaving the RX path (see command `CONFigure:IQIF:RXPath` above) unchanged but adapting the I/Q-IF test scenario to the new RX/TX path combination: If the combination corresponds to a predefined scenario, then `CONFigure:IQIF:RXTXcombined` is set to the predefined scenario; otherwise it is set to `UDEF`.

IQIF:DEFault[?] <Enable> Default Settings

<*Enable*>	Description of parameters	Def. value	Def. unit	FW vers.
ON |	The parameters are set to their default values	ON	–	V3.40
OFF	Some or all parameters differ from the default values			

Description of command

If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting *OFF* causes an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Symbolic Status Event Register Evaluation

The following commands are used to retrieve the events reported in the 1xEV-DO function group. See section *Symbolic Status Event Register Evaluation* in Chapter 5 of the CMU operating manual.

STATus:OPERation:SYMBolic:ENABle <Event>{,<Event>}			Symbolic status evaluation	
Parameter list	Parameter description	Def. Value[1]	Default Unit	FW vers.
<Event>{,<Event>} | NONE	List of symbols for events to be reported No event reported	NONE	–	V3.40
Command description				
This command enables event reporting for one or several events in the 1xEV-DO function group, i.e. it sets the corresponding bits in the `STATus:OPERation:CMU:SUM<nr>:CMU<nr_event>:ENABle` register (`<nr> = 1 | 2, <nr_event>` denotes the current function group) and in all sum registers up to the status byte. The events and the corresponding symbols for the function group are listed in Chapter 5 (see section *Status Registers).* The symbols may be entered in arbitrary order.				

STATus:OPERation:SYMBolic[:EVENt]?			Symbolic status evaluation	
Response	Parameter description	Def. Value[2]	Default Unit	FW vers.
NONE | <Event>{,<Event>}	No event in the *1xEV-DO* function group List of reported events	NONE	–	V3.40
Command description				
This command is always a query. It lists the events reported in the *1xEV-DO* function group and deletes these events in the `STATus:OPERation:CMU:SUM<nr>:CMU<nr_event>:EVENt` register as well as in all sum registers.				

[1] The default values quoted in this command are achieved after a `STATus:PRESet` command. `*RST` does not overwrite the entries in the status registers; see section *Reset Values of the Status Reporting Systems* in chapter 5.

[2] The default values quoted in this command are achieved after a `*CLS` command. `*RST` does not overwrite the entries in the status registers; see section *Reset Values of the Status Reporting Systems* in chapter 5.

Band Class – Network Standard

NETWork Standard

The *NETWork* subsystem switches between the different 1xEV-DO network standards. The network standard determines the channel/frequency assignment for RF analyzer and generator. Furthermore some measurements provide separated default setups for each of the network standards.

CONFigure:NETWork:STANdard[?] <*Standard*> Network Standard

<Standard>	Description of parameters	Def. value	Def. Unit	FW vers
USC |	Band Class 0, US Cellular	USC	–	V3.40
KCEL |	Band Class 0, Korean Cellular			
NAPC |	Band Class 1, North American PCS			
TACS |	Band Class 2, TACS			
JTAC |	Band Class 3, JTACS			
KPCS |	Band Class 4, Korean PCS			
N45T |	Band Class 5, NMT 450			
IM2K |	Band Class 6, IMT-2000			
NA7C |	Band Class 7, North American 700 MHz			
B18M |	Band Class 8, 1800 MHz			
NA9C |	Band Class 9, North American 900 MHz			
NA8S |	Band Class 10, Secondary 800 MHz			

Description of command

This command activates the test mode according to one of the provided 1xEV-DO network standards.

Note: Changing the network standard will affect the frequency setting of the RF analyzer and the generator as well as the sideband suppression and ACP spectrum measurement. See commands
`[SENSe:]RFANalyzer:FREQuency`
`SOURce:RFGenerator:FREQuency[:RF]`
`CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>`
`CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP<nr>`

Analyzer

In the 1xEV-DO function group, the signal of an 1xEV-DO access terminal (mobile station) is analyzed. The remote-control commands presented in this section determine the RF analyzer settings. They correspond to the settings in the popup menu of the softkey *Connect Control*, located at the top right of each main menu. The *Analyzer* settings are general (global) settings that are valid for the entire function group.

Subsystem RFANalyzer

The subsystem *RFANalyzer* configures the RF input path by defining the analyzer level and frequency. Furthermore it decodes the input signal in order to extract the relevant part of the signal. It corresponds to the tab *Analyzer* in the popup menu *Connection Control*.

DEFault:RFANalyzer[?] RF Analyzer
<RF Analyzer>

<RF Analyzer>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystems RFANAlyzer to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem FREQuency

The subsystem *FREQuency* controls the frequency in the RF input signal path. It corresponds to the table section *Analyzer Settings* in the *Analyzer* tab of the *Connection Control* menu.

[SENSe:]RFANalyzer:FREQuency:UNIT[?] Frequency Unit
<Analyzer Freq. Unit>

<Analyzer Freq. Unit>	Description of parameters	Def. Value	Def. unit	FW vers.
HZ | KHZ | MHZ | GHZ | CH	Frequency unit or Channel Number	HZ	–	V3.40

Description of command

This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as a 1xEV-DO channel number. Frequency units must be used to select input signals that are outside the designated channel range.

[SENSe:]RFANalyzer:FREQuency[?] RF Frequency
<Frequency>

<RF Frequency>	Description of parameters	Def. Value	Def. unit	FW vers.
	Input frequency Default input frequency for following standards:		Hz	V3.40
9.990000 MHz to 2700.000000 MHz	Band Class 0, US Cellular	833.4900 MHz CH 283		
9.990000 MHz to 2700.000000 MHz	Band Class 0, Korean Cellular	833.4900 MHz CH 283		
10.000000 MHz to 2700.000000 MHz	Band Class 1, North American PCS	1857.5000 MHz CH 150		
9.987500 MHz to 2699.987500 MHz	Band Class 2, TACS	891.9625 MHz CH 79		
10.000000 MHz to 2700.000000 MHz	Band Class 3, JTACS	915.9500 MHz CH 76		
10.000000 MHz to 2700.000000 MHz	Band Class 4, Korean PCS	1752.2500 MHz CH 45		
10.000000 MHz to 2700.000000 MHz	Band Class 5, NMT 450	450.6000 MHz CH 25		
10.000000 MHz to 2700.000000 MHz	Band Class 6, IMT-2000	1920.6000 MHz CH 12		
10.000000 MHz to 2700.000000 MHz	Band Class 7, North American 700 MHz	776.7000 MHz CH 14		
10.000000 MHz to 2700.000000 MHz	Band Class 8, 1800 MHz	1710.8000 MHz CH 16		
10.000000 MHz to 2700.000000 MHz	Band Class 9, North American 900 MHz	880.9000 MHz CH 18		
10.000000 MHz to 2700.000000 MHz	Band Class 10, Secondary 800 MHz	807.2500 MHz CH 50		

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 even 1xEV-DO channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the reverse channel (signal direction from access terminal to CMU).

Note: Changing the network standard with the command `CONFigure:NETWork:STANdard` will also change the analyzer RF frequency.

[SENSe:]RFANalyzer:FOFFset[?] Frequency Offset
<Analyzer Freq. Offset>

<Analyzer Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
-50.0 kHz to +50.0 kHz | **ON |** **OFF**	Frequency offset setting Frequency offset on, last setting re-activated No frequency offset	OFF	Hz	V3.40

Description of command

This command determines a frequency offset to the RF signal analyzed.

Subsystem LEVel

The subsystem *LEVel* 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:]LEVel:MODE[?] RF Level Mode
<RF Level Mode>

<RF Level Mode>	Description of parameters	Def. value	Def. unit	FW vers.
AUTomatic | MANual	Maximum input level mode for RF	MAN	–	V3.40

Description of command

This command defines whether the maximum expected input level is set manually or using by auto ranging. Using auto-ranging might result in a loss of performance.

[SENSe:]LEVel:MAXimum[?] Max. RF Level
<RF Manual Max Level>

<RF Manual Max Level>	Description of parameters	Def. value	Def. unit	FW vers.
–40 dBm to +44 dBm	Maximum input level for RF 1	0.0	dBm	V3.40
–54 dBm to +30 dBm	Maximum input level for RF 2	0.0	dBm	
–80 dBm to +9 dBm	Maximum input level for RF 4 IN	0.0	dBm	

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).

Subsystem LCMask (Long Code Mask)

The subsystem *LCMask* determines the *Long Code Mask* of the reverse link RF signal. It corresponds to the table section *Analyzer Settings* / *Long Code Mask* in the *Analyzer* tab of the *Connection Control* menu.

[SENSe:]RFANalyzer:LCMask:I:LSB[?] LSB Long Code Mask
[SENSe:]RFANalyzer:LCMask:Q:LSB[?]
<LSB Long Code Mask>

<LSB Long Code Mask>	Description of parameters	Def. value	Def. unit	FW vers.
"**00000000" to "FFFFFFFF"**	Hexadecimal formatted string representing the LSB of the long code mask	"00000000"	–	V3.40

Description of command

This command defines the least significant bits (0 to 31) of the I and Q signal long code masks.

[SENSe:]RFANalyzer:LCMask:I:MSB[?] MSB Long Code Mask
[SENSe:]RFANalyzer:LCMask:Q:MSB[?]
<MSB Long Code Mask>

<MSB Long Code Mask>	Description of parameters	Def. value	Def. unit	FW vers.
"000" to "3FF"	Hexadecimal formatted string representing the MSB of the long code mask	"000" for I and for Q	–	V3.40

Description of command

This command defines the most significant bits (32 to 41) of the I and Q signal long code masks.

Subsystem CCFilter (Code Channel Filter)

The subsystem *CCFilter* determines the reverse link code channels to be evaluated. It corresponds to the table section *Analyzer Settings / Code Channel Filter* in the *Analyzer* tab of the *Connection Control* menu.

[SENSe:]RFANalyzer:CCFilter:DRC[?]
[SENSe:]RFANalyzer:CCFilter:ACK[?]
[SENSe:]RFANalyzer:CCFilter:DATA[?]
<Code Channel Filter>

Code Channel Filter

<Code Channel Filter>	Description of parameters	Def. Value	Def. unit	FW vers.
ON |	The code channel will be measured unless it is inactive. If the code channel is inactive, the appropriate results will return INV.	DCARe	–	V3.40
OFF |	The code channel will not be measured, regardless of whether it is active or not.			
DCARe	Do not care. The code channel will be measured in any case (active or not). Thus the results of some certain measurements appear to be unstable.			

Description of command

These commands determine if the specified reverse link code channel is evaluated. As the DRC, ACK, and Data code channels are not continously present, the code channel filters allow the user to specify the conditions under which the measurements are performed.

Note: If these filters are specified in such a manner that the AT never generates, the measurements will return invalid results.

Subsystem AT<nr> (Access Terminal)

The subsystem *AT<nr>* is a container for all analyzer settings that apply separately to one of the four access terminals. It corresponds to the table section *Analyzer Settings / Reverse Link Frame Offset* in the *Analyzer* tab of the *Connection Control* menu.

[SENSe:]RFANalyzer:AT<nr>:RLINk:FROFfset[?]
<Reverse Link Frame Offset>

Reverse Link Frame Offset

<Reverse Link Frame Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 15 | **DEFault**	Reverse link frame offset Use default setting	0	–	V3.40

Description of command

This command determines the reverse link frame offset for the access terminal <nr> = 1 to 4.

Trigger

The remote-control commands presented in this section determine the RF trigger settings. The *Trigger* settings are general (global) settings that are valid for the entire function group.

Subsystem TRIGger

The subsystem *TRIGger* defines the trigger conditions for the measurements and the routing of output trigger signals. It corresponds to the *Trigger* tab in the second plane of the *Connection Control* menu.

DEFault:TRIGger[:SEQuence][?] Default All Settings
<Trigger Source>

<Trigger Source>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem TRIGger to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem SELect

TRIGger:SELect:AT[?] Select Access Terminal
<Select Access Terminal>

<Select Access Terminal>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 4 | **DEFault**	Access terminal number Use default settings	1	–	V3.40

Description of command

This command selects the specified access terminal. The trigger output signals (see command `TRIGger:OUTPut:PIN<nr>:SIGNal`) refer to the selected AT.

Subsystem SLOPe

TRIGger[:SEQuence]:SLOPe[?] Trigger Slope
<Trigger Slope>

<Trigger Slope>	Description of parameters	Def. value	Def. unit	FW vers.
NEGative | **POSitive |** **DEFault**	Negative Slope (falling edge) Positive Slope (rising edge) Use default settings	POS	–	V3.40

Description of command

This command defines whether the trigger event occurs on the *Rising Edge* or on the *Falling Edge* of the trigger signal. The setting has no influence on *Free Run* measurements (see `TRIGger[:SEQuence]:SOURce`).

Subsystem OUTPut

TRIGger:OUTPut:PIN<nr>:SIGNal[?] Trigger Signal Output Routing
<Frame_Period>

<Trigger Output Routing>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	No output trigger signal	<nr> = 2: NONE <nr> = 3: NONE <nr> = 4: NONE <nr> = 5: NONE	–	V3.40
PP2S |	Periodic pulse with period 2 s			
CCHannel |	Control channel, 80 ms			
CSLot |	Control slot, 26.67 ms			
ATRFrame |	Access terminal reverse frame			
ATFSLot |	Access terminal forward slot			
SLOT |	Slot			
CPCPattern |	Periodic pulse, period is determined by the length of the power control pattern.			
IPCPattern	Single pulse that will be set as the first bit of the injected pattern is being sent.			

Description of command

This command selects the type of periodic pulse signal (or no signal, setting *NONE)* to be applied to pin <nr> (<nr> = 2 to 5) of the AUX 3 connector.

Subsystem THReshold

TRIGger[:SEQuence]:THReshold:RFPower[?] Threshold RF Power
<Threshold RF Power>

<Threshold RF Power>	Description of parameters	Def. value	Def. unit	FW vers.
LOW |	Low trigger threshold (-26 dB)	MED	–	V3.40
MEDium |	Medium trigger threshold (-16 dB)			
HIGH |	High trigger threshold (-6 dB)			
DEFault	Use default settings			

Description of command

This command sets the RF signal level at which the measurement is triggered relative to the maximum RF input level; see `[SENSe:]LEVel:MAXimum`. The setting has effect for trigger source `RFPower` only (see `TRIGger[:SEQuence]:SOURce`).

TRIGger[:SEQuence]:THReshold:IFPower[?] Threshold IF Power
< Threshold IF Power >

<Threshold RF Power>	Description of parameters	Def. value	Def. unit	FW vers.
-47.0 to 0 |	IF power trigger threshold	-16.0	dB	V3.40
DEFault	Use default settings			

Description of command

This command sets the IF signal level at which the measurement is triggered. The IF power threshold is defined relative to the maximum RF input level; see `[SENSe:]LEVel:MAXimum`. The setting has effect for trigger source `IFPower` only (see `TRIGger[:SEQuence]:SOURce`).

Subsystem SOURce

TRIGger[:SEQuence]:SOURce[?] Trigger Source
<Source>

<Source>	Description of parameters	Def. Value	Def. unit	FW vers.
INTernal | **EXTernal |** **FRUN |** **RFPower |** **IFPower** **DEFault**	Trigger source from internal clock External Trigger source supplied Trigger set to free run Trigger set to wide-band IF Power Trigger set to narrow-band RF Power Use default setting	INT	–	V3.40

Description of command

This command sets the source of the trigger signal.

The external trigger source is supplied via the AUX 3 connector on the front panel. The AUX 3 pin assignments are:

Output trigger signals: See command `TRIGger:OUTPut:PIN<nr>:SIGNal[?]`
Input trigger: Pin 8

The trigger setting affects the results of the Transmit Time Error measurement as described here.

Trigger Free Run	No timing error results are possible.
Trigger Internal	Timing error results are possible when DUT is correctly synchronized with the CMU.
IF Power	No timing error results are possible.
RF Power	No timing error results are possible.
Trigger External	Timing error results are possible if an external trigger signal is provided and the DUT is correctly synced with the CMU.

Note: Using an external trigger source will cause routing conflicts with an external power control bit supply. See also command `SOURce:RFGenerator:AT<nr>:PCBits`

Generator

In the 1xEV-DO function group, an 1xEV-DO forward link test signal can be generated. No signalling parameters are transferred. The only *Control Channel* message that is ever sent is the *Sync. Message*. Furthermore a packet stream for up to four access terminals can be generated.

The remote-control commands presented in this section determine the signals generated by the CMU. They correspond to the settings in the popup menu of the softkey *Connect Control*, located at the top right of each main menu.

In the 1xEV-DO function group the generator settings are general (global) settings that are valid for the entire function group.

Subsystem RFGenerator

The subsystem *RFGenerator* configures the RF signals generated by the CMU. It corresponds to the tab *Generator* in the popup menu *Connection Control*.

DEFault:RFGenerator[?] RF Generator
<RF Generator>

<RF Analyzer>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `RFGenerator` to their default values (the setting *OFF* results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

INITiate:RFGenerator	Start RF generator, reserve resources	⇒	*RUN*
ABORt:RFGenerator	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.	V3.40

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	–	V3.40

Description of command

This command is always a query. It returns the current generator status.

Subsystem FREQuency

SOURce:RFGenerator:FREQuency[:RF]:UNIT[?] Frequency Unit
<Unit>

<Unit>	Description of parameters	Def. Value	Def. unit	FW vers.
HZ | KHZ | MHZ | GHZ | CH	Frequency unit or Channel Number	HZ	-	V3.40

Description of command

This command defines whether the frequency of the RF signal generated is specified in frequency units or as an 1xEV-DO channel number. Frequency units must be used to select input signals that are outside the designated 1xEV-DO channel range.

SOURce:RFGenerator:FREQuency[:RF][?] RF Frequency
<Frequency>

<Frequency>	Description of parameters	Def. Value	Def. unit	FW vers.
	RF generator frequency Default frequency for following standards:		Hz	V3.40
9.990000 MHz to 2700.000000 MHz	Band Class 0, US Cellular	878.49 MHz CH 283		
9.990000 MHz to 2700.000000 MHz	Band Class 0, Korean Cellular	878.49 MHz CH 283		
10.000000 MHz to 2700.000000 MHz	Band Class 1, North American PCS	1937.50 MHz CH 150		
9.987500 MHz to 2699.987500 MHz	Band Class 2, TACS	936.9625 MHz CH 79		
10.000000 MHz to 2700.000000 MHz	Band Class 3, JTACS	860.95 MHz CH 76		
10.000000 MHz to 2700.000000 MHz	Band Class 4, Korean PCS	1842.25 MHz CH 45		
10.000000 MHz to 2700.000000 MHz	Band Class 5, NMT 450	460.60 MHz CH 25		
10.000000 MHz to 2700.000000 MHz	Band Class 6, IMT-2000	2110.60 MHz CH 12		
10.000000 MHz to 2700.000000 MHz	Band Class 7, North American 700 MHz	746.60 MHz CH 14		
10.000000 MHz to 2700.000000 MHz	Band Class 8, 1800 MHz	1805.80 MHz CH 16		
10.000000 MHz to 2700.000000 MHz	Band Class 9, North American 900 MHz	925.90 MHz CH 18		
10.000000 MHz to 2700.000000 MHz	Band Class 10, Secondary 800 MHz	852.25 MHz CH 50		

Description of command

This command defines the frequency of the RF signal generated. With the command `SOURce:RFGenerator:FREQuency:UNIT`, the default frequency unit can be changed, and even 1xEV-DO channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the forward channel (signal direction from CMU to the AT under test).

Note: Changing the network standard with the command `CONFigure:NETWork:STANdard` will also change the generator RF frequency.

Subsystem POWer

SOURce:RFGenerator:POWer:OUTPut[?] Output Power
<Output Power>

<**Output Power**>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dBm to –33.0 dBm | **–120.0 dBm to –16.0 dBm |** **–99.0 dBm to +5.0 dBm**	RF1 OUT, 0 dB ext. atten. RF2 OUT, 0 dB ext. atten. RF3 OUT, 0 dB ext. atten	–70.0	dBm	V3.40

Description of command

This command determines total output power (absolute value, in dBm). The output power value range depends on the RF input used and the external attenuation set
(see `[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]` command).

Subsystem PROPerty

SOURce:RFGenerator:PROPerty:PNOFfset[?] PN Offset
<PN Offset>

<**PN Offset**>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +511 | **DEFault**	PN offset Use default settings	0	–	V3.40

Description of command

This command defines the PN offset.

SOURce:RFGenerator:MODE[?] RF Generator Mode
<RF Generator Mode>

<RF Generator Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NORMal | CPILot	RF generator mode	NORM	–	V3.40

Description of command

This command determines the RF generator mode. Setting the generator mode to *CPILot* will generate a continuous pilot signal. The pilot signal will fill the entire slot and the power of the signal is determined by the command:
`SOURce:RFGenerator:POWer:OUTPut[?]`

All other generator commands will be accepted and processed as normal, but the changes to the signal will not occur until the generator mode is switched back to *NORMal* .

Subsystem IMPairments

The subsystem *IMPairments* configures the settings to impair the generated RF signal. It corresponds to table section *Impairments* in the tab *Generator* of the popup menu *Connection Control*.

SOURce:IMPairments:LEVel:AWGN[?] AWGN Level
<AWGN Level>

<AWGN Level>	Description of parameters	Def. value	Def. unit	FW vers.
–20.0 dB to +4.0 dB | **DEF |** **ON |** **OFF**	AWGN level Sets the value to the default setting AWGN generator on, last setting re-activated AWGN generator off	OFF	dB	V3.40

Description of command

This command determines an *Additional White Gaussian Noise* level to impair the RF generator signal.

SOURce:IMPairments:FOFFset[:RF][?] RF Frequency Offset
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
–50.0 kHz to +50.0 kHz | **DEF |** **ON |** **OFF**	BS frequency offset setting Sets the value to the default setting BS frequency offset on, last setting re-activated No frequency offset	OFF	Hz	V3.40

Description of command

This command defines an offset for the RF generator frequency set with the command `[SENSe:]RFGenerator:FREQuency <Number>`**.** The offset frequency must be in multiples of 1 Hz.

Subsystem SNCMessage (Sync. Message)

The subsystem *SNCMessage* configures the *Sync. Message* of *the Control Channel* that is required to synchronize access terminals with the CMU. The control channel messages will have the highest priority for placement within the slots. The Sync. Message will be updated constantly, even when the control channel is not enabled.
The subsystem *SNCMessage* corresponds to the tab *Generator* in the popup menu *Connection Control*.

INITiate:RFGenerator:SNCMessage Start Sync. message (if possible) ⇒ *RUN*
Start later (if currently not possible) ⇒ *ON*

Description of command	FW vers.

This command has no query form.
It initiates the Sync message of the control channel. If sending the Sync. message is currently not possible, the `INITiate` will take effect when the generator meets the following preconditions:
`INIT:RFGenerator`
`FETCh:RFGenerator:STATus? RUN`
	V3.40

ABORt:RFGenerator:SNCMessage Abort Sync. Message ⇒ *OFF*	
Description of command	FW vers.
This command has no query form. This aborts the Sync. message. If no Sync. message is in progress due to wrong generator preconditions the `ABORt` will delete a previous `INITiate` from the action list.	V3.40

FETCh:RFGenerator:SNCMessage:STATus? Generator Sync. Message Status

Returned values	Description of parameters	Def. Value	Def. unit	FW vers.
OFF | **ON |** **RUN**	No Sync. message initiated Sync message initiated but cannot run. Will be started as soon as possible Sync message in progress	ON	–	V3.40

Description of command

This command is always a query. It returns the current Sync. Message status.

Note: The default status is *ON*. Thus the sync. message starts automatically, when the RF generator is initiated. See command `FETCh:RFGenerator:STATus?`

SOURce:RFGenerator:SNCMessage:PSOFfset[?] Packet Start Offset
<Packet Start Offset>

<Packet Start Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 3 | **DEFault**	Packet start offset Sets the value to the default setting	0	–	V3.40

Description of command

This command establishes the offset (in slots) from the start of the control channel cycle to the start of the synchronous message capsule that contains the Sync. Message.

SOURce:RFGenerator:SNCMessage:DRINdex[?] Data Rate Index
<Data Rate Index>

<Data Rate Index>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 2 | DEFault	Data rate index Sets the value to the default setting	1	–	V3.40

Description of command

This command sets the data rate index for the control channel sync. message. The data rate index defines an unambiguous assignment of the data rate and the slot count:

Data Rate Index:	Data Rate (kBit/s):	SlotCount:
1	38.4	16
2	76.8	8
3	153.6	4
4	307.2	2
5	307.2	4
6	614.4	1
7	614.4	2
8	921.6	2
9	1,228.8	1
10	1,228.8	2
11	1,843.2	1
12	2,457.6	1

The data rate can be queried with the command `SOURce:RFGenerator:SNCMessage:DRATe?`
The slot count can be queried with the command `SOURce:RFGenerator:SNCMessage:SCOunt?`

SOURce:RFGenerator:SNCMessage:DRATe? Data Rate
<Data Rate>

<Data Rate>	Description of parameters	Def. value	Def. unit	FW vers.
38.4 to 76.8	Data rate	38.4	kBit/s	V3.40

Description of command

This command is always a query. It returns the data rate assigned to the data rate index that can be set with the command `SOURce:RFGenerator:SNCMessage:DRINdex`

SOURce:RFGenerator:SNCMessage:SCOunt? Slot Count
<Slot Count>

<Slot Count>	Description of parameters	Def. value	Def. unit	FW vers.
8 to 16	Slot count	16	–	V3.40

Description of command

This command is always a query. It returns the slot count assigned to the data rate index that can be set with the command `SOURce:RFGenerator:SNCMessage:DRINdex`

Subsystem AT<nr> (Access Terminal)

The subsystem *AT<nr>* is a container for all generator settings that apply separately to one of the four access terminals. It corresponds to the table section *Generator Settings/Traffic/AT<nr>* in the *Generator* tab of the popup menu *Connection Control*.

INITiate:RFGenerator:AT<nr>:MAC:INDex Place MAC index within MAC channel (if possible) ⇒ *RUN*
Place later (if currently not possible) ⇒ *ON*

Description of command	FW vers.

This command has no query form.
It enables AT<nr> (<nr> = 1 to 4) by placing the proper MAC index within the MAC channel. Packets may then be sent to the AT<nr> with the command `INIT:RFGenerator:AT<nr>:PSTReam`
 	
If enabling the AT<nr> is currently not possible due to wrong preconditions, the `INITiate` will take effect when the generator meets the preconditions:
 	
`INIT:RFGenerator`
`FETCh:RFGenerator:STATus? RUN`
	V3.40

ABORt:RFGenerator:AT<nr>:MAC:INDex Abort MAC Index placement ⇒ *OFF*

Description of command	FW vers.
This command has no query form. It aborts the placement of the MAC index for AT<nr> within the MAC channel. Thus all transfers to the specified AT will be aborted either. If currently no MAC index can be placed within the MAC channel due to wrong generator preconditions the `ABORt` will delete a previous `INITiate` from the action list.	V3.40

FETCh:RFGenerator:AT<nr>:MAC:INDex:STATus? MAC Index placement Status

Returned values	Description of parameters	Def. Value	Def. unit	FW vers.
OFF | **ON |** **RUN**	No MAC Index placement initiated MAC Index placement initiated but cannot run. Placement will start as soon as possible. MAC Index placement in progress	<nr> = 1: ON <nr> = 2: OFF <nr> = 3: OFF <nr> = 4: OFF	–	V3.40

Description of command

This command is always a query. It returns the current MAC index placement status.

Note: The default status for the first AT is *ON*. Thus the packets may immediately be sent to AT1, when the RF generator is initiated. See command `FETCh:RFGenerator:STATus?`

SOURce:RFGenerator:AT<nr>:MAC:INDex[?] MAC Index
<MAC Index>

<MAC Index>	Description of parameters	Def. Value	Def. Unit	FW vers.
5 to 63 | **DEFault**	MAC Index for AT<nr> Sets the value to the default setting	<nr> = 1: 8 <nr> = 2: 16 <nr> = 3: 25 <nr> = 4: 50	–	V3.40

Description of command

This command determines the MAC index for the AT<nr> (<nr> = 1 to 4). Each access terminal requires an individual MAC index. If the entered MAC Index conflicts with another access terminal an "Execution error" is generated.

SOURce:RFGenerator:AT<nr>:MAC:LEVel[?] MAC Level
<MAC Level>

<MAC Level>	Description of parameters	Def. value	Def. unit	FW vers.
–25.0 dB to –7.0 dB | DEFault	MAC channel level Sets the value to the default setting	–16.0	dB	V3.40

Description of command

This command sets the signal level of the MAC channel of the forward 1xEV-DO channel and enables or disables the signal. The individual MAC channel levels for AT<nr> (<nr> = 1 to 4) are in units relative to the total output power.

INITiate:RFGenerator:AT<nr>:PSTReam Send Packets to AT<nr> (if possible) ⇒ *RUN*
Send packets later (if currently not possible) ⇒ *ON*

Description of command	FW vers.

This command has no query form.
It initiates the packet stream to AT<nr> (<nr> = 1 to 4). The number of packets to be sent is determined by the command: `SOURce:RFGenerator:AT<nr>:PCOunt`
When the transmission of a finite number of packets is completed the `PSTReam:STATus` changes to *RDY*.
 	
If sending packets is currently not possible, the `INITiate` will take effect when the generator meets the following preconditions:
 	
`INIT:RFGenerator`
`FETCh:RFGenerator:STATus? RUN`
`INIT:RFGenerator:AT<nr>:MAC:INDex`
`FETCh:RFGenerator:AT<nr>:MAC:INDex:STATus? RUN`
	V3.40

ABORt:RFGenerator:AT<nr>:PSTReam Abort packet transfer ⇒ *OFF*

Description of command	FW vers.
This command has no query form. It aborts the packet stream to AT<nr>. If no packet stream is in progress due to wrong generator preconditions the `ABORt` will delete a previous `INITiate` from the action list.	V3.40

FETCh:RFGenerator:AT<nr>:PSTReam:STATus? Packet Stream Status

Returned values	Description of parameters	Def. Value	Def. unit	FW vers.
OFF |	No packet stream initiated	<nr> = 1: ON, 0 <nr> = 2: OFF, 0	–	V3.40
ON |	Packet stream initiated but cannot run. Will started as soon as possible.	<nr> = 3: OFF, 0 <nr> = 4: OFF, 0		
RUN |	Packet stream in progress			
RDY	Ready: All (finite) specified packets have been sent to the AT<nr>			
, **0 to 65535**	Current number of packets (progress).			

Description of command

This command is always a query. It returns the status of the packet streams.

Note: The default status for the first AT is *ON*. Thus the packets are immediately be sent to AT1, when the RF generator is initiated. See command `FETCh:RFGenerator:STATus?`

SOURce:RFGenerator:AT<nr>:PCOunt[?] Packet Count
<Packet Count>

<Packet Start Offset>	Description of parameters	Def. Value	Def. unit	FW vers.
0 to 65535 | **INFinite |** **MINimum |** **MAXimum |** **DEFault**	Packet start offset An unlimited number of packets is sent to AT<nr> Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	<nr> = 1: INF <nr> = 2: 100 <nr> = 3: 100 <nr> = 4: 10	–	V3.40

Description of command

This command determines the number of packets, that will be sent to AT<nr> (<nr> = 1 to 4).

Note: MAXimum will set the Packet Count to 65535, not to INFinite.

SOURce:RFGenerator:AT<nr>:PSOFfset[?] Packet Start Offset
<Packet Start Offset>

<Packet Start Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to +255 | **DEFault**	Packet start offset Sets the value to the default setting	0	–	V3.40

Description of command

This command will establish the minimum number of slots that are inserted past the end of one packet and the beginning of the next.

For single slot packets, a value of zero will cause the next packet to be sent in the immediate next slot. For multiple slot packets, a value of zero will cause the next packet transmission to start three slots after the end of the previous packet. The three slot delay is identical to the interleaving delay between slots for multiple slot packets. The offset value is attached to the end of the preceding packet. Therefore, an offset value of zero with a rate change from a single slot packet to a multiple slot packet will cause the first slot of the multiple slot packet to be transmitted in the slot immediately following the single slot packet.

SOURce:RFGenerator:AT<nr>:DRINdex[?] Data Rate Index
<Data Rate Index>

<Data Rate Index>	Description of parameters	Def. Value	Def. unit	FW vers.
1 to 12 | **DEFault**	Data rate index Sets the value to the default setting	1	–	V3.40

Description of command

This command sets the data rate index for AT<nr> (<nr> = 1 to 4). The data rate index defines an unambiguous assignment of the data rate and the slot count. This assignment is listed in the description of the command `SOURce:RFGenerator:SNCMessage:DRINdex[?]` on page 6.20.

The data rate can be queried with the command `SOURce:RFGenerator:AT<nr>:DRATe?`
The slot count can be queried with the command `SOURce:RFGenerator:AT<nr>:SCOunt?`

SOURce:RFGenerator:AT<nr>:DRATe? Data Rate
<Data Rate>

<Data Rate>	Description of parameters	Def. value	Def. unit	FW vers.
38.4 to 2457.6	Data rate	38.4	kBit/s	V3.40

Description of command

This command is always a query. It returns the data rate assigned to the data rate index that can be set with the command `SOURce:RFGenerator:AT<nr>:DRINdex`

SOURce:RFGenerator:AT<nr>:SCOunt? Slot Count
<Slot Count>

<Slot Count>	Description of parameters	Def. value	Def. unit	FW vers.
8 to 16	Slot count	16	–	V3.40

Description of command

This command is always a query. It returns the slot count assigned to the data rate index that can be set with the command `SOURce:RFGenerator:AT<nr>:DRINdex`

SOURce:RFGenerator:AT<nr>:PATTern[?] Pattern
<Pattern>

<Pattern>	Description of parameters	Def. value	Def. unit	FW vers.
"00000000" to "FFFFFFFF"	Hexadecimal formatted string representing a data pattern.	"00000000"	–	V3.40

Description of command

This command defines the data patterns that are sent to AT<nr> (<nr> = 1 to 4). The MSB of this value is the first bit of the packet and the word is repeated to fill all space within the packet.

SOURce:RFGenerator:AT<nr>:DRCLock:STATe[?] DRCLock State
<DRCLock State>

<DRCLock State>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1 | **DEFault**	DRCLock State Sets the value to the default setting	1	–	V3.40

Description of command

This command will set the state of the DRCLock bit for the access terminal specified in <nr> (<nr> = 1 to 4).

SOURce:RFGenerator:AT<nr>:DRCLock:PERiod[?] DRCLock Period
<DRCLock Period>

<DRCLock Period>	Description of parameters	Def. value	Def. unit	FW vers.
8 | 16 | **ON |** **OFF |** **DEFault**	DRCLock period Enable DRCLock period, last setting re-activated Disable DRCLock period Sets the value to the default setting	8	–	V3.40

Description of command

This command will establish the period (measured in slots) of time between successive transmissions of the DRCLock bit for the access terminal specified in <nr> (<nr> = 1 to 4).

Any not allowed value within the range is rounded to the nearest allowed value.

SOURce:RFGenerator:AT<nr>:DRCLock:LENGth[?] DRCLock Length
<DRCLock Length>

<DRCLock Length>	Description of parameters	Def. value	Def. unit	FW vers.
1 | 4 | 8 | 16 | 32 | **DEFault**	DRCLock length Sets the value to the default setting	1	–	V3.40

Description of command

This command determines the DRCLock length for the access terminal specified in <nr> (<nr> = 1 to 4). It will establish the number of DRCLock periods that the state of the DRCLock will be held constant.

Any not allowed value within the range is rounded to the nearest allowed value.

SOURce:RFGenerator:AT<nr>:PCBits[?] Power Control Bits
<Power Control Bits>

<Power Control Bits>	Description of parameters	Def. value	Def. unit	FW vers.
HOLD | **ADOW |** **AUP |** **RTES |** **PATTern |** **EXTernal |** **DEFault**	Alternating up/down control bits All power control bits down All power control bits up Range test mode User specified pattern (continuously repeated) External power control bit source supplied Sets the value to the default setting	HOLD	–	V3.40

Description of command

This command defines the power control bits in the RF generator signal. The state of the power control bit is sampled at the beginning of the slot.

The access terminals AT<nr> (<nr> = 1 to 4) can use individual power control bits. A user pattern can be defined with the commands of the `:PCBits:PATTern` subsystem.

The external power control bit source is supplied via pin 8 of the AUX 3 connector on the front panel.

Note: Using an external power control bit source will cause routing conflicts with an external trigger source. See also command `TRIGger[:SEQuence]:SOURce`

SOURce:RFGenerator:AT<nr>:PCBits:RTES:NOBits[?] Number Of Bits
<Number Of Bits>

<Number Of Bits>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 256 | **DEFault**	Number of bits for range test mode. Sets the value to the default setting	100	–	V3.40

Description of command

This command determines the number of bits for the range test mode (<nr> =1 to 4).

PROCedure:RFGenerator:AT<nr>:PCBits:PATTern[?] Power Control Pattern Injection
<Power Control Bits>

<Pwr. Ctrl. Pattern Injection>	Description of parameters	Def. value	Def. unit	FW vers.
INJect | **RDY**	Injects a single power control bit pattern Ready: Injection cycle is completed (query only)	RDY	–	V3.40

Description of command

The command injects a user defined power control bit pattern into the PCB bit stream for AT<nr>. RDY is a query only.

SOURce:RFGenerator:AT<nr1>:PCBits:PATTern:AREA<nr2>:NOBits[?] Number Of Bits
<Number Of Bits>

<Number Of Bits>	Description of parameters	Def. Value	Def. Unit	FW vers.
1 to 128 | DEFault	Number of bits in the first pattern area. Sets the value to the default setting	<nr2> = 1: 32	–	V3.40
1 to 128 | DEFault	Number of bits in the second pattern area. Sets the value to the default setting	<nr2> = 2: 100		
1 to 128 | DEFault	Number of bits in the third pattern area. Sets the value to the default setting	<nr2> = 3: 100		
1 to 128 | DEFault	Number of bits in the fourth pattern area. Sets the value to the default setting	<nr2> = 4: 100		

Description of command

This command determines the number of bits for each of the four areas (<nr2> = 1 to 4). These areas can be configured individually for the AT<nr1> (<nr1> =1 to 4).

SOURce:RFGenerator:AT<nr2>:PCBits:PATTern:AREA<nr2>:POLarity[?] Polarity
<Polarity>

<Polarity>	Description of parameters	Def. value	Def. unit	FW vers.
UP | DOWN | DEFault	Bits up Bits down Sets the value to the default setting	<nr2> = 1: DOWN <nr2> = 2: UP <nr2> = 3: DOWN <nr2> = 4: UP	–	V3.40

Description of command

This command defines the polarity of the bits for the areas<nr2> = 1 to 4.
Each of the access terminals <nr1> = 1 to 4 can use individual settings.

Subsystem RAB (Reverse Activity)

The subsystem *RAB* configures the RAB channel.

SOURce:RFGenerator:RAB:MAC:LEVel[?] MAC Level
<MAC Level>

<MAC Level>	Description of parameters	Def. value	Def. unit	FW vers.
–25.0 dB to –7.0 dB | DEFault	MAC channel level Sets the value to the default setting	–12.0	dB	V3.40

Description of command

This command will set the amount of power within the MAC channel that is dedicated to the RAB channel.
The MAC channel level for the reverse activity bit is in a unit relative to the total output power.

SOURce:RFGenerator:RAB:STATe[?] RAB State
<RAB State>

<RAB State>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1 | DEFault	RAB State Sets the value to the default setting	0	–	V3.40

Description of command

This command sets the state of the *Reverse Activity Bit*.

SOURce:RFGenerator:RAB:OFFSet[?] ***<RAB Offset>***				RAB Offset
<RAB Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 7 | **DEFault**	RAB offset Sets the value to the default setting	0	–	V3.40
Description of command				
This command will establish the starting time offset of the RA bit. This command is specified in RABLength/8 units. The RA bit starts when the equation (SystemTime mod RABLength = RABOffset) is satisfied, with SystemTime expressed in units of slots.				

SOURce:RFGenerator:RAB:LENGth[?] ***<RAB Length>***				RAB Length
<RAB Length>	Description of parameters	Def. value	Def. unit	FW vers.
8 | 16 | 32 | 64 | **DEFault**	RAB length Sets the value to the default setting	8	–	V3.40
Description of command				
This command determines the RAB length. It will establish the duration (in slots) of a RA (Reverse Activity) bit. Any not allowed value within the range is rounded to the nearest allowed value.				

Subsystem OAT (Other Access Terminals)

The subsystem *OAT* configures other access terminals (beyond the four defined access terminals). These ATs will never have a packet addressed to them, but are used to provide fill in the MAC channel code domain. These other access terminals are used to evenly distribute the excess power (beyond what is required by the AT<nr> and RAB channels).

SOURce:RFGenerator:OAT:COUNt[?] ***<RAB Offset>***				Other Access Terminal Count
<Count>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 55 | **DEFault**	Packet start offset Sets the value to the default setting	5	–	V3.40
Description of command				
This command will establish the number of additional access terminals that appear in the MAC Channel				

RF Input and Output

The remote-control commands presented in this section determine the inputs and outputs used and the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect Control*, located at the top right of each main menu.

These are general (global) settings that are valid for the entire function group.

Subsystem RF Input and Output (External Attenuation at Connectors)

The subsystem for input and output configures the input and output RF connectors. The subsystem corresponds to the tab AF/*RF* in the popup menu *Connect Control*.

INPut[:STATe][?] RF Input
<State>

<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	–	V3.40

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][?] RF Output
<State>

<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	–	V3.40

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][?] Ext. Att. Input
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude][?]
<Attenuation>

<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	V3.40

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][?] Ext. Att. Output
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude][?]
<Attenuation>

<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	V3.40

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 *Connect. Control*.

SOURce:DM:CLOCk:STATe[?] REF OUT 2
<Mode>

<Mode>	Description of parameters	Def. Value	Def. unit	FW vers.
ON | OFF	Switch on/off system clock	OFF	–	V3.40

Description of command

This commands switches the system clock specific to the network at the *REF OUT 2* connector on or off. When set to on, the frequency is set at 13.1072 MHz.

SOURce:DM:CLOCk:FREQuency[?] <*Frequency*> System Clock
<*Frequency*>

<Frequency>	Description of parameters	Def. Value	Def. unit	FW vers.
39.3216 MHz | 19.6608 MHz | 13.1072 MHz | 9.8304 MHz	System Clock Frequency	39.3216 MHz	Hz	V3.40

Description of command

This command determines the system clock frequency applied to *REF OUT 2* .

Any not allowed value within the range is rounded to the nearest allowed value.

Measurements

This section describes the measurements that are provided by the 1xEV-DO function group. Please note that both, the specific measurement setup and the general (global) settings from the *RF Analyzer* section have an effect on the measurement results.

WPOWer (Wide Band Power)

The subsystem *WPOWer* measures the power of the signal transmitted by the access terminal using a wideband filter. It corresponds to the softkey *WPower* in RF connector tab of the *Connect. Control* menu. The main purpose of the wideband power measurement is to indicate whether an input signal is available and whether it is advisable to change the *Max Level* settings.

Control of Measurement

INITiate:WPOWer	Start new measure ment	⇒ *RUN*
ABORt:WPOWer	Abort measurement and switch off	⇒ *OFF*
STOP:WPOWer	Stop measurement	⇒ *STOP*
CONTinue:WPOWer	Next measurement step (only *counting mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status given in the top right column.	V3.40

CONFigure:WPOWer:EREPorting[?] <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
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 operating manual).

FETCh:WPOWer:STATus? Measurement

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	V3.40
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 ... 10000 |	No counting mode set			
NONE		NONE	–	

Description of command

This command is always a query. It returns the status of the measurement (see chapters 3 and 5 of CMU operating manual).

Test Configuration

The commands of the following subsystems configure the *WPOWer* measurement in *RF connector* tab of the *Connect. Control* menu.

Subsystem CONTrol

CONFigure:WPOWer:CONTrol:REPetition[?] *<Repetition>,<StopCond>,<Stepmode>*			Test cycles	
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
CONTinuous | SINGleshot | 1 ... 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	V3.40
<StopCond>	Description of parameters	Def. value	Def. unit	FW vers.
SONerror | NONE	Start measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	V3.40
<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	–	V3.40

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.

Measured Values

The subsystem *WPOWer?* retrieves the results of the wideband power measurement.

READ[:SCALar]:WPOWer?	Start single shot measurement and return results			
FETCh[:SCALar]:WPOWer?	Read out measurement results (unsynchronized)			
SAMPle[:SCALar]:WPOWer?	Read out measurement results (synchronized)			
Return	Description of parameters	Def. value	Def. unit	FW vers.
–30.0dBm to +30.0 dBm	Maximum burst power (not averaged)	NAN	dBm	V3.40

Description of command

These commands are always queries. They start the measurement of the maximum burst power *(peak burst power)* and return the result.

NPOWer (Narrow Band Power)

The subsystem *NPOWer* measures the *Narrow Band Power* using the 1xEV-DO receiver filter (acoording to IS-856-1). The subsystem corresponds to the *NPower* menu and the popup menu *Power Configuration* in the front panel menus. The measurement can be made with a variable number of samples, see command `CONFigure:NPOWer:CONTrol:CBSize`.

Control of Measurement

The subsystem *NPower* controls the narrow band power measurement. It corresponds to the softkey *NPower* in the measurement menu *Power.*

INITiate:NPOWer	Start new measurement	⇒ *RUN*
ABORt:NPOWer	Abort running measurement and switch off	⇒ *OFF*
STOP:NPOWer	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:NPOWer	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:NPOWer:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
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 (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:NPOWer:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	V3.40
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *NPower* measurement in the *Power* menu. They correspond to the *Power Configuration* menu.

Subsystem CONTrol

The subsystem *NPOWer:CONTrol* defines the repetition mode and statistic count of the measurement.

CONFigure:NPOWer:CONTrol[?] ***<Statistics>*, *<Repetition>*, *<Stop Condition>*, *<Step Mode>***			Scope of Measurement	
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | MINimum | MAXimum | DEF,	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Condition>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | SON,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)*	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | STEP	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle	NONE	–	V3.40
Description of command				
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands				

CONFigure:NPOWer:CONTrol:STATistics[?] ***<Statistics>***			Statistic Count	
<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000 | MINimum | MAXimum | DEF	Number of bursts per statistics cycle Sets the value to the range minimum Sets the value to the range maximum Sets the value to the default setting	100	–	V3.40
Description of command				
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				

CONFigure:NPOWer:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	V3.40
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement even in case of error	NONE	–	V3.40
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Default value			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement according to its rep. mode	NONE	–	V3.40
STEP |	Interrupt measurement after each statistics cycle			
DEFault	Default value			

Description of command

This command determines the number of statistics cycles 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:NPOWer:CONTrol:CBSize[?] Extend Capture Buffer
<Samples>

<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
1024 to 32768 |	Total number of samples	4096	–	V3.40
DEFault	Sets the value to the default setting			

Description of command

This command specifies the number of samples acquired to calculate a single shot `NPOWer` result. The default value corresponds to an oversampling factor of 4. Increasing the number of samples slows down the measurement but may be necessary to obtain stable and accurate results, because 1xEV-DO signals typically show rapid variations in time and a large crest factor.

Measured Values

The subsystem *NPOWer* determines and outputs the results of the Narrow Band Power measurements.

Scalar results:

READ[:SCALar]:NPOWer? Start single shot measurement and return results
FETCh[:SCALar]:NPOWer? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:NPOWer? Read out measurement results (synchronized)

Returned values	Description	Def. value	Def. unit	FW vers.
Avg. Power of Current evaluation period,	-137 dBm to +53 dBm		dBm	V3.40
Min. Power of Current evaluation period,	-137 dBm to +53 dBm		dBm	
Max. Power of Current evaluation period,	-137 dBm to +53 dBm		dBm	
Avg. Power referenced to a stat. cycle,	-137 dBm to +53 dBm		dBm	
Min. Power of the entire measurement,	-137 dBm to +53 dBm		dBm	
Max. Power of the entire measurement	-137 dBm to +53 dBm		dBm	

Description of command

These commands are always queries. They start a measurement and output all scalar measurement results.

MODulation:MQUality (Modulation Quality)

The subsystem *MODulation:MQUality* measures general scalar modulation parameters. The subsystem corresponds to the *Analyzer/Generator* menu and the popup menu *Modulation Quality Configuration.*

Control of Measurement

The subsystem *MODulation:MQUality* controls the modulation quality measurement. It corresponds to the softkey *Mod. Qual.* in the measurement menu *Analyzer/Generator.*

INITiate:MODulation:MQUality:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:MQUality:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MQUality:HPSK	Stop measurement after current stat. Cycle	⇒ *STOP*
CONTinue:MODulation:MQUality:HPSK	Next measurement step (*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.	V3.40

CONFigure:MODulation:MQUality:HPSK:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. Value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see Chapter 5 of the CMU 200 Operating manual about event reporting).

FETCh[:SCALar]:MODulation:MQUality:HPSK:STATus? Measurement Status

Returned values	Description of parameters	Def. Value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *Modulation Quality* measurement in the *Analyzer/Generator* menu. They correspond to the *Modulation Quality Configuration* menu.

Subsystem CONTrol

The subsystem *MODulation*:*MQUality:CONTrol* configures the modulation quality measurement. It corresponds to the *Control* tab in the popup menu *Modulation Quality Configuration*.

DEFault:MODulation:MQUality:HPSK:CONTrol[?] Default Settings
<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the `MODulation:MQUality:HPSK:CONTrol` subsystem to their default values (the setting *OFF* results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

CONFigure:MODulation:MQUality:HPSK:CONTrol[?] Scope of Measurement
<Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000,	Number of bursts within a statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | **CONT |** **SING |** **DEF,**	Multiple measurement (counting, until Status = STEP | RDY)Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **SONerror |** **DEF,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **STEP |** **DEF**	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle Sets the value to the default setting	NONE	–	V3.40

Description of command

This command sets all measurement control parameters. It combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands.

CONFigure:MODulation:MQUality:HPSK:CONTrol:STATistics[?] Statistic Count
<Statistics>

<**Statistics**>	Description of parameters	Def. Value	Def. unit	FW vers.
1 to 1000	Number of bursts within a statistics cycle	100	–	V3.40

Description of command

This command selects the type of measured values and determines the number of bursts forming one statistics cycle.

CONFigure:MODulation:MQUality:HPSK:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 **CONT |** **SING |** **DEF,**	Multiple measurement (counting, until Status = STEP | RDY)Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **SONerror |** **DEF,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **STEP |** **DEF**	Continue measurement according to its rep. mode Interrupt measurement after each statistics cycle Sets the value to the default setting	NONE	–	V3.40

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.

Sideband Frequency Offset
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 2 MHz | **DEF |** **OFF |** **ON**	Sideband frequency offset Sets the value to the default setting | minimum | maximum Measurement disabled, result INV Enable measurement, last setting re-activated	see below	Hz	V3.40

Description of command

The sideband suppression measurement yields 4 pairs of results corresponding to symmetrical frequency offsets to the RF frequency (command `[SENSe:]RFANalyzer:FREQuency[?]`) using a gaussian filter with a bandwidth of 30 kHz.

This command determines these four frequency offset values (<nr> = 1 to 4). The sideband suppression frequency offset depends on the network standard (`CONFigure:NETWork:STANdard`). The default values are the same as listed in the command: `CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP<nr>[?]`

Subsystem LIMit

The subsystem *MODulation:MQUality:...:LIMit* defines tolerance values for the modulation quality measurement. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Quality Configuration.*

CONFigure:MODulation:MQUality:HPSK:CMMax:LIMit[?] **<Rho Limit>, <Carrier Freq. Error Limit>, <Transmit Time Error Limit>,** **<Carrier Feedthrough Limit>, <IQ Imbalance>, <Sideband Suppr. 1>, <Sideband Suppr. 2>,** **<Sideband Suppr. 3>, <Sideband Suppr. 4>,**				Limits
<Rho Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 to 1.0 | **OFF |** **ON,**	Limit for Rho No Rho limit check Limit check on, last setting re-activated	0.944	–	V3.40
<Carrier Freq. Error Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0 Hz to 1000 Hz | **OFF |** **ON,**	Upper limit for carrier frequency error No carrier frequency error limit check Limit check on, last setting re-activated	300	Hz	V3.40
<Transmit Time Error Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 s to 0.00001 s | **OFF |** **ON,**	Upper limit for transmit time error No transmit time error limit Limit check on, last setting re-activated	0.000001	s	V3.40
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–120 dB to –20 dB | **OFF |** **ON,**	Upper limit for carrier feedthrough No carrier feedthrough limit check Limit check on, last setting re-activated	–25	dB	V3.40
<IQ Imbalance>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dB to –20.0 dB | **OFF |** **ON,**	Upper limit for IQ Imbalance.	–30	dB	V3.40
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON,**	Limit for sideband suppression at freq. offset 1 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.40
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON,**	Limit for sideband suppression at freq. offset 2 No sideband suppres limit check Limit check on, last setting re-activated	–54	dB	V3.40
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON,**	Limit for sideband suppression at freq. offset 3 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.40
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON**	Limit for sideband suppression at freq. offset 4 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.40
Description of command				
This command defines limits for *Current* and *Max/Min* quantities describing the modulation quality.				

CONFigure:MODulation:MQUality:HPSK:AVERage:LIMit[?] Limits
<Rho Limit>, <Carrier Freq. Error Limit>, <Transmit Time Error Limit>, <Carrier Feedthrough Limit>, <IQ Imbalance>, <Sideband Suppr. 1>, <Sideband Suppr. 2>, <Sideband Suppr. 3>, <Sideband Suppr. 4>

<Rho Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 to 1.0 | **OFF |** **ON,**	Limit for Rho No Rho limit check Limit check on, last setting re-activated	0.944	–	V3.40
<Carrier Freq. Error Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0 Hz to 1000 Hz | **OFF |** **ON,**	Upper limit for carrier frequency error No carrier frequency error limit check Limit check on, last setting re-activated	300	Hz	V3.40
<Transmit Time Error Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 s to 0.00001 s | **OFF |** **ON,**	Upper limit for transmit time error No transmit time error limit Limit check on, last setting re-activated	0.000001	s	V3.40
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–120 dB to –20 dB | **OFF |** **ON,**	Upper limit for carrier feedthrough No carrier feedthrough limit check Limit check on, last setting re-activated	–25	DB	V3.40
<IQ Imbalance>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 dB to –20.0 dB | **OFF |** **ON,**	Upper limit for IQ Imbalance.	–30	dB	V3.40
<Sideband Suppr. 1>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON,**	Limit for sideband suppression at freq. offset 1 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.40
<Sideband Suppr. 2>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON,**	Limit for sideband suppression at freq. offset 2 No sideband suppres limit check Limit check on, last setting re-activated	–54	dB	V3.40
<Sideband Suppr. 3>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON,**	Limit for sideband suppression at freq. offset 3 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.40
<Sideband Suppr. 4>	Description of parameters	Def. value	Def. unit	FW vers.
–128 dB to 0 dB | **OFF |** **ON**	Limit for sideband suppression at freq. offset 4 No sideband suppres limit check Limit check on, last setting re-activated	–43	dB	V3.40

Description of command

This command defines limits for the *Average* quantities describing the modulation quality.

DEFault:MODulation:MQUality:HPSK:CMMax:LIMit[?] Default Settings
<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation:MQUality:*:LIMit subsystem to their default values (the setting OFF results in an error message). The length of the parameter lists in the `CONFigure:MODulation:MQUality...CMMax:LIMit` commands is not affected.

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

The keyword `CMMax` refers to the *Current* and *Max./Min*. limits.

DEFault:MODulation:MQUality:HPSK:AVERage:LIMit[?] Default Settings
<Enable>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation:MQUality:*:LIMit subsystem to their default values (the setting OFF results in an error message). The length of the parameter lists in the `CONFigure:MODulation:MQUality...AVERage:LIMit` commands is not affected.

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Measured Values

The subsystem *MODulation* 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 *Analyzer/Generator.*

READ[:SCALar]:MODulation:MQUality:HPSK? Start single shot measurement and return results
FETCh[:SCALar]:MODulation:MQUality:HPSK? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:MODulation:MQUality:HPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
AT Power (x3),	–120.0 dBm to –33.0 dBm	NAN	dBm	V3.40
Rho (x3),	0.0 to +1.0	NAN	–	
Carrier Frequency Error (x3),	–10.0 Hz to 0.0 Hz	NAN	Hz	
Transmit Time Error (x3),	0.0 to 0.00001	NAN	s	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
IQ Imbalance (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Lower Sideband Supp. 1 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 1 (x3)	–120 dB to 10 dB	NAN	dB	
Lower Sideband Supp. 2 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 2 (x3)	–120 dB to 10 dB	NAN	dB	
Lower Sideband Supp. 3 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 3 (x3)	–120 dB to 10 dB	NAN	dB	
Lower Sideband Supp. 4 (x3),	–120 dB to 10 dB	NAN	dB	
Upper Sideband Supp. 4 (x3)	–120 dB to 10 dB	NAN	dB	
Out of Tolerance	0% to 100 %	NAN	%	

Description of command

These commands are always queries. They start a modulation measurement and output 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 *MMax* value. Sideband Supp. 1 to Sideband Supp. 4 denotes the sideband suppression at offset frequencies 1 to 4; see command `CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]`.

CALCulate[:SCALar]:MODulation:MQUality:HPSK:MATChing:LIMIt?			Limit Matching	
Returned values	Value range	Def. value	Def. unit	FW vers.
Rho (x3),	For all measured values:	INV	–	V3.40
Carrier Frequency Error (x3),		INV	–	
Transmit Time Error (x3),	NMAU | NMAL | INV | OK	INV	–	
Carrier Feedthrough (x3),		INV	–	
IQ Imbalance (x3),		INV	-	
Lower Sideband Supp. 1 (x3),		INV	–	
Upper Sideband Supp. 1 (x3)		INV	–	
Lower Sideband Supp. 2 (x3),		INV	–	
Upper Sideband Supp. 2 (x3)		INV	–	
Lower Sideband Supp. 3 (x3),		INV	–	
Upper Sideband Supp. 3 (x3)		INV	–	
Lower Sideband Supp. 4 (x3),		INV	–	
Upper Sideband Supp. 4 (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 above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. Sideband Supp. 1 to Sideband Supp. 4 denotes the sideband suppression at offset frequencies 1 to 4; see command `CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP<nr>[?]`.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

MODulation:OVERview

The subsystem *MODulation:OVERview* measures general scalar modulation parameters of the AT transmitter output signal. The subsystem corresponds to the measurement menu *Modulation* and the associated popup menu *Modulation Configuration.*

Control of Measurement

The subsystem *MODulation:OVERview* controls the modulation overview measurement. It corresponds to the softkey *Overview HPSK* in the measurement menu *Modulation*.

INITiate:MODulation:OVERview:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:OVERview:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:OVERview:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:OVERview:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the modulation overview measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:MODulation:OVERview:HPSK:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ | **SOPC |** **SRSQ |** **OFF |** **DEFault**	Service request Single operation complete SRQ and SOPC No reporting Sets the value to the default setting	OFF	–	V3.40

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:MODulation:OVERview:HPSK: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	–	V3.40
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).

Test Configuration

The commands of the following subsystems configure the *Modulation Overview* measurement in the *Modulation* menu. They correspond to the *Modulation Overview Configuration* menu.

Subsystem CONTrol

The subsystem *MODulation:OVERview:CONTrol* configures the modulation overview measurement. It corresponds to the *Control* tab in the popup menu *Modulation Configuration*.

DEFault:MODulation:OVERview:HPSK:CONTrol[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `MODulation:OVERview:….:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

CONFigure:MODulation:OVERviewHPSK:CONTrol[?] Scope of Measurement
<Statistic Count>, <Repetition>, <Stop Cond>, <Step Mode>

<Statistic Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW-Vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40

Description of command

This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.

CONFigure:MODulation:OVERview:HPSK:CONTrol:STATistics[?] Statistic Count
<Statistic Count>

<Statistic Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40

Description of command

This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.

CONFigure:MODulation:OVERview:HPSK:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	V3.40
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement even in case of error	NONE	–	V3.40
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.40
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command

This command determines the repetition mode, stop condition, and 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 LIMit

The subsystem *MODulation:OEMP:...:LIMit* defines the tolerance values for the scalar results of the following modulation measurements (*OEMP*):

- Overview
- Error Vector Magnitude
- Magnitude Error
- Phase Error.

The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Quality Configuration.* Different limits can be configured for the the *Current* and *Max./Min*. traces.

CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined][?] Limits
<Limit_Peak_EVM>, <Enable>, <Limit_RMS_EVM>, <Enable>, <Limit_Peak_ME>, <Enable>, <Limit_RMS_ME>, <Enable>, <Limit_Peak_PE>, <Enable>, <Limit_RMS_PE>, <Enable>, <Carrier_Feedthrough_Limit>, <Enable>, <IQ_Imbalance_Limit>, <Enable>, <Carrier_Freq_Error_Limit>, <Enable>, <Tx_Time_Error_Limit>, <Enable>, <Rho_Limit>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF,	Switch limit check for parameter preceding <*Enable*> on or off	ON	–	V3.40
Parameters	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.40
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to 180.0 deg,	(PE) Phase Error Peak	OFF	deg	
0.0 deg to 180.0 deg,	(PE) Phase Error RMS	OFF	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs	Transmit Time Error	1.0	s	
0.0 to 1.0	Rho	0.944	–	

Description of command

This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword `CMMax` refers to the *Current* and *Max./Min*. traces. After each parameter definition, the limit check for this parameter can be enabled or disabled.

Limit definition and enabling of the limit check can be done separately.

CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined][?] Limits
<Limit_Peak_EVM>, <Enable>, <Limit_RMS_EVM>, <Enable>, <Limit_Peak_ME>, <Enable>, <Limit_RMS_ME>, <Enable>, <Limit_Peak_PE>, <Enable>, <Limit_RMS_PE>, <Enable>, <Carrier_Feedthrough_Limit>, <Enable>, <IQ_Imbalance_Limit>, <Enable>, <Carrier_Freq_Error_Limit>, <Enable>, <Tx_Time_Error_Limit>, <Rho_Limit>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF,	Switch limit check for parameter preceding <*Enable*> on or off	ON	–	V3.40
Parameters	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.40
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to 180.0 deg,	(PE) Phase Error Peak	19.6	deg	
0.0 deg to 180.0 deg,	(PE) Phase Error RMS	13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs	Transmit Time Error	1.0	s	
0.0 to 1.0	Rho	0.944	–	

Description of command

This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword AVERage refers to the *Average* trace. After each parameter definition, the limit check for this parameter can be enabled or disabled.

Limit definition and enabling of the limit check can be done separately.

Limit values

CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?]
<Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <Rho_Limit>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.40
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to 180.0 deg,	(PE) Phase Error Peak	OFF	deg	
0.0 deg to 180.0 deg,	(PE) Phase Error RMS	OFF	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs,	Transmit Time Error	1.0	s	
0.0 to 1.0	Rho	0.944	–	

Description of command

This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword CMMax refers to the *Current* and *Max./Min*. traces.

Limit values

CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue[?] <Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <Rho_Limit>

Parameter	Description of parameters	Def. value	Def. unit	FW vers.
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error Peak	+33.4	%	V3.40
0.0 % to +100.0 %,	(EVM) Error Vector Magnitude Error RMS	+23.6	%	
0.0 % to +100.0 %,	(ME) Magnitude Error Peak	+33.4	%	
0.0 % to +100.0 %,	(ME) Magnitude Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	(PE) Phase Error Peak	19.6	deg	
0.0 deg to +45.0 deg,	(PE) Phase Error RMS	13.6	deg	
–120.0 dB to –20.0 dB,	Carrier Feedthrough	–25.0	dB	
–120.0 dB to –20.0 dB,	IQ Imbalance	–30.0	dB	
0 Hz to 1000 Hz,	Carrier Frequency Error	+300	Hz	
0.0 µs to 10.0 µs,	Transmit Time Error	1.0	s	
0.0 to 1.0	Rho	0.944	–	

Description of command

This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keyword AVERage refers to the *Average* trace.

Limit Enable

CONFigure:MODulation:OEMP:HPSK:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] <Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <Rho_Limit>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch limit check for corresponding parameter on or off.	ON (see below)	–	V3.40

Description of command

This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keyword CMMax refers to the *Current* and *Max./Min*. traces.

Note: The default value is *ON* for all limits execept the **phase error** limits (Def. Value = ***OFF***).

Limit Enable

CONFigure:MODulation:OEMP:HPSK:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle[?] <Limit_Peak_EVM>, <Limit_RMS_EVM>, <Limit_Peak_ME>, <Limit_RMS_ME>, <Limit_Peak_PE>, <Limit_RMS_PE>, <Carrier_Feedthrough_Limit>, <IQ_Imbalance_Limit>, <Carrier_Freq_Error_Limit>, <Tx_Time_Error_Limit>, <Rho_Limit>

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	V3.40

Description of command

This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keyword AVERage refers to the *Average* trace.

DEFault:MODulation:OEMP:HPSK:LIMit[?] ***<Enable>***			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from their default values	ON	–	V3.40
Description of command				
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `MODulation:OEMP:LIMit` to their default values (the setting *OFF* results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				

Measured Values

The subsystem *MODulation:OVERview* measures and returns the modulation overview parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Overview.*

			Scalar Results	
READ[:SCALar]:MODulation:OVERview:HPSK?			Start single shot measurement and return results	
FETCh[:SCALar]:MODulation:OVERview:HPSK?			Read out meas. results (unsynchronized)	
SAMPle[:SCALar]:MODulation:OVERview:HPSK?			Read out measurement results (synchronized)	
Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3),	0.0 % to 100.0 %	NAN	%	V3.40
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),	0.0 deg to +45.0 deg	NAN	deg	
Phase Error RMS (x3),	0.0 deg to +45.0 deg	NAN	deg	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/Q Imbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
Rho (x3),	0 to 1	NAN	–	
AT Power (x3),	–133.0 dBm to +19.0 dBm	NAN	dB	
Current Statistics,	1 to 1000	NAN	–	
Limit Matching	0.0 % to 100.0 %	NAN	%	
Description of command				
These commands are always queries. They start a modulation overview measurement and output all scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.				

CALCulate[:SCALar]:MODulation:OVERview:HPSK:MATChing:LIMit?			Limit Matching	
Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3),	For all measured values:	INV	–	V3.40
EVM RMS (x3),		INV	–	
Magn Error Peak (x3),	NMAU | NMAL | INV | OK	INV	–	
Magn Error RMS (x3),		INV	–	
Phase Error Peak (x3),		INV	–	
Phase Error RMS (x3),		INV	–	
Carrier Feedthrough (x3),		INV	–	
I/Q Imbalance (x3),		INV	–	
Carrier Freq. Error (x3),		INV	–	
Tx Time Error (x3),		INV	–	
Rho (x3),		INV	–	
AT Power (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 above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

MODulation:EVMagnitude (Error Vector Magnitude)

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 H-PSK*, and the associated popup menu *Modulation Configuration.*

Control of Measurement

The subsystem *MODulation:EVMagnitude* controls the error vector magnitude measurement. It corresponds to the softkey *EVM H-PSK* in the measurement menu *Modulation*.

INITiate:MODulation:EVMagnitude:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:EVMagnitude:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:EVMagnitude:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:EVMagnitude:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the error vector magnitude measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:MODulation:EVMagnitude:HPSK:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:MODulation:EVMagnitude:HPSK:STATus? Measurement Status

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *Error Vector Magnitude* measurement in the *Modulation* menu. They correspond to the *Modulation Configuration* menu.

Subsystem CONTrol

The subsystem *MODulation:EVMagnitude:CONTrol* configures the error vector magnitude measurement. It corresponds to the *Control* tab in the popup menu *Modulation Configuration*.

CONFigure:MODulation:EVMagnitude:HPSK:CONTrol[?] ***<Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>***			Scope of Measurement	
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay,**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW-Vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode Sets the value to the default setting	NONE	–	V3.40
Description of command				
This command combines the ....`CONTrol:STATistics` and ...`CONTrol:REPetition` commands, see below.				

CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:RMODe[?] ***<Result Mode>***			Result mode	
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
Description of command				
This command specifies the type of measured values.				

CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:STATistics[?] Statistics Count
<Statistics Count>

<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40

Description of command

This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.

CONFigure:MODulation:EVMagnitude:HPSK:CONTrol:REPetition[?] Test Cycles
<Repetition> ,<Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode Sets the value to the default setting	NONE	–	V3.40

Description of command

This command determines the repetition mode, stop condition, and 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:MODulation:EVMagnitude:HPSK:CONTrol[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `MODulation:EVMagnitude:….:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem LIMit

The subsystem *MODulation:OEMP:...:LIMit* (refer to page 6.46) defines the tolerance values for the *OEMP* modulation measurements. The subsystem corresponds to the *Modulation* section in the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:EVMagnitude:HPSK[?] **<*Mode*>, <*Start*>, <*Samples*>**			Definition of Subarrays	
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
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	–	V3.40
<Start>	Description of parameters	Def. value	Def. unit	FW vers.
0 µs to 833 µs	Start time in current range	NAN	s	V3.40
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1024	Number of samples in current range	NAN	–	V3.40

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 symbol 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

The subsystem *MODulation:EVMagnitude* measures and returns the error vector magnitude results and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Error Vector Magnitude.*

Scalar Results

READ[:SCALar]:MODulation:EVMagnitude:HPSK? Start single shot measurement and return results
FETCh[:SCALar]:MODulation:EVMagnitude:HPSK? Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude:HPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3),	0.0 % to 100.0 %	NAN	%	V3.40
EVM RMS (x3),	0.0 % to 100.0 %	NAN	%	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/Q Imbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
Rho (x3),	0 to 1	NAN	–	
AT Power (x3),	–133.0 dBm to +19.0 dBm	NAN	dB	
Current Statistics,	1 to 1000	NAN	–	
Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command

These commands are always queries. They start a EVM measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.

CALCulate[:SCALar]:MODulation:EVMagnitude:HPSK:MATChing:LIMit? Out of Tolerance

Returned values	Value range	Def. value	Def. unit	FW vers.
EVM Peak (x3),	For all measured values:	INV	–	V3.40
EVM RMS (x3),		INV	–	
	NMAU | NMAL | INV | OK			
Carrier Feedthrough (x3),		INV	–	
I/Q Imbalance (x3),		INV	–	
Carrier Freq. Error (x3),		INV	–	
Tx Time Error (x3),		INV	–	
Rho (x3),		INV	–	
AT Power (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 above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

EVM in Evaluation Period

READ:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
READ:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
READ:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Start single shot measurement and return results

FETCh:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
FETCh:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
FETCh:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Read measurement results (unsynchronized)

SAMPle:ARRay:MODulation:EVMagnitude:HPSK:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude:HPSK:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude:HPSK:MMAX?

Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for error vector magnitude,	0.0 % to + 100.0 %,	NAN	%	V3.40
xth value for error vector magnitude	0.0 % to + 100.0 %	NAN	%	

Description of command

These commands are always queries. They return the error vector magnitude vs. time at fixed, equidistant test points. The number of measured values is 1024, corresponding to a time range of 0 symbols to 833 microseconds.

The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).

Subarray Results

READ:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
READ:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
READ:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?

Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
FETCh:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:EVMagnitude:HPSK:MMAX?

Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for error vector magnitude	0.0 % to + 100.0 %,	NAN	%	V3.40
xth value for error vector magnitude	0.0 % to + 100.0 %	NAN	%	

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` command.

The `CONFigure:SUBarrays:MODulation:EVMagnitude` command defines 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, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).

MODulation:PERRor (Phase Error)

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,* and the associated popup menu *Modulation Configuration.*

Control of Measurement

The subsystem *MODulation:PERRor* controls the phase error measurement. It corresponds to the softkey *Phase Error* in the measurement menu *Modulation*.

INITiate:MODulation:PERRor:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:PERRor:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:PERRor:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:PERRor:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the phase error measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:MODulation:PERRor:HPSK:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:MODulation:PERRor:HPSK:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *Phase Error* measurement in the *Modulation* menu. They correspond to the *Modulation Configuration* menu.

Subsystem CONTrol

The subsystem *MODulation:PERRor:CONTrol* configures the phase error measurement. It corresponds to the tab *Control* in the popup menu *Modulation Configuration*.

CONFigure:MODulation:PERRor:HPSK:CONTrol[?] Scope of Measurement ***<Result Mode>*, *<Statistics Count>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay,**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW-Vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40
Description of command				
This command combines the `...CONTrol:STATistics`, `...CONTrol:REPetition` and `...CONTrol:RMODe` commands.				

CONFigure:MODulation:PERRor:HPSK:CONTrol:STATistics[?] Statistics Count ***<Statistics Count>***				
<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40
Description of command				
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				

CONFigure:MODulation:PERRor:HPSK:CONTrol:REPetition[?] Test Cycles
<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	V3.40
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement even in case of error	NONE	–	V3.40
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.40
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

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:HPSK:CONTrol:RMODe[?] Result Mode
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar |	Scalar values only (incl. ramp matching)	ARR	–	V3.40
ARRay	Scalar measured values and arrays			

Description of command

This command specifies the type of measured values.

DEFault:MODulation:PERRor:HPSK:CONTrol[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON |	The parameters are set to their default values	ON	–	V3.40
OFF	Some or all parameters are not set to default			

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `MODulation:PERRor:….:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem LIMit

The subsystem *MODulation:OEMP:...:LIMit* (refer to page 6.46) defines the tolerance values for the *OEMP* modulation measurements. The subsystem corresponds to the *Modulation* section in the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays

The subsystem *SUBarrays:MODulation:PERRor* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:PERRor:HPSK[?] **<*Mode*>, <*Start*>, <*Samples*>**			Definition of Subarrays	
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
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	–	V3.40
<Start>	Description of parameters	Def. value	Def. unit	FW vers.
0 µs to 833 µs,	Start time in current range	NAN	s	V3.40
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1024	Number of samples in current range	NAN	–	V3.40

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 symbol 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

The subsystem *MODulation:PERRor* measures and returns the phase error results and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Phase Error.*

Scalar Results:

READ[:SCALar]:MODulation:PERRor:HPSK? Start single shot measurement and return results
FETCh[:SCALar]:MODulation:PERRor:HPSK? Read out meas. Results (unsynchronized)
SAMPle[:SCALar]:MODulation:PERRor:HPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
PE Peak (x3),	0.0 deg to +45.0 deg	NAN	%	V3.40
PE RMS (x3),	0.0 deg to +45.0 deg	NAN	%	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/Q Imbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
Tx Time Error (x3),	0 µs to 10 µs	NAN	µs	
Rho (x3),	0 to 1	NAN	–	
AT Power (x3),	–133.0 dBm to –19.0 dBm	NAN	dBm	
Current Statistics,	1 to 1000	NAN	–	
Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command

These commands are always queries. They start a phase error measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.

CALCulate[:SCALar]:MODulation:PERRor:HPSK:MATChing:LIMit? Out of Tolerance

Returned values	Value range	Def. value	Def. unit	FW vers.
PE Peak (x3),	For all measured values:	INV	–	V3.40
PE RMS (x3),		INV	–	
	NMAU | NMAL | INV | OK			
Carrier Feedthrough (x3),		INV	–	
I/Q Imbalance (x3),		INV	–	
Carrier Freq. Error (x3),		INV	–	
Tx Time Error (x3),		INV	–	
Rho (x3),		INV	–	
AT Power (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 above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Phase Error in Burst

READ:ARRay:MODulation:PERRor:HPSK:CURRent?
READ:ARRay:MODulation:PERRor:HPSK:AVERage?
READ:ARRay:MODulation:PERRor:HPSK:MMAX? Start single shot measurement and return results

FETCh:ARRay:MODulation:PERRor:HPSK:CURRent?
FETCh:ARRay:MODulation:PERRor:HPSK:AVERage?
FETCh:ARRay:MODulation:PERRor:HPSK:MMAX? Read measurement results (unsynchronized)

SAMPle:ARRay:MODulation:PERRor:HPSK:CURRent?
SAMPle:ARRay:MODulation:PERRor:HPSK:AVERage?
SAMPle:ARRay:MODulation:PERRor:HPSK:MMAX? Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for phase error	–100.0 deg to + 100.0 deg,	NAN	deg	V3.40
xth value for phase error	–100.0 deg to + 100.0 deg	NAN	deg	

Description of command

These commands are always queries. They return the phase error vs. time at fixed, equidistant test points. The number of measured values is 1024, corresponding to a time range of 0 symbols to 833 microseconds.

The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).

Subarray Results

READ:SUBarrays:MODulation:PERRor:HPSK:CURRent?
READ:SUBarrays:MODulation:PERRor:HPSK:AVERage?
READ:SUBarrays:MODulation:PERRor:HPSK:MMAX?
Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:PERRor:HPSK:CURRent?
FETCh:SUBarrays:MODulation:PERRor:HPSK:AVERage?
FETCh:SUBarrays:MODulation:PERRor:HPSK:MMAX?
Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:PERRor:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:PERRor:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:PERRor:HPSK:MMAX?
Read results (synchronized) ⇒ RUN

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for phase error	100.0 deg to + 100.0 deg,	NAN	deg	V3.40
xth value for phase error	–100.0 deg to + 100.0 deg	NAN	deg	

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` command.

The `CONFigure:SUBarrays:MODulation:PERRor` command defines 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, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).

MODulation:MERRor (Magnitude Error)

The subsystem *MODulation:MERRor* measures the magnitude error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Magnitude Error,* and the associated popup menu *Modulation Configuration.*

Control of Measurement

The subsystem *MODulation:MERRor* controls the magnitude error measurement. It corresponds to the softkey *Magn. Error* in the measurement menu *Modulation*.

INITiate:MODulation:MERRor:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:MERRor:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:MERRor:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:MERRor:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the magnitude error measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:MODulation:MERRor:HPSK:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:MODulation:MERRor:HPSK:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *Magnitude Error* measurement in the *Modulation* menu. They correspond to the *Modulation Configuration* menu.

Subsystem CONTrol

The subsystem *MODulation:MERRor:CONTrol* configures the magnitude error measurement. It corresponds to the tab *Control* in the popup menu *Modulation Configuration*.

CONFigure:MODulation:MERRor:HPSK:CONTrol[?] Scope of Measurement ***<Result Mode>, <Statistics Count>, <Repetition>, <Stop Cond>, <Step Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay,**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW-Vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40
Description of command				
This command combines the `....CONTrol:RMODe`, `....CONTrol:STATistics`, and `...CONTrol:REPetition` commands, see below.				

CONFigure:MODulation:MERRor:HPSK:CONTrol:RMODe[?] Result mode ***<Result Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
Description of command				
This command specifies the type of measured values.				

CONFigure:MODulation:MERRor:HPSK:CONTrol:STATistics[?] Statistics Count ***<Statistics Count>***				
<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40
Description of command				
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				

CONFigure:MODulation:MERRor:HPSK:CONTrol:REPetition[?] Test Cycles
<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	V3.40
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement even in case of error	NONE	–	V3.40
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.40
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command

This command determines the repetition mode, stop condition, and 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:MODulation:MERRor:HPSK:CONTrol[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON |	The parameters are set to their default values	ON	–	V3.40
OFF	Some or all parameters are not set to default			

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `MODulation:MERRor:….:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem LIMit

The subsystem *MODulation:OEMP:...:LIMit* (refer to page 6.46) defines the tolerance values for the *OEMP* modulation measurements. The subsystem corresponds to the *Modulation* section in the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays

The subsystem *SUBarrays:MODulation:MERRor* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:MERRor:HPSK[?] **<*Mode*>, <*Start*>, <*Samples*>**			Definition of Subarrays	
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
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	–	V3.40
<Start>	Description of parameters	Def. value	Def. unit	FW vers.
0 µs to 833 µs,	Start time in current range	NAN	s	V3.40
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1024	Number of samples in current range	NAN	–	V3.40

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 symbol 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

The subsystem *MODulation:MERRor* measures and returns the magnitude error results and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Magnitude Error.*

READ[:SCALar]:MODulation:MERRor:HPSK? Start single shot measurement and return results — Scalar Results

FETCh[:SCALar]:MODulation:MERRor:HPSK? Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation:MERRor:HPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
ME Peak (x3),	0.0 % to 100.0 %	NAN	%	V3.40
ME RMS (x3),	0.0 % to 100.0 %	NAN	%	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/Q Imbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
Transmit Time Error (x3),	0 µs to 10 µs	NAN	µs	
Rho (x3),	0 to 1	NAN	–	
AT Power (x3),	–133.0 dBm to +19.0 dBm	NAN	dB	
Current Statistics,	1 to 1000	NAN	–	
Limit Matching	0.0 % to 100.0 %	NAN	%	

Description of command

These commands are always queries. They start a magnitude error measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MaxMin* value.

CALCulate[:SCALar]:MODulation:MERRor:HPSK:MATChing:LIMit? Out of Tolerance

Returned values	Value range	Def. value	Def. unit	FW vers.
ME Peak (x3),	For all measured values:	INV	–	V3.40
ME RMS (x3),		INV	–	
	NMAU | NMAL | INV | OK			
Carrier Feedthrough (x3),		INV	–	
I/Q Imbalance (x3),		INV	–	
Carrier Freq. Error (x3),		INV	–	
Transmit Time Error (x3),		INV	–	
Rho (x3),		INV	–	
AT Power (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 above command) have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MaxMin* value. The limits are defined with the `CONFigure:MODulation:OEMP`... commands.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Magnitude Error in Evaluation Period

READ:ARRay:MODulation:MERRor:HPSK:CURRent?
READ:ARRay:MODulation:MERRor:HPSK:AVERage?
READ:ARRay:MODulation:MERRor:HPSK:MMAX?

Start single shot measurement and return results

FETCh:ARRay:MODulation:MERRor:HPSK:CURRent?
FETCh:ARRay:MODulation:MERRor:HPSK:AVERage?
FETCh:ARRay:MODulation:MERRor:HPSK:MMAX?

Read measurement results (unsynchronized)

SAMPle:ARRay:MODulation:MERRor:HPSK:CURRent?
SAMPle:ARRay:MODulation:MERRor:HPSK:AVERage?
SAMPle:ARRay:MODulation:MERRor:HPSK:MMAX?

Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
1st value for magnitude error,	0.0 % to + 100.0 %,	NAN	%	V3.40
xth value for magnitude error	0.0 % to + 100.0 %	NAN	%	

Description of command

These commands are always queries. They return the magnitude error vs. time at fixed, equidistant test points. The number of measured values is 1024, corresponding to a time range of 0 symbols to 833 microseconds.

The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).

Subarray Results

READ:SUBarrays:MODulation:MERRor:HPSK:CURRent?
READ:SUBarrays:MODulation:MERRor:HPSK:AVERage?
READ:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Start measurement and wait for end ⇒ RUN

FETCh:SUBarrays:MODulation:MERRor:HPSK:CURRent?
FETCh:SUBarrays:MODulation:MERRor:HPSK:AVERage?
FETCh:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Read meas. results (unsynchronized) ⇒ RUN

SAMPle:SUBarrays:MODulation:MERRor:HPSK:CURRent?
SAMPle:SUBarrays:MODulation:MERRor:HPSK:AVERage?
SAMPle:SUBarrays:MODulation:MERRor:HPSK:MMAX?

Read results (synchronized) ⇒ RUN

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
1st value for magnitude error	0.0 % to + 100.0 %,	NAN	%	V3.40
xth value for magnitude error	0.0 % to + 100.0 %	NAN	%	

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` command.

The `CONFigure:SUBarrays:MODulation:MERRor` command defines 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, minimum,* and *maximum* results is explained in Chapter 3 (see *display mode*).

MODulation:IQANalyzer (IQ Analyzer)

The subsystem *MODulation:IQANalyzer* measures the I and Q amplitudes of the received HPSK signal as a function of time. The subsystem corresponds to the measurement menu *Modulation,* application *I/Q Analyzer HPSK,* and the sections in the popup menu *Modulation Configuration* that are related to the *I/Q Analyzer* application.

Control of Measurement

The subsystem *MODulation:IQANalyzer* controls the measurement. It corresponds to the softkey *IQ Analyzer* in the measurement menu *Modulation*.

INITiate:MODulation: IQANalyzer:HPSK	Start new measurement	⇒ *RUN*
ABORt:MODulation:IQANalyzer:HPSK	Abort running measurement and switch off	⇒ *OFF*
STOP:MODulation:IQANalyzer:HPSK	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:MODulation:IQANalyzer:HPSK	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the IQ Analyzer measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:MODulation:IQANalyzer:HPSK:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF |	No reporting			
DEFault	Sets the value to the default setting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:MODulation:IQANalyzer:HPSK:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *IQ Analyzer* measurement in the *Modulation* menu. They correspond to the sections in the *Modulation Configuration* menu that are related to the *I/Q Analyzer* application.

Subsystem CONTrol

The subsystem *MODulation:IQANalyzer:CONTrol* configures the measurement. It corresponds to the tab *Control* in the popup menu *Modulation Configuration*.

CONFigure:MODulation:IQANalyzer:HPSK:CONTrol:REPetition[?] Test Cycles
<Repetition>*, *<Stop Cond>*, *<Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Multiple measurement (counting, until Status = STEP | RDY)	SING	–	V3.40
CONTinuous |	Continuous measurement (until STOP or ABORT)			
SINGleshot |	Single shot measurement (until Status = RDY)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement even in case of error	NONE	–	V3.40
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.40
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command

This command determines the repetition mode, stop condition, and 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:IQANalyzer:HPSK:CONTrol:RMODe[?] Result mode
<Result Mode>

<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar |	Scalar values only	ARR	–	V3.40
ARRay	Scalar measured values and arrays			

Description of command

This command specifies the type of measured values.

DEFault:MODulation:IQANalyzer:HPSK:CONTrol[?] ***<Enable>***			Default Settings	
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40
Description of command				
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `MODulation:IQANalyzer:…:CONTrol` to their default values (the setting *OFF* results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				

Subsystem SUBarrays

The subsystem *SUBarrays:MODulation:IQANalyzer* defines the measurement range and the type of output values.

CONFigure:SUBarrays:IQANalyzer:HPSK[?] ***<Mode>*, *<Start>*, *<Samples>***			Definition of Subarrays	
<Mode>	Description of parameters	Def. value	Def. unit	FW vers.
ALL	Return all measurement values	ALL	–	V3.40
<Start>	Description of parameters	Def. value	Def. unit	FW vers.
0 µs to 833 µs,	Start time in current range	NAN	s	V3.40
<Samples>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 4096	Number of samples in current range	NAN	–	V3.40
Description of command				
This command configures the `READ:SUBarrays..., FETCh:SUBarrays...,` and `SAMPle:SUBarrays:MODulation:IQANalyzer` 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 symbol period. The subranges may overlap but must be within the total range of the *IQ Analyzer* measurement. Test points outside this range are not measured (result *NAN)*. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.				

Measured Values

The subsystem *MODulation:IQANalyzer* measures and returns the IQ Analyzer results. No limit check is perfomed. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *IQ Analyzer.*

Scalar Results

READ[:SCALar]:MODulation:IQANalyzer:HPSK? Start single shot measurement and return results

FETCh[:SCALar]:MODulation: IQANalyzer:HPSK? Read out meas. results (unsynchronized)

SAMPle[:SCALar]:MODulation: IQANalyzer:HPSK? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
IQ Peak (x3),	0.0 % to 100.0 %	NAN	%	V3.40
IQ RMS (x3),	0.0 % to 100.0 %	NAN	%	
Carrier Feedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/Q Imbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 Hz to 1000 Hz	NAN	Hz	
Transmit Time Error (x3),	0 µs to 10 µs	NAN	µs	
Rho (x3),	0 to 1	NAN	–	
AT Power (x3),	–133.0 dBm to +19.0 dBm	NAN	dB	

Description of command

These commands are always queries. They start a modulation measurement and output the scalar measurement results (see Chapter 4). The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *calculation of statistical quantities*). The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MaxMin* value.

Normalized I phase amplitude

READ:ARRay:MODulation:IQANalyzer:HPSK:IPHase? Start single shot measurement and return results

FETCh:ARRay:MODulation:IQANalyzer:HPSK:IPHase? Read measurement results (unsynchronized)

SAMPle:ARRay:MODulation:IQANalyzer:HPSK:IPHase? Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
-2.0 to +2.0,	1st value for normalized I amplitude,	NAN	–	V3.40
...,				
-2.0 to +2.0	4096th value for normalized I amplitude	NAN	–	

Description of command

These commands are always queries. They return the normalized I amplitude. The number of measured values is 4096. This corresponds to an oversampling factor of four compared to the *OEMP* modulation measurements. The time range of 0 symbols to 833 microseconds.

Normalized Q phase amplitude

READ:ARRay:MODulation:IQANalyzer:HPSK:QPHase? Start single shot measurement and return results

FETCh:ARRay:MODulation:IQANalyzer:HPSK:QPHase? Read measurement results (unsynchronized)

SAMPle:ARRay:MODulation:IQANalyzer:HPSK:QPHase? Read measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
-2.0 to +2.0,	1st value for normalized Q amplitude,	NAN	–	V3.40
...,				
-2.0 to +2.0	4096th value for normalized Q amplitude	NAN	–	

Description of command

These commands are always queries. They return the normalized Q amplitude. The number of measured values is 4096. This corresponds to an oversampling factor of four compared to the *OEMP* modulation measurements. The time range of 0 symbols to 833 microseconds.

Subarray Results

READ:SUBarrays:MODulation:IQANalyzer:HPSK:IPHase? Start measurement and wait for end

FETCh:SUBarrays:MODulation:IQANalyzer:HPSK:IPHase? Read meas. results (unsynchronized)

SAMPle:SUBarrays:MODulation:IQANalyzer:HPSK:IPHase? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
-2.0 to +2.0,	1st value for normalized I amplitude,	NAN	–	V3.40
...,				
-2.0 to +2.0	nth value for normalized I amplitude	NAN	–	

Description of command

These commands are always queries. They return the normalized I amplitude in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:IQANalyzer:HPSK:IPHase` command.

The `CONFigure:SUBarrays:MODulation:IQANalyzer:HPSK:IPHase` command defines a maximum of 32 subranges.

Subarray Results

READ:SUBarrays:MODulation:IQANalyzer:HPSK:QPHase? Start measurement and wait for end

FETCh:SUBarrays:MODulation:IQANalyzer:HPSK:QPHase? Read meas. results (unsynchronized)

SAMPle:SUBarrays:MODulation:IQANalyzer:HPSK:QPHase? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
-2.0 to +2.0,	1st value for normalized Q amplitude,	NAN	–	V3.40
...,				
-2.0 to +2.0	nth value for normalized Q amplitude	NAN	–	

Description of command

These commands are always queries. They return the normalized Q amplitude in the subranges defined by means of the `CONFigure:SUBarrays:MODulation:IQANalyzer:HPSK:QPHase` command.

The `CONFigure:SUBarrays:MODulation:IQANalyzer:HPSK:QPHase` command defines a maximum of 32 subranges.

CDPower:CDPW (Code Domain Power)

The subsystem *CDPower:CDPW* measures the Code Domain Power output of the access terminal. Both the *RRI* and the *Pilot* time slot are evaluated in the same measurement shot. The *CDPower:CDPW* subsystem corresponds to the measurement menu *Code Domain Power*, application *CDP* and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

Control of Measurement

The subsystem *CDPower:CDPW* controls the code domain power measurement. It corresponds to the softkey *CDP* in the measurement menu *Code Domain Power*.

INITiate:CDPower:CDPW	Start new measurement	⇒ *RUN*
ABORt:CDPower:CDPW	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:CDPW	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:CDPW	Next measurement step (*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.	V3.40

CONFigure:CDPower:CDPW:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
DEFault |	Sets the value to the default setting			
OFF	No reporting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:CDPower:CDPW:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *Code Domain Power* measurement in the *Code Domain Power* menu. They correspond to the *Code Domain Power Configuration popup* menu.

Subsystem CONTrol

The subsystem *CDPower:CDPW:CONTrol* configures the Code Domain Power measurement. It defines the result mode, result order, repetition mode, statistic count and stop condition of the measurement. It corresponds to the tab *Control* in the popup menu *Code Domain Power Configuration*.

CONFigure:CDPower:CDPW:CONTrol[?] Scope of Measurement ***<Result Mode>*, *<Current Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
<Current Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | CONTinuous | SINGleshot | DEFault,	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | SONerror | DEFault,	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | NONE | DEFault	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40
Description of command				
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				

CONFigure:CDPower:CDPW:CONTrol:RMODe[?] Result mode ***<Result Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
Description of command				
This command specifies the type of measured values.				

CONFigure:CDPower:CDPW:CONTrol:STATistics[?] Statistic Count
<Current Statistics >

<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40

Description of command

This command defines the number of bursts forming a statistics cycle.

CONFigure:CDPower:CDPW:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40

Description of command

This command determines the repetition mode, stop condition, and 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:CDPW:CONTrol:RORDer[?] Result Order
<Result Order>

<Result Order>	Description of parameters	Def. value	Def. unit	FW vers.
HADamard | **BITReverse**	Walsh code channels returned using Hadamard matrix Walsh code channels returned at MSB to LSB	HAD	–	V3.40

Description of command

This command defines the method used to display the code channels. `HADamard` displays the code channels in order determined by the Hadamard matrix. `BITReverse` displays the code channels so that the related code channels are adjacent to each other.

This setting is only available for Code Domain and Peak Code Domain Error measurement applications.

DEFault:CDPower:CDPW:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `CDPower:CDPW:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem LIMit

CDPower:CPCCommon:LIMit

The subsystem *CDPower:CPCCommon:LIMit* defines common tolerance values for the scalar results of the following Code Domain Power applications (*CPCCommon*):

- Code Domain Power (*CDP*)
- Peak Code Domain Error Power (*PCDep*)
- Channel Power (*CHPW*)

CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric[:COMBined][?] **<Carrier Feedthrough Limit>, <Carrier Freq. Error Limit>, <Rho Limit>**			Limits	
<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 to –20.0 | **DEFault |** **OFF |** **ON,**	Carrier feedthrough limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–25.0	dB	V3.40
<Carrier Freq. Error Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1000.0 Hz | **DEFault |** **OFF |** **ON,**	Carrier frequency error limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	300.0	Hz	V3.40
<Rho Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 to 1.0 | **DEFault |** **OFF |** **ON**	Correlated power to the total power ratio limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	0.944	–	V3.40
Description of command				
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords CMAX and AVERage refer to the *Current* and *Max.* display and for the *Average* display, respectively.				

CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric[:COMBined][?] Limits
<Carrier Feedthrough Limit Average>, <Carrier Freq. Error Limit Average>, <Rho Limit Average>

<Carrier Feedthrough Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–120.0 to –20.0 | **DEFault |** **OFF |** **ON,**	Carrier feedthrough limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–25.0	dB	V3.40
<Carrier Freq. Error Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0 to 1000.0 Hz | **DEFault |** **OFF |** **ON,**	Carrier frequency error limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	300.0	Hz	V3.40
<Rho Limit>	Description of parameters	Def. value	Def. unit	FW vers.
0.0 to 1.0 | **DEFault |** **OFF |** **ON**	Correlated power to the total power ratio limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	0.944	–	V3.40

Description of command

This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords CMAX and AVERage refer to the *Current* and *Max.* display and for the *Average* display, respectively.

DEFault:CDPower:CPCCommon:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem CDPower:CPCCommon:LIMit to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

CDPower:CDPW:LIMit

The subsystem *CDPower:CDPW:LIMIT* defines the tolerance values that apply to the Code Domain Power application only.

CONFigure:CDPower:CDPW:CMAX:LIMit:ASYMmetric[:COMBined][?] Limits
<CDP Limit Y>

<CDP Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | **DEFault |** **OFF |** **ON**	Peak code domain power Y limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–23.0	dB	V3.40

Description of command

This command defines the upper limit for the code domain power of the inactive channels (I and Q signal). The active channels are not checked. The keywords CMAX and AVERage refer to the *Current* and *Max.* display and for the *Average* display, respectively.

CONFigure:CDPower:CDPW:AVERage:LIMit:ASYMmetric[:COMBined][?] Limits
<CDP Limit Y Average>

<CDP Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | **DEFault |** **OFF |** **ON**	Peak code domain power Y limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–23.0	dB	V3.40

Description of command

This command defines the upper limit for the code domain power of the inactive channels (I and Q signal). The active channels are not checked. The keywords CMAX and AVERage refer to the *Current* and *Max.* display and for the *Average* display, respectively.

CONFigure:CDPower:CDPW:LIMit:IQLCheck[?] IQ Leakage Check
<IQ Leakage Check>

<IQ Leakage Check>	Description of parameters	Def. value	Def. unit	FW vers.
DEFault | **OFF |** **ON**	Sets the value to the default setting IQ Leakage Check disabled IQ Leakage Check enabled	ON	–	V3.40

Description of command

This command enables or disables the IQ leakage check. When enabled, the tolerance check will be performed for all inactive channels regardless of wether the corresponding channel on the opposite signal phase is active or not. Disabling the IQ leakage check will only indicate tolerance violations of those inactive channels that have no active correspondance on the opposite signal phase.

DEFault:CDPower:CDPW:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem CDPower:CDPW:LIMit to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Measured Values

The subsystem *CDPower:CDPW* determines and outputs the results of the Code Domain Power measurement.

Scalar results:

READ[:SCALar]:CDPower:CDPW? Start single shot measurement and return results
FETCh[:SCALar]:CDPower:CDPW? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:CDPower:CDPW? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
AT Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.40
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	–	
Current Statistics	1 to 10000	NAN	–	

Description of command

These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.

CALCulate[:SCALar]:CDPower:CDPW:MATChing:LIMit? Limit Matching

Returned values	Value range	Def. value	Def. unit	FW vers.
Carrier Feedthrough (x3),	For all values	INV	–	V3.40
Carrier Freq. Error (x3),		INV	–	
Rho (x3)	NMAU | NMAL | INV | OK	INV	–	

Description of command

This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be generated*:*

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent? Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:CURRent? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} RRI time,	–60.0 dB to +10.0 dB,	NAN	dB	V3.40
W_0^{16} Pilot time,	...,			
...,	...,			
W_{15}^{16} RRI time,	...,			
W_{15}^{16} Pilot time	–60.0 dB to +10.0 dB			

Description of command

These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Current* is explained in Chapter 3 (see *display mode*).

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage? Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:AVERage? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Average* is explained in Chapter 3 (see *display mode*).

I Signal Measurement

READ:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum? Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:ISIGnal[:VALue]:MAXimum? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the Walsh Code of the in-phase signal path (I-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Maximum* is explained in Chapter 3 (see *display mode*).

Q signal Measurement

READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent? Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:CURRent? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Current* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage? Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:AVERage? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Average* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum? Start single shot meas. and return results
FETCh:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CDPW:QSIGnal[:VALue]:MAXimum? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the Walsh Code of the quadrature signal path (Q-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Maximum* is explained in Chapter 3 (see *display mode*).

CALCulate:ARRay:CDPower:CDPW:ISIGnal:CURRent[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CALCulate:ARRay:CDPower:CDPW:ISIGnal:AVERage[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CALCulate:ARRay:CDPower:CDPW:ISIGnal:MAXimum[:RESult]:MATChing:LIMit?			I Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40
Description of command				
This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded. **Note:** Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.				

CALCulate:ARRay:CDPower:CDPW:QSIGnal:CURRent[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40
Description of command				
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded. **Note:** Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.				

CALCulate:ARRay:CDPower:CDPW:QSIGnal:AVERage[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40
Description of command				
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded. **Note:** Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.				

CALCulate:ARRay:CDPower:CDPW:QSIGnal:MAXimum[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40
Description of command				
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded. **Note:** Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.				

CDPower:PCDep (Peak Code Domain Error Power)

The subsystem *CDPower:PCDep* measures the Peak Code Domain Error Power output of the access terminal. Both the *RRI* and the *Pilot* time slot are evaluated in the same measurement shot. The subsystem corresponds to the measurement menu *Code Domain Power,* application *PCDep,* and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

Control of Measurement

The subsystem *CDPower:PCDep* controls the peak code domain error power measurement. It corresponds to the softkey *PCDEP* in the measurement menu *Code Domain Power*.

INITiate:CDPower:PCDep	Start new measurement	⇒ *RUN*
ABORt:CDPower:PCDep	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:PCDep	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:PCDep	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the peak code domain error power measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:CDPower:PCDep:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
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 (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:CDPower:PCDep:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *Peak Code Domain Error Power* measurement in the *Code Domain Power* menu. They correspond to the *Code Domain Power Configuration popup* menu.

Subsystem CONTrol

The subsystem *CDPower:PCDep:CONTrol* defines the result mode, result order, repetition mode, statistic count and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:PCDep:CONTrol[?] Scope of Measurement ***<Result Mode>*, *<Current Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay,**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
<Current Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW-Vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40
Description of command				
This command combines the `...CONTrol:RMODe`,`...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				

CONFigure:CDPower:PCDep:CONTrol:RMODe[?] Result Mode ***<Result Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
Description of command				
This command specifies the type of measured values.				

CONFigure:CDPower:PCDep:CONTrol:RORDer[?] Result Order
<Result Order>

<Result Order>	Description of parameters	Def. value	Def. unit	FW-Vers.
HADamard | **BITReverse**	Walsh code channels returned using Hadamard matrix Walsh code channels returned at MSB to LSB	HAD	–	V3.40

Description of command

This command defines the method used to display the code channels. `HADamard` displays the code channels in order determined by the Hadamard matrix. `BITReverse` displays the code channels so that the related code channels are adjacent to each other.

This setting is only available for Code Domain and Peak Code Domain Error measurement applications.

CONFigure:CDPower:PCDep:CONTrol:STATistics[?] Statistic Count
<Current Statistics>

<Current Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40

Description of command

This command defines the number of bursts forming a statistics cycle.

CONFigure:CDPower:PCDep:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40

Description of command

This command determines the repetition mode, stop condition, and 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:CDPower:PCDep:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `CDPower:PCDep:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem LIMit

CDPower:CPCCommon:LIMit

The subsystem *CDPower:CPCCommon:LIMit* defines common tolerance values for the scalar results of the *CPCCommon* Code Domain Power applications. These commands are described in on page 6.77.

CDPower:PCDep:LIMit

The subsystem *CDPower:PCDep:LIMIT* defines the tolerance values that apply to the Peak Code Domain Error Power application only.

CONFigure:CDPower:PCDep:CMAX:LIMit:ASYMmetric[:COMBined][?] **<CDP Limit Y>**			Limits	
<PCDep Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | **DEFault |** **OFF |** **ON**	Peak code domain error power limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–23.0	dB	V3.40
Description of command				
This command defines the upper limit for the peak code domain error power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.				

CONFigure:CDPower:PCDep:AVERage:LIMit:ASYMmetric[:COMBined][?] **<PCD Limit Y Average>**			Limits	
<PCDep Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | **DEFault |** **OFF |** **ON**	Peak code domain error power limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–23.0	dB	V3.40
Description of command				
This command defines the upper limit for the peak code domain error power. The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.				

DEFault:CDPower:PCDep:LIMit[?] ***<Enable>***			Default Settings	
Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40
Description of command				
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `DEFault:CDPower:PCDep:LIMit` to their default values (the setting *OFF* results in an error message). If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				

Measured Values

The subsystem *CDPower:PCDep* determines and outputs the results of the Peak Code Domain Error Power measurement. The peak code domain error power is the difference between the ideal code domain power and the measured signal.

Scalar results:

READ[:SCALar]:CDPower:PCDep? Start single shot measurement and return results
FETCh[:SCALar]:CDPower:PCDep? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:CDPower:PCDep? Read out measurement results (synchronized)

Returned values	Description	Def. value	Def. unit	FW vers.
AT Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.40
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	–	
Current Statistics	1 to 10000	NAN	–	

Description of command

These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.

CALCulate[:SCALar]:CDPower:PCDep:MATChing:LIMit? Limit Matching

Returned values	Description	Def. value	Def. unit	FW vers.
Carrier Feedthrough (x3),	For all values	NAN	–	V3.40
Carrier Freq. Error (x3),			–	
Rho (x3)	NMAU | NMAL | INV | OK		–	

Description of command

This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be generated*:*

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

I Signal Measurement

READ:ARRay:CDPower:PCDep:ISIGnal[:VALue]:CURRent? Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:ISIGnal[:VALue]:CURRent? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:ISIGnal[:VALue]:CURRent? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
W_0^{16} RRI time,	–60.0 dB to +10.0 dB,	NAN	dB	V3.40
W_0^{16} Pilot time,	...,			
...,	...,			
W_{15}^{16} RRI time,	...,			
W_{15}^{16} Pilot time	–60.0 dB to +10.0 dB			

Description of command

These commands are always queries. They start a measurement and output the code domain error power of the Walsh Code of the in-phase signal path (I-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Current* is explained in Chapter 3 (see *display mode*).

I Signal Measurement

READ:ARRay:CDPower:PCDep:ISIGnal[:VALue]:AVERage? Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:ISIGnal[:VALue]:AVERage? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:ISIGnal[:VALue]:AVERage? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the code domain error power of the Walsh Code of the in-phase signal path (I-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Average* is explained in Chapter 3 (see *display mode*).

I Signal Measurement

READ:ARRay:CDPower:PCDep:ISIGnal[:VALue]:MAXimum? Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:ISIGnal[:VALue]:MAXimum? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:ISIGnal[:VALue]:MAXimum? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the code domain error power of the Walsh Code of the in-phase signal path (I-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Maximum* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal[:VALue]:CURRent? Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:QSIGnal[:VALue]:CURRent? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:QSIGnal[:VALue]:CURRent? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the code domain error power of the Walsh Code of the quadrature signal path (Q-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Current* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal[:VALue]:AVERage? Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:QSIGnal[:VALue]:AVERage? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:QSIGnal[:VALue]:AVERage? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the code domain error power of the Walsh Code of the quadrature signal path (Q-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Average* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:PCDep:QSIGnal[:VALue]:MAXimum? Start single shot meas. and return results
FETCh:ARRay:CDPower:PCDep:QSIGnal[:VALue]:MAXimum? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:PCDep:QSIGnal[:VALue]:MAXimum? Read results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	FW vers.
W_0^{16} RRI time, **W_0^{16} Pilot time,** **...,** **W_{15}^{16} RRI time,** **W_{15}^{16} Pilot time**	–60.0 dB to +10.0 dB, ..., ..., ..., –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the code domain error power of the Walsh Code of the quadrature signal path (Q-signal). 32 values are returned representing the alternating results of the RRI and the Pilot time. The calculation of *Maximum* is explained in Chapter 3 (see *display mode*).

CALCulate:ARRay:CDPower:PCDep:ISIGnal:CURRent[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CALCulate:ARRay:CDPower:PCDep:ISIGnal:AVERage[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CALCulate:ARRay:CDPower:PCDep:ISIGnal:MAXimum[:RESult]:MATChing:LIMit?			I Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CALCulate:ARRay:CDPower:PCDep:QSIGnal:CURRent[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CALCulate:ARRay:CDPower:PCDep:QSIGnal:AVERage[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CALCulate:ARRay:CDPower:PCDep:QSIGnal:MAXimum[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in code channel W_0^{16} RRI (least significant bit) to W_{15}^{16} Pilot	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.

Note: Even bits are assigned to the RRI time slot and odd bits are assigned to the pilot time slot.

CDPower:CHPW (Channel Power)

The subsystem *CDPower:CHPW* measures the Channel Power ouput. The subsystem corresponds to the measurement menu *Code Domain Power,* application *Channel Power,* and the sections related to this application in the associated popup menu *Code Domain Power Configuration.*

Control of measurement

The subsystem *CDPower:CHPW* controls the channel power measurement. It corresponds to the softkey *ChP* in the measurement menu *Code Domain Power*.

INITiate:CDPower:CHPW	Start new measurement	⇒ *RUN*
ABORt:CDPower:CHPW	Abort running measurement and switch off	⇒ *OFF*
STOP:CDPower:CHPW	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:CDPower:CHPW	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the channel power measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:CDPower:CHPW:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
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 (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:CDPower:CHPW:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *Channel Power* measurement in the *Code Domain Power* menu. They correspond to the *Code Domain Power Configuration popup* menu.

Subsystem CONTrol

The subsystem *CDPower:CHPW:CONTrol* defines the result mode, repetition mode, statistic count and stop condition of the measurement. These settings are provided in the *Control* tab in the popup menu *Code Domain Power Configuration.*

CONFigure:CDPower:CHPW:CONTrol[?] Scope of Measurement ***<Result Mode>*, *<Current Statistics>*, *<Repetition>*, *<Stop Cond>*, *<Step Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay,**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
<Current Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW-Vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40
Description of command				
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				

CONFigure:CDPower:CHPW:CONTrol:RMODe[?] Result Mode ***<Result Mode>***				
<Result Mode>	Description of parameters	Def. value	Def. unit	FW-Vers.
SCALar | **ARRay**	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARR	–	V3.40
Description of command				
This command specifies the type of measured values.				

CONFigure:CDPower:CHPW:CONTrol:STATistics[?] Statistic Count
<Current Statistics >

<Current Statistics>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40

Description of command

This command defines the number of bursts forming a statistics cycle.

CONFigure:CDPower:CHPW:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (counting, until Status = STEP | RDY) Continuous measurement (until STOP or ABORT) Single shot measurement (until Status = RDY) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40

Description of command

This command determines the repetition mode, stop condition, and 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:CDPower:CHPW:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `CDPower:CHPW:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Subsystem LIMit

CDPower:CPCCommon:LIMit

The subsystem *CDPower:CPCCommon:LIMit* defines common tolerance values for the scalar results of the *CPCCommon* Code Domain Power applications. These commands are described in on page 6.77.

CDPower:CHPW:LIMit

The subsystem *CDPower:CHPW:LIMIT* defines the tolerance values that apply to the Channel Power application only.

CONFigure:CDPower:CHPW:CMAX:LIMit:ASYMmetric[:COMBined][?] Limits
<CHPW Limit Y>

<CHPW Limit Y>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | **DEFault |** **OFF |** **ON**	Channel power Y limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–23.0	dB	V3.40

Description of command

This command defines the upper limit for the channel power (Y value). The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.

CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric[:COMBined][?] Limits
<CHPW Limit Y Average>

<CHPW Limit Y Average>	Description of parameters	Def. value	Def. unit	FW vers.
–60.0 to 0 | **DEFault |** **OFF |** **ON**	Channel power Y limit Sets the value to the default setting Disables the tolerance check Tolerance check enabled, last value re-activated	–23.0	dB	V3.40

Description of command

This command defines the upper limit for the channel power (Y value). The keywords `CMAX` and `AVERage` refer to the *Current* and *Max.* display and for the *Average* display, respectively.

DEFault:CDPower:CHPW:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | **OFF**	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `CDPower:CHPW:LIMit` to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Measured Values

The subsystem *CDPower:CHPW* determines and outputs the results of the Channel Power measurement.

		Scalar results:
READ[:SCALar]:CDPower:CHPW?	Start single shot measurement and return results	
FETCh[:SCALar]:CDPower:CHPW?	Read out measurement results (unsynchronized)	
SAMPle[:SCALar]:CDPower:CHPW?	Read out measurement results (synchronized)	

Returned values	Value range	Def. value	Def. unit	FW vers.
AT Power (x3),	–100.0 dBm to –50.0 dBm	NAN	dBm	V3.40
Carrier Feedthrough (x3),	–120.0 dB to –20.0 dB	NAN	dB	
Carrier Freq. Error (x3),	0 to 1000.0 Hz	NAN	Hz	
Rho (x3),	0.0 to 1.0	NAN	–	
Out of Tolerance,	0.0% to 100.0%	NAN	%	
Current Statistics	1 to 1000	NAN	–	

Description of command

These commands are always queries. They start a measurement and output all scalar measurement results. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value.

CALCulate[:SCALar]:CDPower:CHPW:MATChing:LIMit?			Limit Matching	
Returned values	Value range	Def. value	Def. unit	FW vers.
Carrier Feedthrough (x3),	For all values	INV	–	V3.40
Carrier Freq. Error (x3),		INV	–	
Rho (x3)	NMAU | NMAL | INV | OK	INV	–	

Description of command

This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *MMax* value. The following messages may be generated*:*

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

		I Signal Measurement
READ:ARRay:CDPower:CHPW:ISIGnal[:VALue]:CURRent?	Start single shot meas. and return results	
FETCh:ARRay:CDPower:CHPW:ISIGnal[:VALue]:CURRent?	Read meas. results (unsynchronized)	
SAMPle:ARRay:CDPower:CHPW:ISIGnal[:VALue]:CURRent?	Read results (synchronized)	

Returned values		Value range	Def. value	Def. unit	FW vers.
W_0^{16}	**RRI,**	–60.0 dB to +10.0 dB,	NAN	dB	V3.40
W_0^{16}	**Pilot,**	–60.0 dB to +10.0 dB,			
W_4^{8}	**ACK**	–60.0 dB to +10.0 dB			

Description of command

These commands are always queries. They start a measurement and output the levels of the RRI, Pilot and the ACK channel of the in-phase signal path (I-signal). The calculation of *Current* is explained in Chapter 3 (see *display mode*).

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal[:VALue]:AVERage? Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:ISIGnal[:VALue]:AVERage? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:ISIGnal[:VALue]:AVERage? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} **RRI,** W_0^{16} **Pilot,** W_4^{8} **ACK**	–60.0 dB to +10.0 dB, –60.0 dB to +10.0 dB, –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the RRI, Pilot and the ACK channel of the in-phase signal path (I-signal). The calculation of *Average* is explained in Chapter 3 (see *display mode*).

I Signal Measurement

READ:ARRay:CDPower:CHPW:ISIGnal[:VALue]:MAXimum? Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:ISIGnal[:VALue]:MAXimum? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:ISIGnal[:VALue]:MAXimum? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_0^{16} **RRI,** W_0^{16} **Pilot,** W_4^{8} **ACK**	–60.0 dB to +10.0 dB, –60.0 dB to +10.0 dB, –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the RRI, Pilot and the ACK channel of the in-phase signal path (I-signal). The calculation of *Maximum* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal[:VALue]:CURRent? Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:QSIGnal[:VALue]:CURRent? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:QSIGnal[:VALue]:CURRent? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_8^{16} **DRC,** W_2^{4} **Data**	–60.0 dB to +10.0 dB, –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the DRC and the DATA channel of the quadrature signal path (Q-signal). The calculation of *Current* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal[:VALue]:AVERage? Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:QSIGnal[:VALue]:AVERage? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:QSIGnal[:VALue]:AVERage? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_8^{16} **DRC,** W_2^{4} **Data**	–60.0 dB to +10.0 dB, –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the DRC and the DATA channel of the quadrature signal path (Q-signal). The calculation of *Average* is explained in Chapter 3 (see *display mode*).

Q Signal Measurement

READ:ARRay:CDPower:CHPW:QSIGnal[:VALue]:MAXimum? Start single shot meas. and return results
FETCh:ARRay:CDPower:CHPW:QSIGnal[:VALue]:MAXimum? Read meas. results (unsynchronized)
SAMPle:ARRay:CDPower:CHPW:QSIGnal[:VALue]:MAXimum? Read results (synchronized)

Returned values	Value range	Def. value	Def. unit	FW vers.
W_8^{16} **DRC,** W_2^4 **Data**	–60.0 dB to +10.0 dB, –60.0 dB to +10.0 dB	NAN	dB	V3.40

Description of command

These commands are always queries. They start a measurement and output the levels of the DRC and the DATA channel of the quadrature signal path (Q-signal). The calculation of *Maximum* is explained in Chapter 3 (see *display mode*).

CALCulate:ARRay:CDPower:CHPW:ISIGnal:CURRent[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in: W_0^{16} RRI bit 0 W_0^{16} Pilot bit 1 W_4^8 ACK bit 2 (bit 0 is the least significant)	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

CALCulate:ARRay:CDPower:CHPW:ISIGnal:AVERage[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in: W_0^{16} RRI bit 0 W_0^{16} Pilot bit 1 W_4^8 ACK bit 2 (bit 0 is the least significant)	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

CALCulate:ARRay:CDPower:CHPW:ISIGnal:MAXimum[:RESult]:MATChing:LIMit? I Signal Tolerance

Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in: W_0^{16} RRI bit 0 W_0^{16} Pilot bit 1 W_4^8 ACK bit 2 (bit 0 is the least significant)	NAN	–	V3.40

Description of command

This command is always a query. If a bit is set in the returned value the I signal limit in the corresponding code channel is exceeded.

CALCulate:ARRay:CDPower:CHPW:QSIGnal:CURRent[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in: W_8^{16} DRC bit 0 W_2^4 Data bit 1 (bit 0 is the least significant)	NAN	–	V3.40
Description of command				
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				

CALCulate:ARRay:CDPower:CHPW:QSIGnal:AVERage[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in: W_8^{16} DRC bit 0 W_2^4 Data bit 1 (bit 0 is the least significant)	NAN	–	V3.40
Description of command				
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				

CALCulate:ARRay:CDPower:CHPW:QSIGnal:MAXimum[:RESult]:MATChing:LIMit?			Q Signal Tolerance	
Returned value	Description	Def. value	Def. unit	FW vers.
32 bit value	Indicator for limit matching in: W_8^{16} DRC bit 0 W_2^4 Data bit 1 (bit 0 is the least significant)	NAN	–	V3.40
Description of command				
This command is always a query. If a bit is set in the returned value the Q signal limit in the corresponding code channel is exceeded.				

SPECtrum:ACP (ACP Spectrum)

The subsystem *SPECtrum:ACP* measures the power of four adjacent channel pairs. These four pairs correspond to symmetrical frequency offsets to the RF frequency (command `[SENSe:]RFANalyzer:FREQuency[?]`). The subsystem corresponds to the measurement menu *Spectrum* and the associated popup menu *Spectrum Configuration.*

Control of Measurement

The subsystem *SPECtrum:ACP* controls the adjacent channel power spectrum measurement. It corresponds to the softkey *ACP* in the measurement menu *Spectrum*.

INITiate:SPECtrum:ACP	Start new measurement	⇒ *RUN*
ABORt:SPECtrum:ACP	Abort running measurement and switch off	⇒ *OFF*
STOP:SPECtrum:ACP	Stop measurement after current stat. cycle	⇒ *STOP*
CONTinue:SPECtrum:ACP	Next measurement step (*stepping mode*)	⇒ *RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the ACP spectrum measurement, setting it to the status indicated in the top right column.	V3.40

CONFigure:SPECtrum:ACP:EREPorting[?] Event Reporting
<Report Mode>

<Report Mode>	Description of parameters	Def. value	Def. unit	FW vers.
SRQ |	Service request	OFF	–	V3.40
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
DEFault |	Sets the value to the default setting			
OFF	No reporting			

Description of command

This command defines the events generated when the measurement is terminated or stopped (see *Event Reporting* in Chapter 5 of the CMU manual).

FETCh[:SCALar]:SPECtrum:ACP:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	FW vers.
OFF |	Measurement in the OFF state (*RST or ABORt)	OFF	–	V3.40
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			
1 to 10000 |	Counter for current statistics cycle	NONE	–	
NONE	No counting mode set			
1 to 1000	Counter for current evaluation period within a cycle	NONE	–	
NONE	Statistic count set to off			

Description of command

This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).

Test Configuration

The commands of the following subsystems configure the *ACP Spectrum* measurement in the *Spectrum* menu. They correspond to the *Spectrum Configuration popup* menu.

Subsystem CONTrol

The subsystem *SPECtrum:ACP:CONTrol* configures the ACP Spectrum measurement. It defines the repetition mode, statistic count, stop condition and the offset frequencies of the measurement. It corresponds to the tab *Control* in the popup menu *Spectrum Configuration*.

CONFigure:SPECtrum:ACP:CONTrol[?] ***<Current Statistics>, <Repetition>, <Stop Cond>, <Step Mode>***			Scope of Measurement	
<Current Statistics>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 1000,	Number of bursts per statistics cycle	100	–	V3.40
<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 | **CONTinuous |** **SINGleshot |** **DEFault,**	Multiple measurement (*counting*, until `Status = STEP | RDY`) Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Sets the value to the default setting	SING	–	V3.40
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE | **SONerror |** **DEFault,**	Continue measurement even in case of error Stop measurement in case of error *(stop on error)* Sets the value to the default setting	NONE	–	V3.40
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP | **NONE |** **DEFault**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. Mode Sets the value to the default setting	NONE	–	V3.40
Description of command				
This command combines the `...CONTrol:RMODe`, `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				

CONFigure:SPECtrum:ACP:CONTrol:STATistics[?] ***<Current Statistics >***			Statistic Count	
<Statistics Count>	Description of parameters	Def. value	Def. unit	FW-Vers.
1 to 1000	Number of bursts per statistics cycle	100	–	V3.40
Description of command				
This command defines the number of bursts forming a statistics cycle.				

CONFigure:SPECtrum:ACP:CONTrol:REPetition[?] Test Cycles
<Repetition>, <Stop Cond>, <Step Mode>

<Repetition>	Description of parameters	Def. value	Def. unit	FW vers.
1 to 10000 |	Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	V3.40
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)			
SINGleshot |	Single shot measurement (until `Status = RDY`)			
DEFault,	Sets the value to the default setting			
<Stop Cond>	Description of parameters	Def. value	Def. unit	FW vers.
NONE |	Continue measurement even in case of error	NONE	–	V3.40
SONerror |	Stop measurement in case of error *(stop on error)*			
DEFault,	Sets the value to the default setting			
<Step Mode>	Description of parameters	Def. value	Def. unit	FW vers.
STEP |	Interrupt measurement after each statistics cycle	NONE	–	V3.40
NONE |	Continue measurement according to its rep. Mode			
DEFault	Sets the value to the default setting			

Description of command

This command determines the repetition mode, stop condition, and 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:ACP:CONTrol[?] Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	FW vers.
ON |	The parameters are set to their default values	ON	–	V3.40
OFF	Some or all parameters are not set to default			

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `SPECtrum:ACP:CONTrol` to their default values (the setting *OFF* results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

CONFigure:SPECtrum:ACP:CONTrol:FOFFset:ACP<nr>[?] ACP Frequency Offset
<Freq. Offset>

<Freq. Offset>	Description of parameters	Def. value	Def. unit	FW vers.
	The ACP frequency offset depends on the network standard:		Hz	V3.40
0 to 2 MHz | **OFF |** **ON**	**Band Class 0, US Cellular** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 0, Korean Cellular** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 1, North American PCS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 2, TACS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 3, JTACS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 4, Korean PCS** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 5, NMT 450** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 6, IMT-2000** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 7, North American 700 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 8, 1800 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 1150.00 kHz <nr> = 2: 1200.00 kHz <nr> = 3: 1250.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 9, North American 900 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		
0 to 2 MHz | **OFF |** **ON**	**Band Class 10, Secondary 800 MHz** Measurement disabled, result INV Enable measurement, last setting re-activated	<nr> = 1: 870.00 kHz <nr> = 2: 885.00 kHz <nr> = 3: 900.00 kHz <nr> = 4: 1980.00 kHz		

Description of command

This command determines four frequency offset values (<nr> = 1 to 4) which define the four adjacent channel pairs. *OFF* will disable the mesurement on the specified frequency pair and *INV* will be returned as result. See also the command `CONFigure:NETWork:STANdard`

Subsystem LIMit

SPECtrum:ACP:LIMit

The subsystem *SPECtrum:ACP:LIMit* defines tolerance values for the ACP Spetrum measurement.

CONFigure:SPECtrum:ACP:LIMit:ACP<nr>[?] Limits
<ACP Limit>

<ACP Limit>	Description of parameters	Def. value	Def. unit	FW vers.
–80.0 to +10.0 | OFF	Power limit for ACP<nr> Disables the tolerance check for ACP<nr>	<nr> = 1: -43 dB <nr> = 2: -43 dB <nr> = 3: -43 dB <nr> = 4: -54 dB	dB	V3.40

Description of command

This command defines the upper power limits for the adjacent channel pairs <nr> = 1 to 4. These limits apply to any of the statistic evaluation modes (*Current, Average and Maximum*).

DEFault:SPECtrum:ACP:LIMit[?] Default Settings
<Enable>

Enable	Description of parameters	Def. value	Def. unit	FW vers.
ON | OFF	The parameters are set to their default values Some or all parameters are not set to default	ON	–	V3.40

Description of command

If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem `SPECtrum:ACP:LIMit` to their default values (the setting *OFF* results in an error message).

If used as a query, the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Measured Values

The subsystem *SPECtrum:ACP* determines and outputs the results of the ACP Spectrum measurement.

Scalar results:

READ[:SCALar]:SPECtrum:ACP? Start single shot measurement and return results
FETCh[:SCALar]:SPECtrum:ACP? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:SPECtrum:ACP? Read out measurement results (synchronized)

Returned values		Value range	Def. value	Def. unit	FW vers.
Power of adj. Channel –4	**(Current),**	–80.0 dB to 0.0 dB	NAN	dB	V3.40
Power of adj. Channel –3	**(Current),**		NAN		
Power of adj. Channel –2	**(Current),**		NAN		
Power of adj. Channel –1	**(Current),**		NAN		
Power of adj. Channel +1	**(Current),**		NAN		
Power of adj. Channel +2	**(Current),**		NAN		
Power of adj. Channel +3	**(Current),**		NAN		
Power of adj. Channel +4	**(Current),**		NAN		
Power of adj. Channel –4	**(Average),**	–80.0 dB to 0.0 dB	NAN	dB	
Power of adj. Channel –3	**(Average),**		NAN		
Power of adj. Channel –2	**(Average),**		NAN		
Power of adj. Channel –1	**(Average),**		NAN		
Power of adj. Channel +1	**(Average),**		NAN		
Power of adj. Channel +2	**(Average),**		NAN		
Power of adj. Channel +3	**(Average),**		NAN		
Power of adj. Channel +4	**(Average),**		NAN		
Power of adj. Channel –4	**(Maximum),**	–80.0 dB to 0.0 dB	NAN	dB	
Power of adj. Channel –3	**(Maximum),**		NAN		
Power of adj. Channel –2	**(Maximum),**		NAN		
Power of adj. Channel –1	**(Maximum),**		NAN		
Power of adj. Channel +1	**(Maximum),**		NAN		
Power of adj. Channel +2	**(Maximum),**		NAN		
Power of adj. Channel +3	**(Maximum),**		NAN		
Power of adj. Channel +4	**(Maximum),**		NAN		
Channel Power	**(Current),**	–80.0 dBm to 0.0 dBm	NAN	dBm	
Channel Power	**(Average),**		NAN		
Channel Power	**(Maximum),**		NAN		
Out of Tolerance,		0 to 100 %	NAN	–	
Current Statistics		1 to 10000	NAN	–	

Description of command

These commands are always queries. They start a measurement and output all scalar measurement results.

CALCulate[:SCALar]:SPECtrum:ACP:MATChing:LIMit? Limit Matching

Returned values	Value range	Def. value	Def. unit	FW vers.
Tolerance Channel –4 (Current), **Tolerance Channel –3 (Current),** **Tolerance Channel –2 (Current),** **Tolerance Channel –1 (Current),** **Tolerance Channel +1 (Current),** **Tolerance Channel +2 (Current),** **Tolerance Channel +3 (Current),** **Tolerance Channel +4 (Current),**	NMAU | NMAL | INV | OK	INV	–	V3.40
Tolerance Channel –4 (Average), **Tolerance Channel –3 (Average),** **Tolerance Channel –2 (Average),** **Tolerance Channel –1 (Average),** **Tolerance Channel +1 (Average),** **Tolerance Channel +2 (Average),** **Tolerance Channel +3 (Average),** **Tolerance Channel +4 (Average),**	NMAU | NMAL | INV | OK	INV	–	
Tolerance Channel –4 (Maximum), **Tolerance Channel –3 (Maximum),** **Tolerance Channel –2 (Maximum),** **Tolerance Channel –1 (Maximum),** **Tolerance Channel +1 (Maximum),** **Tolerance Channel +2 (Maximum),** **Tolerance Channel +3 (Maximum),** **Tolerance Channel +4 (Maximum),**	NMAU | NMAL | INV | OK	INV	–	

Description of command

This command is always a query. It indicates whether and in which way the (fixed) limit have been exceeded. The symbol (x3) behind a value indicates that the list contains three results corresponding to the *Current*, the *Average,* and the *Maximum* value. The following messages may be generated*:*

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

List of Commands

In the following, all remote-control commands of the 1xEV-DO function group are listed. They are arranged in order of appearance of the subsystems.

Table 6-1 Remote-control commands

RF Input and Output

WPOWer Measurement

NPOWer Measurement

MQUality Measurement

MODulation:OVERview Measurement

MODulation:EVMagnitude Measurement

MODulation:PERRor Measurement

MODulation:MERRor Measurement

MODulation:IQANalyzer Measurement

CDPower:CDPW Measurement

CDPower:PCDep Measurement

CDPower:CHPW Measurement

SPECtrum:ACP Measurement

7 Remote Control – Program Example

The following example program illustrates primary and secondary addressing by setting up a call and performing simple measurements with the CMU. In the example, remote control via GPIB bus and the programming language *Winbatch* is used.

A large variety of additional GPIB examples can be found on the CMU customer web.

Winbatch uses device names such as *CMUBASE, 1xEV-DO-N* which are previously defined and assigned to the primary address, secondary address, and some general device settings.

With these device names, a complete command line reads:

```
CMUBASE: <CMU_Command>
```

where <CMU_Command> may be any of the commands (setting commands or queries) specified within the function group and mode identified by the device name CMUBASE. Program sequences consisting of commands that are defined in several function groups and modes can be re-used with an exchanged device name.

In addition to these data transfer commands, *Winbatch* provides *WHILE, GOTO*, and *IF* statements to express conditions and define loops.

With the statement:

```
WHILE 1xEV-DO-N: FETC:SPEC:ACP:STAT? <> RDY
```

the instrument waits until the spectrum measurement has finished before it executes the following commands.

For a C program assigning secondary addresses, refer to Chapter 7 of the CMU operating manual.

In the program example preliminary configurations for different measurements are defined, and the network parameters are set before performing actual measurements.

Before running the program, configure your *Winbatch* settings such that *CMUBASE* is the device name for the CMU *BASE* system and *1xEV-DO-N* denote the function group *1xEV-DO Non-Signalling*.

```
ECHO ON

FPRINT ------------------------------------------------------------------
FPRINT INITIALISATION ROUTINE:
FPRINT ASK FOR THE IDENTIFIER OF THE CMU, RESET THE INSTRUMENT,
FPRINT DEFINE THE SECONDARY ADDRESSES FOR ALL AVAILABLE FUNCTION GROUPS
FPRINT ------------------------------------------------------------------

CMUBASE: *IDN?
CMUBASE: *RST;*OPC?
CMUBASE: *CLS

CMUBASE: TRAC:REM:MODE:DISP ON
```

```
; Get primary and secondary addresses
CMUBASE: SYSTEM:REMOTE:ADDR:PRIM?
CMUBASE: SYST:REM:ADDR:SEC?

; Set the secondary address of the functional groups
CMUBASE: SYST:REM:ADDR:SEC?

CMUBASE: SYST:REM:ADDR:SEC 1,"CDMA2K450MS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 2,"CDMA2K450MS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 3,"CDMA2KCellMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 4,"CDMA2KCellMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 5,"CDMA2KPCSMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 6,"CDMA2KPCSMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 7,"CDMA2KIMT2KMS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 8,"CDMA2KIMT2KMS_NSig"
CMUBASE: SYST:REM:ADDR:SEC 10,"EVDO1XAT_NSig"

CMUBASE: SYST:REM:ADDR:SEC?

FPRINT ------------------------------------------------------------------------
FPRINT Configure the connector
FPRINT ------------------------------------------------------------------------

1xEV-DO-N: INP:STAT RF2
1xEV-DO-N: OUTP:STAT RF2
1xEV-DO-N: SENS:CORR:LOSS:INP2 1.0
1xEV-DO-N: SENS:CORR:LOSS:OUTP2 1.0

FPRINT ------------------------------------------------------------------------
FPRINT Network configuration
FPRINT ------------------------------------------------------------------------

1xEV-DO-N: CONFigure:NETWork:STANDard USC
1xEV-DO-N: CONFigure:NETWork:STANDard?


FPRINT ------------------------------------------------------------------------
FPRINT Analyzer configuration
FPRINT ------------------------------------------------------------------------

1xEV-DO-N: RFANalyzer:FREQuency:UNIT CH

1xEV-DO-N: RFANalyzer:FOFFset 0

1xEV-DO-N: RFANalyzer:LCMask:I:LSB "00000000"
1xEV-DO-N: RFANalyzer:LCMask:I:MSB "000"

1xEV-DO-N: RFANalyzer:LCMask:Q:LSB "00000000"
1xEV-DO-N: RFANalyzer:LCMask:Q:MSB "000"

1xEV-DO-N: RFANalyzer:CCFilter:DRC DCAR
1xEV-DO-N: RFANalyzer:CCFilter:ACK DCAR
1xEV-DO-N: RFANalyzer:CCFilter:DATA DCAR

FPRINT ------------------------------------------------------------------------
FPRINT Measurement configuration
FPRINT ------------------------------------------------------------------------

1xEV-DO-N: TRIGger:SOURce FRUN
```

```
; Ana/Gen

1xEV-DO-N: CONFigure:MODulation:MQUality:HPSK:CONTrol:STATistics 10

1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP1 ON
1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP2 ON
1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP3 ON
1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP4 ON

1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP1?
1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP2?
1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP3?
1xEV-DO-N:
CONFigure:MODulation:MQUality:HPSK:CONTrol:FOFFset:SBSuppress:ACP4?

1xEV-DO-N: CONFigure:MODulation:MQUality:HPSK:CMMax:LIMit?
1xEV-DO-N: CONFigure:MODulation:MQUality:HPSK:AVERage:LIMit?

; NarrowBandPower

1xEV-DO-N: CONFigure:NPOWer:CONTrol:STATistics 10
1xEV-DO-N: CONFigure:NPOWer:CONTrol:CBSize?

; Code Domain Power (Channel Power)

1xEV-DO-N: CONFigure:CDPower:CPCCommon:CMAX:LIMit:ASYMmetric?
1xEV-DO-N: CONFigure:CDPower:CPCCommon:AVERage:LIMit:ASYMmetric?

1xEV-DO-N: CONFigure:CDPower:CHPW:CONTrol:RMODe?

1xEV-DO-N: CONFigure:CDPower:CHPW:CONTrol:STATistics 10

1xEV-DO-N: CONFigure:CDPower:CHPW:CMAX:LIMit:ASYMmetric?
1xEV-DO-N: CONFigure:CDPower:CHPW:AVERage:LIMit:ASYMmetric?


FPRINT ------------------------------------------------------------------
FPRINT Generator configuration
FPRINT ------------------------------------------------------------------

1xEV-DO-N: SOURce:RFGenerator:MODE NORM

1xEV-DO-N: SOURce:RFGenerator:FREQuency:UNIT CH

1xEV-DO-N: SOURce:IMPairments:LEVel:AWGN OFF
1xEV-DO-N: SOURce:IMPairments:FOFFset OFF

1xEV-DO-N: SOURce:RFGenerator:PROPerty:PNOFfset 0


; Sync Message
```

```
1xEV-DO-N: SOURce:RFGenerator:SNCMessage:PSOFfset 0
1xEV-DO-N: SOURce:RFGenerator:SNCMessage:DRINdex 1
1xEV-DO-N: SOURce:RFGenerator:SNCMessage:DRATe?
1xEV-DO-N: SOURce:RFGenerator:SNCMessage:SCOunt?

; Configuration Access Terminal 1

1xEV-DO-N: SOURce:RFGenerator:AT1:MAC:INDex 63
1xEV-DO-N: SOURce:RFGenerator:AT1:MAC:LEVel -15
1xEV-DO-N: SOURce:RFGenerator:AT1:PCOunt INF
1xEV-DO-N: SOURce:RFGenerator:AT1:PSOFfset 8
1xEV-DO-N: SOURce:RFGenerator:AT1:DRINdex 12
1xEV-DO-N: SOURce:RFGenerator:AT1:DRATe?
1xEV-DO-N: SOURce:RFGenerator:AT1:SCOunt?
1xEV-DO-N: SOURce:RFGenerator:AT1:PATTern "B4B4B4B4"
1xEV-DO-N: SOURce:RFGenerator:AT1:DRCLock:STATe 1
1xEV-DO-N: SOURce:RFGenerator:AT1:DRCLock:PERiod 16
1xEV-DO-N: SOURce:RFGenerator:AT1:DRCLock:LENGth 16

; Reverse Activity
1xEV-DO-N: SOURce:RFGenerator:RAB:MAC:LEVel -10
1xEV-DO-N: SOURce:RFGenerator:RAB:STATe 1
1xEV-DO-N: SOURce:RFGenerator:RAB:OFFSet 3
1xEV-DO-N: SOURce:RFGenerator:RAB:LENGth 8

1xEV-DO-N: SOURce:RFGenerator:OAT:COUNt 10

1xEV-DO-N: INIT:RFGenerator;*OPC?

1xEV-DO-N: INIT:RFGenerator:AT1:MAC:INDex
1xEV-DO-N: INIT:RFGenerator:AT1:PSTReam

1xEV-DO-N: SOURce:RFGenerator:POWer:OUTPut  -50
1xEV-DO-N: SOURce:RFGenerator:FREQuency 300

1xEV-DO-N: SOURce:RFGenerator:AT1:PCBits HOLD

FPRINT ------------------------------------------------------------------
FPRINT Maximum Output Power Measurement
FPRINT ------------------------------------------------------------------

1xEV-DO-N: LEVel:MODE MAN
1xEV-DO-N: LEVel:MAXimum 25dBm
1xEV-DO-N: RFANalyzer:FREQuency 300

1xEV-DO-N: SOURce:RFGenerator:POWer:OUTPut  -105.5
1xEV-DO-N: SOURce:RFGenerator:FREQuency 300

1xEV-DO-N: SOURce:RFGenerator:AT1:PCBits AUP

1xEV-DO-N: INIT:MODulation:MQUality:HPSK
1xEV-DO-N: FETCh:MODulation:MQUality:HPSK?

1xEV-DO-N: INITiate:CDPower:CHPW
1xEV-DO-N: FETCh:CDPower:CHPW?

FPRINT ------------------------------------------------------------------
FPRINT Minimum Output Power Measurement
FPRINT ------------------------------------------------------------------
```

```
1xEV-DO-N: LEVel:MODE MAN
1xEV-DO-N: LEVel:MAXimum -50dBm
1xEV-DO-N: RFANalyzer:FREQuency 300

1xEV-DO-N: SOURce:RFGenerator:POWer:OUTPut  -25
1xEV-DO-N: SOURce:RFGenerator:FREQuency 300

1xEV-DO-N: SOURce:RFGenerator:AT1:PCBits ADOW

1xEV-DO-N: INIT:MODulation:MQUality:HPSK
1xEV-DO-N: FETCh:MODulation:MQUality:HPSK?

1xEV-DO-N: INITiate:NPOWer
1xEV-DO-N: FETCh:NPOWer?

1xEV-DO-N: INITiate:CDPower:CHPW
1xEV-DO-N: FETCh:CDPower:CHPW?
```

8 Maintenance

The CMU does not require any special maintenance. Remove any contamination on the instrument by means of a soft cloth. Make sure that the air vents are not obstructed.

Refer to the CMU Operating manual detailed maintenance, storage, and packing procedures. The CMU Operating manaul also contains a list of support and service centers.

Refer to the CMU Service manual for information on troubleshooting, repair, and calibration.

9 Error Codes

Table 9-1 lists the error codes and associated messages that may occur when you are using the remote control commands.

Table 9-1 Error Codes

Error Code	Message
0	No error
-100	Command error
-101	Invalid character
-102	Syntax error
-103	Invalid separator
-104	Data type error
-105	GET not allowed
-108	Parameter not allowed
-109	Missing parameter
-111	Header separator error
-112	Program mnemonic too long
-113	Undefined header
-113	Undefined header
-114	Header suffix out of range
-120	Numeric data error
-121	Invalid character in number
-123	Exponent too large
-124	Too many digits
-128	Numeric data not allowed
-131	Invalid suffix
-134	Suffix too long
-138	Suffix not allowed
-141	Invalid character data
-144	Character data too long
-148	Character data not allowed
-151	Invalid string data
-158	String data not allowed
-161	Invalid block data
-168	Block data not allowed
-171	Invalid expression
-178	Expression data not allowed
-180	Macro error
-200	Execution error

-211	Trigger ignored
-221	Setting conflict
-222	Data out of range
-223	Too much data
-224	Illegal parameter value
-230	Data corrupt or stale
-240	Hardware error
-241	Hardware missing
-250	Mass storage error
-251	Missing mass storage
-252	Missing media
-253	Corrupt media
-254	Media full
-255	Directory full
-256	File name not found
-257	File name error
-258	Media protected
-300	Device–specific error
-310	System error
-311	Memory error
-313	Calibration memory lost
-314	Save/recall memory lost
-315	Configuration memory lost
-330	Self test failed
-350	Queue overflow
-360	Communication error
-361	Parity error in program message
-362	Framing error in program message
-363	Input buffer overrun
-400	Query error
-410	Query INTERRUPTED
-420	Query UNTERMINATED
-430	Query DEADLOCKED
-440	Query UNTERMINATED after indefinite response

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