ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Software Options:

CDMA800/1900-MS (IS95) for CMU-B81

CMU-K81/-K82

1115.5500.02/1115.5600.02

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Contents of Manuals for Universal Radio Communication Tester CMU

Operating Manual CMU-K81/-K82 (Software Options: CDMA800/1900-MS (IS95) for CMU-B81)

The present operating manual describes the application of CMU for CDMA 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 CDMA Option operating manual is subdivided into 10 chapters:

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 CDMA 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 CDMA mobile tests.

Chapter 6 lists all remote control commands defined for CDMA 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.

CMU Universal Radio Communication Tester Operating Manual

The CMU operating manual is for the CMU basic unit. There you will find the technical specifications of the CMU, front and rear panel controls and connectors, necessary steps for putting the instrument into operation, the basic operating concept, and manual and remote control. Typical measurement tasks are explained in detail using the functions of the user interface and program examples.

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 CDMA operating manual.

Manual	Order Number	For Options		
		Type	Description	Stock No.
Operating Manual CMU-K21/-K22/-K23	1115.6088.12	CMU-K21 CMU-K22 CMU-K23	GSM900-MS for CMU-B21 GSM1800-MS for CMU-B21 GSM1900-MS for CMU-B21	1115.6007.02 1115.6107.02 1115.6207.02
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	1115.4185.12	CMU-K30 CMU-K31 CMU-K32 CMU-K33 CMU-K39 CMU-K41	GSM400-BS for CMU-B21 GSM900-BS for CMU-B21 GSM1800-BS for CMU-B21 GSM1900-BS for CMU-B21 MOC/MTC EDGE for CMU-K30/31/32/33	1115.4004.02 1115.4104.02 1115.4104.02 1115.4104.02 1115.4791.02 1115.4604.02
Operating Manual CMU-K53	1115.5081.12	CMU-K53	Bluetooth for CMU	1115.5000.02

About this Firmware Version

Dear Customer,

Your CMU was delivered with software option CMU-K81/-K82, cdma800/1900-MS. The latest software includes new features not published in the current operating manual.

These release notes contain new GPIB commands and modified commands to support the following new features:

- Band-to-Band Handoff (handoff between cdma bands without dropping the call)
- Narrowband Power Measurement
- Sideband Suppression Measurement

The end of this document also lists corrections to the existing cdma Operating manual. All information in these release notes supersede the information in the cdma Operating manual part number 1115.5581.12-01-.

CDMA Module Tests (Non-Signalling)

Modified Commands

Generator Settings – Subsystem RFGenerator

Page 6.8: The default values for the RF1, RF2, and RF3 connectors (command `SOURce:RFGenerator:LEVel`) have changed to –70.0 dBm.

SOURce:RFGenerator:LEVel RF Level
<CDMA_Power>, <Traffic_Lev>, <Paging_Lev>, <Sync_Lev>, <Pilot_Lev>

Values	Description of parameters	Def. value	Def. unit	Unit ring
	CDMA Power for following RF OUT:			
–144.0 dBm to –33.0 dBm |	RF1, 0.0 dB ext. atten.	–70.0	dBm	
–144.0 dBm to –16.0 dBm |	RF2, 0.0 dB ext atten.	–70.0	dBm	
–97.0 dBm to 7.0 dBm,	RF3 OUT , 0.0 dB ext. atten	–70.0	dBm	
–20.0 dB to –7.0 dB | OFF,	Traffic Level	–14.0	dB	
–20.0 dB to –7.0 dB | OFF,	Paging Level	–12.0	dB	
–20.0 dB to –7.0 dB | OFF,	Sync Level	–16.0	dB	
–20.0 dB to –7.0 dB | OFF	Pilot Level	–7.0	dB	

Description of command	FW vers.
This command determines all RF generator levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel, the forward paging channel, the forward sync channel, and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.	V2.53

New Commands

SOURce:RFGenerator:LEVel:CDMA <CDMA_*Power*> RF Level

<CDMA_Power>	Description of command	Def. value	Def. unit	Unit ring.
	CDMA Power for following RF OUT:			
–144.0 dBm to –33.0 dBm |	RF1, 0.0 dB ext. atten.	–70.0	dBm	
–144.0 dBm to –16.0 dBm |	RF2, 0.0 dB ext atten.	–70.0	dBm	
–97.0 dBm to 7.0 dBm	RF3 OUT , 0.0 dB ext. atten	–70.0	dBm	

Description of command	FW vers.
This command determines the RF generator levels of the CMU. This includes the total CDMA output power (absolute value, in dBm). CDMA Power value range depends on the RF input used and the external attenuation set.	V2.53

SOURce:RFGenerator:LEVel:TRAFfic <Traffic_*Level*>				RF Level
<Traffic_Level>	Description of command	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | OFF	Traffic Level	–14.0	dB	
Description of command				FW vers.
This command sets the relative power of the traffic channel.				V2.53

SOURce:RFGenerator:LEVel:PAGing <Paging_Level>				
<Paging_Level>	Description of command	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | OFF	Paging Level	–12.0	dB	
Description of command				FW vers.
This command sets the relative power of the paging channel.				V2.53

SOURce:RFGenerator:LEVel:SYNC <Sync_Level>				
<Sync_Level>	Description of command	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | OFF	Sync Level	–16.0	dB	
Description of command				FW vers.
This command sets the relative power of the sync channel.				V2.53

SOURce:RFGenerator:LEVel:PILot <Pilot_Level>				
<Pilot_Level>	Description of command	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB | OFF	Pilot Level	–7.0	dB	
Description of command				FW vers.
This command sets the relative power of the pilot channel.				V2.53

Test Object NPOWer

Control of measurement – Subsystem NPOWer

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 (only *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.	V2.53
*Note: The **`INITiate:NPOWer`** command is not supported in this release, as parameter changes are not synchronized with the measurement control. Only the measurement form **`READ[:SCALar]:NPOWer?`** should be used.*	

CONFigure:NPOWer:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).				V2.53

FETCh:NPOWer:STATus?				Measurement Status
Return	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
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				FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				V2.53

Subsystem NPOWer:CONTrol

CONFigure:NPOWer:CONTrol *<Statistics>, <Repetition>, <StopCond>, <Stepmode>*			Scope of Measurement	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the ...CONTrol:STATistics and ...CONTrol:REPetition commands, see below.				V2.53

CONFigure:NPOWer:CONTrol:STATistics <*Statistics*>			Statistics Count	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the number of bursts forming a statistics cycle.				V2.53

CONFigure:NPOWer:CONTrol:REPetition Test Cycles
<Repetition>, <StopCond>, <Stepmode>

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
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.*	V2.53

CONFigure:NPOWer:EPOWer *<Expected Power>* Expected Power

<Expected Power>	Description of parameters	Def. value	Def. unit	Unit ring
–34.0 dBm to 53.0 dBm | –48.0 dBm to 39.0 dBm | –71.0 dBm to 0.0 dBm	Expected Power RF1 IN, 0 dB ext. atten. RF2 IN, 0 dB ext. atten. RF4 IN, 0 dB ext. atten.	 –20.0 –20.0 –20.0	 dBm dBm dBm	

Description of command	FW-Vers.
Sets the CMU receiver to the expected mobile transmit power. Expected Power value range depends on the RF input used and the external attenuation set.	V2.53

Measured Values – Subsystem NPOWer

READ[:SCALar]:NPOWer? Scalar results:
Start single shot measurement and return results

Returned values	Value range	Def. value	Def. unit	Unit ring
CurrentAveragePower			dBm	
CurrentMinPower			dBm	
CurrentMaxPower			dBm	
AverageAveragePower			dBm	
AverageMinPower			dBm	
AverageMaxPower			dBm	

Description of command	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.	V2.53

CDMA Mobile Tests (Signalling Mode)

Modified Commands

Pages 6.25 – 6.26: The Subsystem HANDoff commands have been modified to include the band-to-band handoff selections.

Subsystem HANDoff

STATus:HANDoff:TARGet:LIST?			Destination List	
Response	Description of parameters	Def. value	Def. unit	Unit ring
"AMPSMS" | "AMPSMSFallback" | "CDMACellMsInterCell" | "CDMAPCSMsInterCell"	Target for CDMA 800/1900 Target for CDMA 800/1900 Target for CDMA 1900 Target for CDMA 800	–	–	–
Description of command			Sig. State	FW vers.
This command is always a query and returns a list of all networks that are available for a handoff. On registration, the complete (default) target list is replaced by the actual target list depending on the capabilities of the mobile station. ***NOTE:*** *CDMA band-to-band handoff parameters require firmware version 2.53 or higher.*			all	V2.53

CONFigure:HANDoff:TARGet <*Target*>			Destination Selection	
<Target>	Description of parameters	Def. value	Def. unit	Unit ring
"AMPSMS" | "AMPSMSFallback" | "CDMACellMsInterCell" | "CDMAPCSMsInterCell" | NONE	Possible target for CDMA 800/1900 Possible target for CDMA 800/1900 Possible target for CDMA 1900 Possible target for CDMA 800 No handoff	NONE	–	–
Description of command			Sig. State	FW vers.
This command selects a handoff target. The available targets depend on the current network and on the capabilities of the mobile station (see command `STATus:HANDoff:TARGet:LIST?`). The query returns `NONE` unless a destination has been selected. Handoff is initiated via the `PROCedure:SIGNalling:ACTion HANDoff` command. ***NOTE:*** *CDMA band-to-band handoff parameters require firmware version 2.53 or higher.*			TCES Q: all	V2.53

DEFault:HANDoff:SIGNalling <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem HANDoff:SIGNalling 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)*. This command must be sent to the secondary address of the destination CDMA network.			all Q: all	V2.53

New Commands

The following commands have been added to the group Subsystem HANDoff in the Signalling Mode in support of the band-to-band handoff capability.

Subsystem HANDoff

DEFault:HANDoff:LEVel <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem HANDoff:LEVel 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)*. This command must be sent to the secondary address of the destination CDMA network.			all Q: all	V2.53

CONFigure:HANDoff:RFCHannel <*Number*>			RF Channel	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 and 990 to 1023	Number of target RF channel on US Cellular IS-95 network.	283	– –	
0 to 1199	Number of target RF channel on US PCS network.	25		
Description of command			Sig. State	FW vers.
This command determines the handoff target RF channel of the destination network. If used as a query the command returns the channel number. This command must be sent to the secondary address of the destination CDMA network.			all Q: all	V2.53

CONFigure:HANDoff:TCH *<Number>*				Traffic Channel
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 31, 33 to 63	Number of traffic channel	8	–	
Description of command			Sig. State	FW vers.
This command determines the target traffic channel number after handoff on the destination network. This command must be sent to the secondary address of the destination CDMA network.			all: Q: all	V2.53

CONFigure:HANDoff:PNOFfset *<Number>*				PN Offset
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 511	PN offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the timing of the pilot channel on the handoff network. This command must be sent to the secondary address of the destination CDMA network.			all: Q: all	V2.53

CONFigure:HANDoff:FOFFset *<Number>*				Frame Offset
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 15	Frame offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the target traffic channel timing in CDMA frames. This command must be sent to the secondary address of the destination CDMA network.			all: Q: all	V2.53

CONFigure: HANDoff:LEVel RF Level
<CDMA_Power>, <Traffic_Lev>, <Paging_Lev>, <Sync_Lev>, <Pilot_Lev>

Values	Description of parameters	Def. value	Def. unit	Unit ring
	CDMA Power			
–144.0 dBm to –33.0 dBm |	RF1 OUT, 0 dB ext. atten.	–70.0	dBm	
–144.0 dBm to –18.0 dBm |	RF2 OUT, 0 dB ext. atten.	–70.0	dBm	
–97.0 dBm to 7.0 dBm,	RF3 OUT, 0 dB ext. atten	–70.0	dBm	
–20.0 dB to –7.0 dB,	Traffic Level	–14.0	dB	
–20.0 dB to –7.0 dB,	Paging Level	–12.0	dB	
–20.0 dB to –7.0 dB,	Sync Level	–16.0	dB	
–20.0 dB to –7.0 dB	Pilot Level	–7.0	dB	

Description of command	Sig. State	FW vers.
This command determines all RF and channel levels on the destination CDMA network after the handoff has been preformed. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel, the forward paging channel, the forward sync channel, and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set. This command must be sent to the secondary address of the destination CDMA network.	all: Q: all	V2.53

Subsystem BSSignal

CONFigure:BSSignal:SIGNalling:CLDTime <Rel_Timeout>

<Value>	Description of parameters	Def. value	Def. unit	Unit ring
SHORt | LONG	Call lost detect timeout	Short	–	

Description of command	FW vers.
This command sets the effective “call lost” detection time. The **Rel_Timeout** parameter controls how many contiguous bad reverse traffic frames occur before the system determines that the call has been lost. SHORt is approximately 1 second of bad frames, and LONG is approximately 5 seconds of bad frames. This GPIB command has no equivalent front panel setting. This setting is volatile; it will return to the default value upon CMU reset.	V2.53

Test Object OVERVIEW

General Configuration – Subsystem OVERview:MSS

CONFigure:OVERview:MSS:FOFFset <Offset> Sideband suppression frequency offset

Limits	Description of parameter	Def. value	Def. unit	Unit ring
0 kHz to 1600 kHz	Offset for sideband suppression	900	kHz	

Description of command	FW vers.
This command defines the frequency offset on each side of the channel center at which the sideband suppression is measured. Values are entered and returned in kHz.	V2.53

Test Configuration – Subsystem OVERview:MSS:LIMIT

Overview Limits

CONFigure:OVERview:MSS:CAMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue <Carr_Freq>, <Transmit_Time>, <Wavf_Qual>, <Sideband_Lev>

Limits	Description of parameter	Def. value	Def. unit	Unit ring
0.0 Hz to 1000.0 Hz	Upper limit for carrier frequency error	300	Hz	
0.0 µS to 10.0 µS	Upper limit for transmit time error	1.0E-06	S	
0.000 to 1.000	Lower limit for waveform quality	0.944	–	
–150.0 dB to 0.0 dB	Upper limit for sideband suppression	–43.0	dB	

Description of command	FW vers.
This command defines the limits for the overview measurement.	V2.53

Measured Values – Subsystem OVERview:MSS

Scalar results:

READ[:SCALar]:OVERview:MSS? Start single shot measurement and return results

Returned values	Value range	Def. value	Def. unit	Unit ring
Expected MS Power	–144.0 dBm to –33.0 dBm	NAN	dBm	
Measured MS Power	–144.0 dBm to –33.0 dBm	NAN	dBm	
Expected Carrier Frequency	0 to 1000.0 Hz	NAN	Hz	
Carrier Frequency Error	0.0 Hz to 1000.0 Hz	NAN	Hz	
Transmit Time Error	0.0 µS to 10.0 µS	NAN	µS	
Waveform Quality	0.000 to 1.000	NAN	–	
Lower Sideband Suppression	–150.0 dB to 0.0	NAN	dB	
Upper Sideband Suppression	–150.0 dB to 0.0	NAN	dB	

Description of command	FW vers.
This commands is always a query. It starts a measurement and outputs all scalar measurement results.	V2.53

General Configuration – Subsystem OVERview:SSUPpression

CONFigure:OVERview:SSUPpression:FOFFset <Offset> Sideband suppression frequency offset

Limits	Description of parameter	Def. value	Def. unit	Unit ring
0 kHz to 1600 kHz	Offset for sideband suppression	900	kHz	

Description of command	FW vers.
This command defines the frequency offset on each side of the channel center at which the sideband suppression is measured. Values are entered and returned in kHz.	V2.53

Test Configuration – Subsystem OVERview:SSUPpression:LIMIT

Overview Limits

CONFigure:OVERview:SSUPpression:CAMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue <Sideband_Lev>

Limits	Description of parameter	Def. value	Def. unit	Unit ring
–150.0 dB to 0.0 dB	Upper limit for sideband suppression	–43.0	dB	
Description of command				FW vers.
This command defines the limits for the overview measurement.				V2.53

Measured Values – Subsystem OVERview:SSUPpression

Scalar results:

READ[:SCALar]:OVERview:SSUPpression? Start single shot measurement and return results

Returned values	Value range	Def. value	Def. unit	Unit ring
Lower Sideband Suppression Upper Sideband Suppression	–150.0 dB to 0.0 –150.0 dB to 0.0	NAN NAN	dB dB	
Description of command				FW vers.
This commands is always a query. It starts a measurement and outputs all scalar measurement results.				V2.53

Corrections to the Operating Manual

The following remote control commands differ from what is stated in the current operating manual. The page number where you'll find the command in the current operating manual is listed and followed with a brief description of the modification.

Page 6.16 The MS Power is added as a returned value.

READ[:SCALar]:MODulation? Start single shot measurement and return results
FETCh[:SCALar]:MODulation? Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
MS Power, Waveform Quality, Carrier Frequency Error, Transmit Time Error, Carrier Feedthrough, I/Q Imbalance, Meas. out of Tolerance	–144.0 dB to –33.0 dB, 0.0 to +1.0, –10.0 Hz to 0.0 Hz, 0.0 µs to 10.0 µs, –120.0 dB to –20.0 dB, –120.0 dB to –20.0 dB 0% to 100 %	NAN NAN NAN NAN NAN NAN NAN	dBm – Hz µs dB dB %	

Description of command	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see Chapter 4).	V2.50

Page 6.21 The valid signalling states is updated.

CONFigure:BSSignal:SIGNalling:TCH *<Number>* Traffic Channel

<Number>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 31, 33 to 63	Number of traffic channel, CDMA800 Number of traffic channel, CDMA1900	8	– –	

Description of command	Sig. State	FW vers.
This command determines the traffic channel number. The command is valid in the Signal Off, Signal On, Registered states. These commands are not valid in the call established states.	SOFF SON SYNC Q: all	V2.50

Page 6.21 The valid signalling states is updated.

CONFigure:BSSignal:SIGNalling:RFCHannel <*Number*>			RF Channel	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 and 990 to 1023	Number of RF channel, US Cellular IS 95	283	– –	
0 to 1199	Number of RF channel, Japan Cellular IS 95	76		
0 to 1199	Number of RF channel, Japan Cellular T 53	76		
0 to 1000 and 1329 to 2047	Number of RF channel, China Cellular IS 95	79		
0 to 1199	Number of RF channel, US PCS UB-IS-95	25		
0 to 1199	Number of RF channel, US PCS J-STD08	25		
0 to 699	Number of RF channel, Korean PCS UB-IS-95	75		
0 to 699	Number of RF channel, Korean PCS J-STD08	75		
Description of command			Sig. State	FW vers.
This command determines the RF channel number. This command is not valid in the call established states.			SOFF Q: all	V2.50

Page 6.22 The valid signalling states is updated.

CONFigure:BSSignal:SIGNalling:PNOFfset <*Number*>			PN Offset	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +511	PN offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel.			SOFF Q: all	V2.50

Page 6.22 The valid signalling states is updated.

CONFigure:BSSignal:SIGNalling:FOFFset <*Number*>			Frame Offset	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +15	Frame offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the traffic channel timing in CDMA frames. The command valid in the Signal Off, Signal On, Registered states. This command is not valid in the call established states.			SOFF SON SYNC Q: all	V2.50

Page 6.28: The possible value of R089sec for the command (`CONFigure:NETWork:SYSTem:TBReg: <Time>`) is **not** valid.

CONFigure:NETWork:SYSTem:TBReg <*Time*>			Time Based Registration	
<Time>	Description of parameters	Def. value	Def. unit	Unit ring
R012sec | R014sec | R017sec | R020sec | R024sec | R029sec | R034sec | R041sec | R049sec | R058sec | R069sec | R082sec | R097sec | R116sec | OFF	Registration interval in seconds no periodic registration	R012sec	–	
Description of command			Sig. State	FW vers.
This command sets the periodic registration interval.			SOFF SON SYNC Q: all	V2.50

Page 6.39: The default value for the upper limit of the transmit time is corrected.

Overview Limits

CONFigure:OVERview:MODulation:CAMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue <*Carr_Freq*>, <*Transmit_Time*>, <*Wavef_Qual*>

Limits	Description of parameters	Def. value	Def. unit	Unit ring
0.0 Hz to +1000.0 Hz, 0.0 µs to 10.0 µs, 0.0000 to 1.000	Upper limit for carrier frequency error Upper limit for transmit time error Lower limit for waveform quality	+300 1.0E–06 0.944	Hz s –	
Description of command				FW vers.
This commands defines the limits for the overview measurement.				V2.50

Page 6.64: The returned values for the command (`READ[SCALar]:POWer:GOUTput?`) includes the Bursts Out of Tolerance.

Scalar results:

READ[:SCALar]:POWer:GOUTput? Start single shot measurement and return results
FETCh[:SCALar]:POWer:GOUTput? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:GOUTput? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Mean Output, Limit Lines Matching Bursts Out of Tolerance	0.0 dBm to +100.0 dBm MATC | NMAT | INV | OUT 0% to 100%	NAN INV NAN	dBm – %	
Description of command				FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.				V2.50

Contents

1 Setup

Before proceeding to perform any of the steps described in this manual, please make sure that the instrument is properly connected and put into operation according to the instructions given in chapter 1 of the CMU Operating manual. The hardware and software options available are shown in the *Startup* menu. The Hardware Option entry "CMU-B81" indicates the status of the hardware option required for CDMA (Code Division Multiple Access) mobile tests. The Software Options entry CMU-K81 (CDMA800-MS) and/or CMU-K82 PCS (CDMA1900-MS) indicates the status of the software option required for CDMA mobile tests.

- If *available* is indicated, the CMU is ready to perform GSM 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.
- If *not available* is indicated, the software must be installed via the PCMCIA interface or the floppy disk drive.

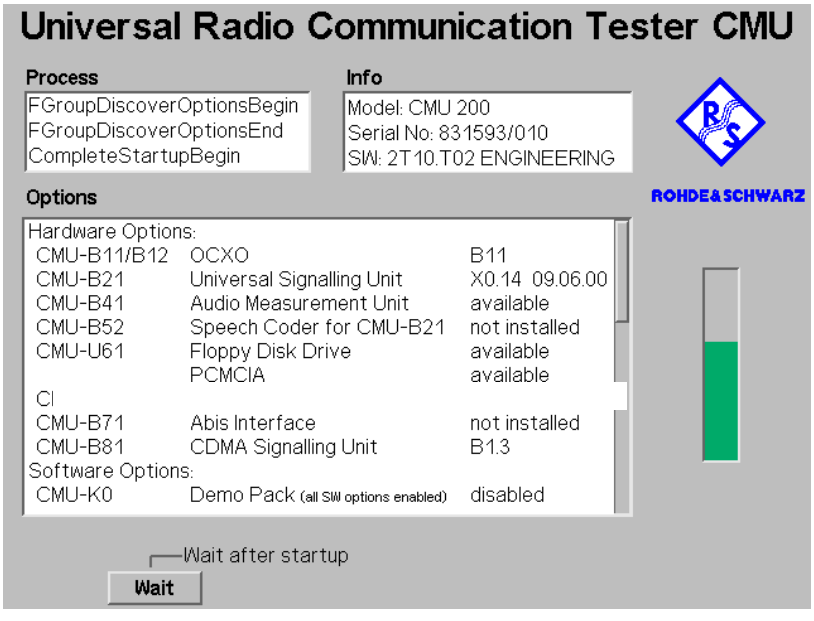


Figure 1-1: Setup – Options menu

Table 1-1 lists the CDMA networks supported (and the standard) when the hardware and software options are installed to support CDMA functionality.

Table 1-1: CDMA Networks Supported

Network	Standard
US Cellular	IS 95
US PCS	UB IS 95 or J-STD008
Japan Cellular	IS 95 or T53
China Cellular	IS 95
Korea PCS	UB IS 95 or J-STD008

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.*

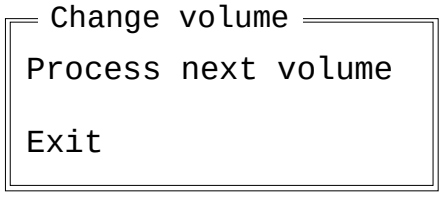
To install the software proceed as follows:

- 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. To this end the *VersionManager* is called up.

- Use the softkeys on the left side of the display to select the item *Install new software version.*
- If more than one version or more than one installation medium is available, use the softkeys again to select the desired version/installation medium.

The installation is started. To indicate that the flash disk 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.

To monitor the installation process the CMU displays messages such as:

```
...Volume # 1 has been processed
...Volume # 2 to be installed next
```

After processing the last floppy disk the CMU displays the messages:

```
...Installation completed
...please remove the installation media to reboot
...press any key to continue
```

- Remove the disk and press any key to reboot the CMU.

The CMU reboots and performs a firmware update of the hardware modules. This may take a few minutes. Afterwards the new software version is started and the instrument is ready to operate.

For more information on software installation refer to chapter 4 of your CMU service manual instrument.

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 a CDMA mobile station. It is intended to provide a quick overview of the function groups *CDMA Non-Signalling* and *Signalling* and their functionality. The tests and screen shots provided are based on the *USCell IS95* 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 contains information on customizing the instrument and display according to your personal preferences. For instructions about activating the CDMA option, refer to Chapter 1 of this manual.

The procedures in this chapter include:

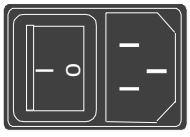
- Analyzer/Generator operation in *Non-Signalling* mode,
- Connection of the phone and selection of signalling parameters
- Power and modulation measurements in *Signalling* mode.

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 CDMA background information) are discussed in Chapter 4.

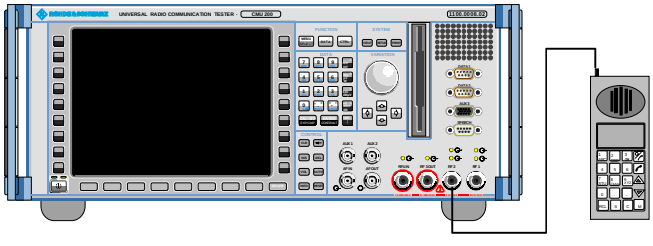
Connecting a Mobile Phone

This chapter describes how to use the CMU to perform CDMA mobile phone 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 CDMA 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 antenna connector of the mobile phone (operating in the CDMA cellular network).
- Supply the mobile phone with the correct operating voltage (battery or power supply).
- Turn the mobile phone on.

The sample screens were obtained with the CMU set to the *CDMA Cellular MS* Function Group.

Additional Information...

Alternative Settings and Measurements

... 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.

O*peration:*

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

☞ Chapter 1 of the CMU operating manual

... on Step 2

RF connection of the mobile phone

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

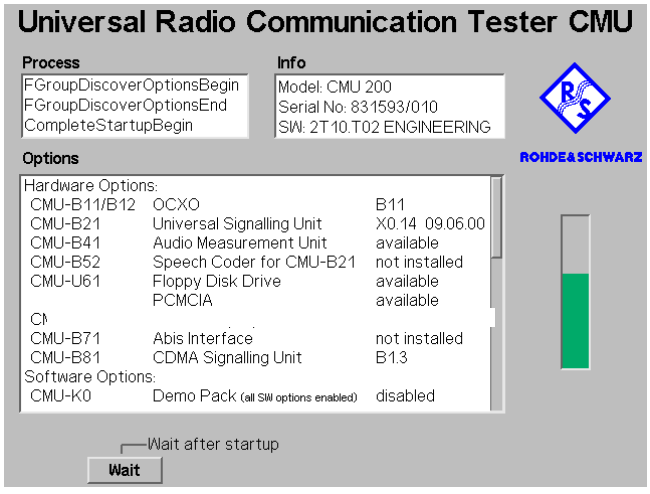
Input and output connectors can be selected in the *Ext.Att*. tab of the *Connect. Control* menu.

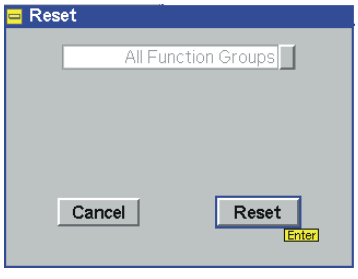
Ensure that the attenuation of any antenna coupler and/or cables used is being taken into account by the CMU. During the test the mobile receiver is being tested with very low RF signal levels, and even a small attenuation can cause the CMU to show a fail indication.

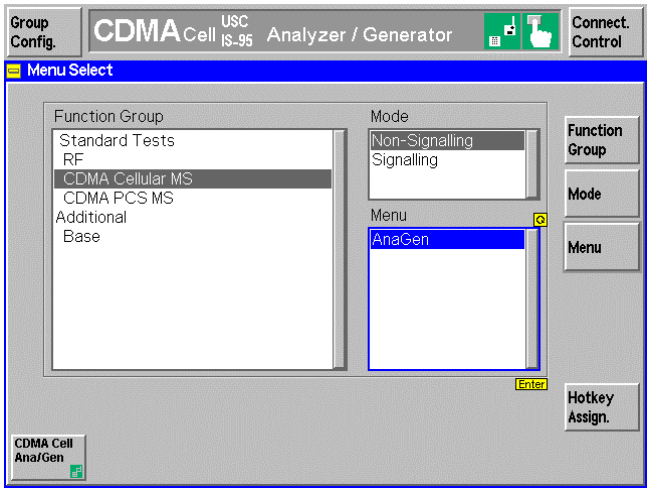
An external signal from a real network may interfere with the signal sent from the CMU to the mobile The tests should ideally be performed in a shielded room, however, if this is not possible, the channel(s) used for the test should be changed. If different results are obtained on neighboring channels,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

The unidirectional connectors RF4 IN and RF3 OUT are intended for connecting modules requiring high input levels or modules with low RF output levels. RF4 IN and RF3 OUT can also be used to connect CDMA mobiles off the air via antennas.







Step 3

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

The startup menu displays while the CMU performs the power-up tests.

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.

➢ Use the left and right arrow keys to toggle between Cancel and Reset.

➢ Select *Reset* and press the *ENTER* key.

➢ Select *Yes* in the confirmation popup window to confirm the instrument reset.

The CMU indicates that it performs a general reset of all device settings.

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.

➢ Select the *CDMA Cellular MS* function group.

➢ Select the *Non-Signalling* test mode.

➢ Select the *Ana/Gen* (Analyzer/Generator) menu.

➢ Press the *Enter* key to open the *Analyzer/Generator* menu.

Additional Information...

Alternative Settings and Measurements

... 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.

☞ Chapter 4 of CMU operating manual

Chapter 4 also contains information on customizing the CMU.

... on Step 4

The CMU performs a general reset of all device settings and is ready to carry out the following steps. The *Reset* popup menu closes automatically.

... on Step 5

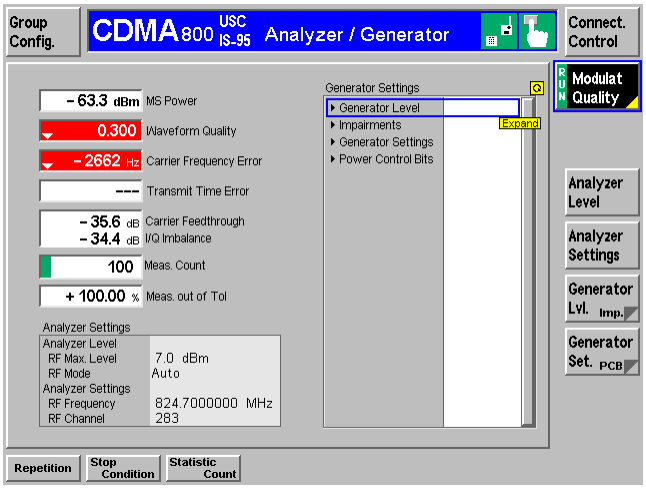
Menu Select menu

The *Menu Select* menu shows all function groups installed and enabled on the CMU. The Function Group *CDMA Cellular MS* is subdivided in the two measurement modes *Non-Signalling* and *Signalling*, each containing measurement menus.

☞ Chapter 3

Non-Signalling Mode

In the *Non-Signalling* mode, a specific RF signal can be generated and an RF signal with CDMA characteristics analyzed. Without signalling, the measurements are restricted to the specified channel but without frequency restrictions.



Step 1

The *Analyzer/Generator* menu configures the signals generated by the RF generator of the CMU and sets the RF analyzer.

After Reset, all parameters are set to their default values. They can be changed directly in the *Analyzer/Generator* menu. User-defined parameters are saved for later sessions when the CMU is switched off.

The current measurement results for power, and modulation of the received signal are displayed. Output fields displaying "---" indicates that no valid measurement results are available.

- Press the *Generator Lvl.* Softkey to display the Generator Level hotkeys.
- Press the *Gen. Control* hotkey.
- Press the *ON/OFF* key to switch on the generator.
- Press the *Modulation Quality* softkey to start the modulation measurements.

Additional Information...

... on Step 1

Analyzer/Generator menu

The *Analyzer/Generator* menu contains three panels of information:

- Measurement results
- Analyzer Settings
- Generator Settings

The status of the *Modulation* measurement and of the RF Generator is included in the corresponding softkey/hotkey. 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.

Alternative Settings and Measurements

☞ Chapter 4

The section *CDMA Module Tests* in 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*.

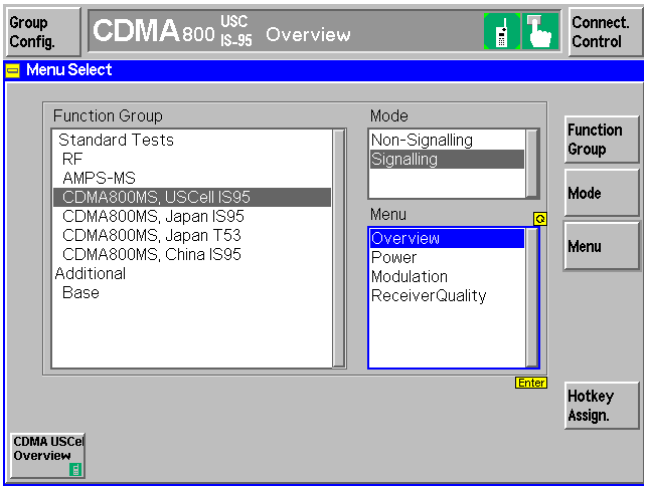
Signalling Mode

In the Signalling mode the CMU transmits a pilot, sync, and paging channel signal to which the mobile is able to synchronize. A call can then be established from either the CMU or the mobile.

Call Setup and Signalling Parameters

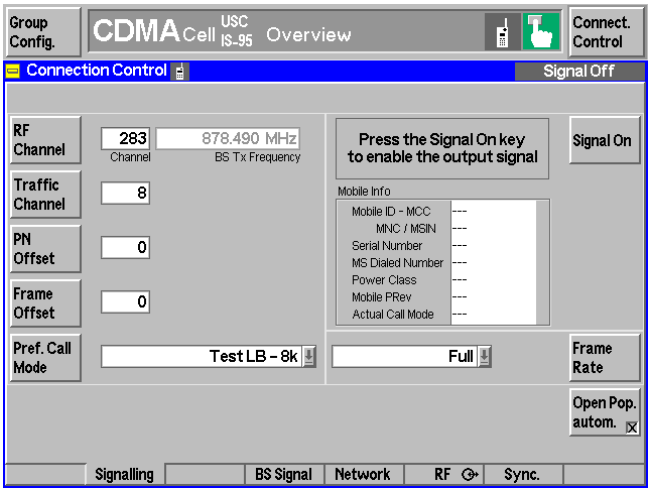
The signalling processes and configurations are controlled via the *Connection Control* popup menu. The *Connection Control* popup menu is automatically displayed when the *Signalling* Mode is selected.

MENU SELECT



Step 1

- Press the *Menu Select* key to open the *Menu Select* menu again.
- Select the *Signalling* test mode.
- Select the *Overview* menu.
- Press the *Enter* key to activate the measurement.



Step 2

- Press the *Connect. Control* softkey to display the *Connection Control* menu (if not already displayed).
- Press the *Signalling* tab to display the *Signalling* page.

In the *Signal Off State*, the *Signalling* page indicates the most important parameters characterizing the signals generated by the CMU. These parameters can be set directly using the softkeys.

The *Mobile Info* display area is empty since a mobile station has not registered with the CMU.

Additional Information...

Alternative Settings and Measurements

... on Step 1

Since making measurements requires a connection to a mobile station, the CMU immediately displays the *Connection Control* screen when selecting the CDMA Signaling Mode.

The immediate display of the connection control screen can be disabled by deselecting *Open Pop. autom.* in the *Signalling* tab of the *Connection Control* menu.

... on Step 2

Connection Control is divided into pages accessed by the tabs at the bottom of the screen.

The tabbed pages provide access to all signalling parameters. Typically the default settings allow a call to be established. The Connection Control parameter settings are global settings. Individual measurement settings override these global parameters.

Signalling

The *Signalling* tab displays the most important parameters characterizing the signals generated by the CMU. These parameters can be set directly using the softkeys.

☞ Chapter 4.

BS Signal

The *BS Signal* tab displays the configuration settings to simulate a base station. From the *BS Signal* tab you can access the parameters set in the *Signalling* tab. In addition you can set the CDMA Levels and Handoff Parameters.

☞ Chapter 4.

Network

The network identity and other parameters characterizing the network are configured in the *Network* tab.

☞ Chapter 4.

RF ⊶

Input/output connectors suitable for the type of measurements and signal levels must be chosen. An external input/output attenuation value can be specified in order to compensate for known attenuation of the input/output signal like those caused by cables.

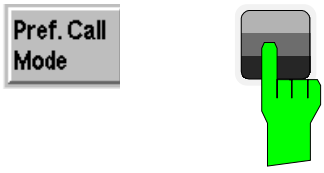
☞ Chapter 4.

Input/output connectors and external attenuation are configured in the RF ⊶ index card.

Sync.

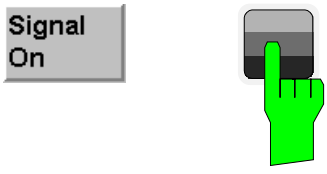
The Sync. tab defines the reference frequency and sync signal used by the CMU.

☞ Chapter 4.



Step 3

- Press the *Pref. Call Mode* softkey and set the mode to *Test LB – 8k*.

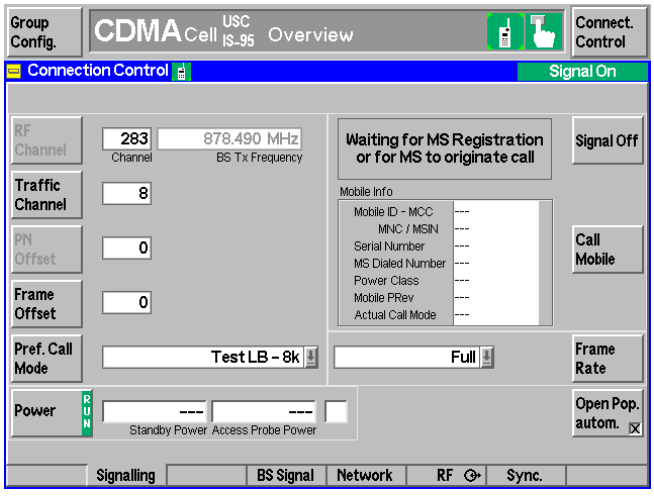


Step 4

- Press the *Signal On* softkey.
- Wait for the mobile station to register with the CMU.

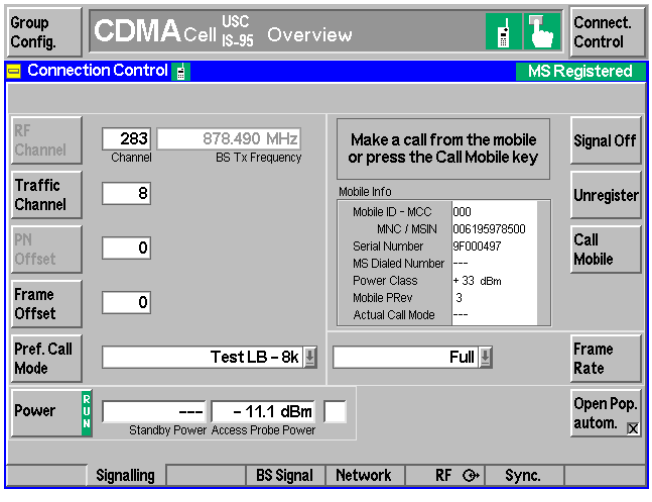
After pressing the *Signal On* softkey, the CMU goes to the Signal On state (Unregistered) and waits for the mobile station to register.

The *Power* softkey shows the current status of the power measurement. At present, the power measurement is switched on, however, no signal is received because the mobile phone has not registered with the CMU yet.



After the mobile station registers with the CMU, the CMU goes to the MS Registered State.

The *Mobile Info* area now contains the important parameters characterizing the mobile station. The *Power* measurement displays the *Standby Power* and *Access Probe Power* of the mobile station.



Additional Information...

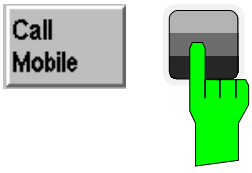
Alternative Settings and Measurements

... on Step 3

All CDMA measurements are performed in the test loopback mode.

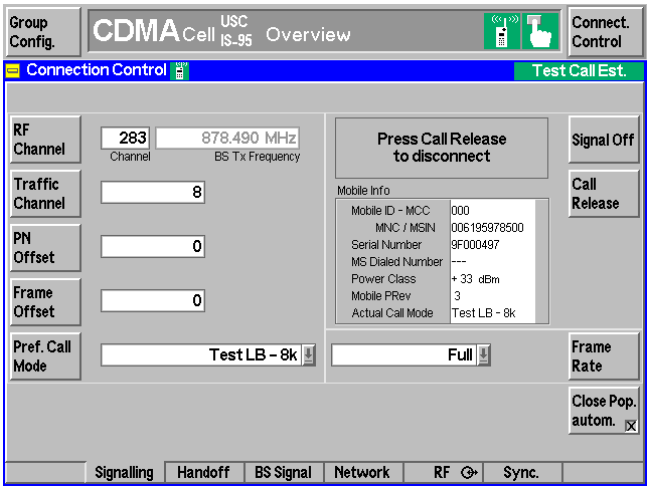
... on Step 4

A number of subsequent messages indicate that the mobile synchronizes with the CMU and performs a location update. The *Signalling Info* box displays the mobile ID, power class, and the actual call mode established.



Step 5

➢ Press the *Call Mobile* softkey.

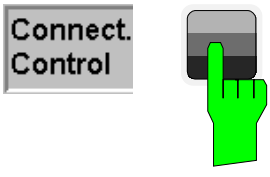


The *Test Call Est.* screen is displayed when the call is established.

The CMU is now registered with the mobile phone and a call has been established in the loopback test mode.

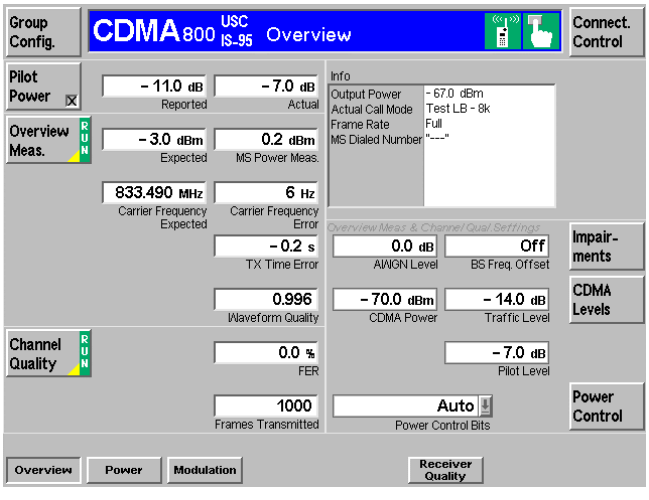
The *Mobile Info* table now displays the basic properties of the mobile station.

With a test call established, power, modulation, and receiver quality measurements can be performed.



Step 6

➢ Press the *Connect. Control* softkey (or the *Escape* key).



The *Connection Control* menu closes and the CMU displays the *Overview* menu.

The *Overview* menu provides access to some of the main results of the power, modulation, and receiver quality measurements.

The *Pilot Power* displays the pilot power reported from the mobile station and the actual pilot power sent by the CMU. Select the *Pilot Power* softkey and place an X in the box to activate the report. The *Actual* field is the Pilot Level value entered with the *CDMA Levels* softkey.

The *Overview* and *Channel Quality* softkeys start the Receiver Quality measurement. These measurements can be run simultaneously or independently.

Additional Information...

Alternative Settings and Measurements

... on Step 5

Mobile Info

The *Mobile Info* list shows the basic properties of the connected mobile station. These values represent the information transmitted by the mobile station to the CMU.

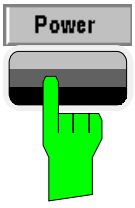
... on Step 6

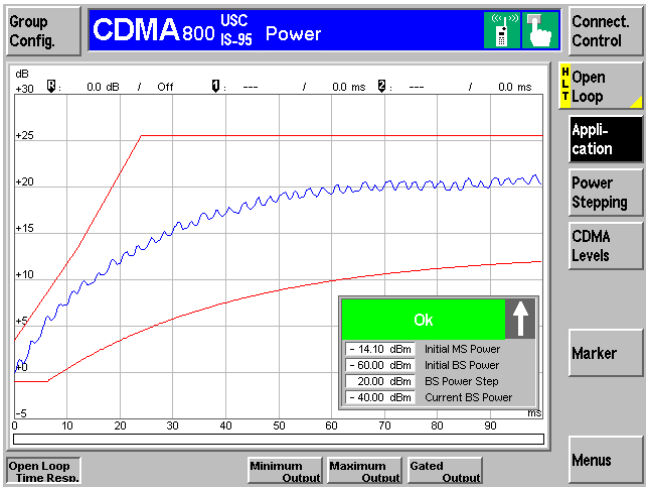
Closing the Connection Control screen returns the CMU to the last measurement menu accessed. In this case the CMU returns to the Overview menu by default since no measurement menu has been displayed.

Pressing the Overview Meas. or Channel Quality softkey twice opens the configuration menu for the Overview measurements.

Power Measurements

The Power measurement menu provides information about the mobile station's power levels and performance. The CMU provides four applications to measure and display power measurements. In this signalling example, only the *Gated Output* application is selected.

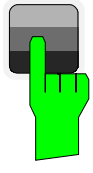


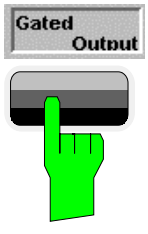


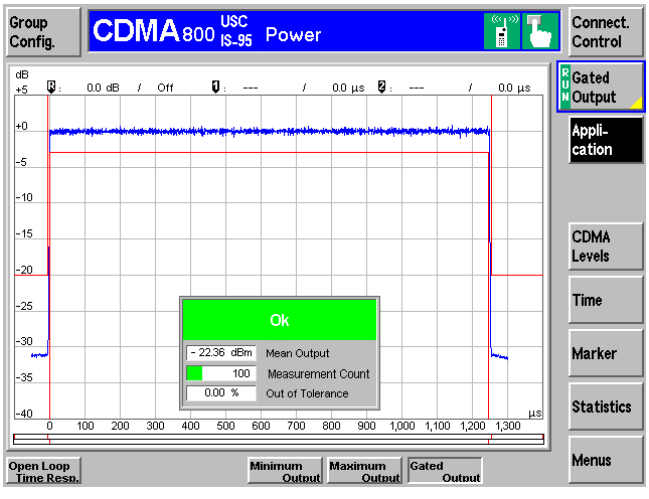
Step 1

➢ Press the *Power* hotkey to switch to the Power measurement applications.

The last power application accessed is displayed. In this example, the Open Loop application is displayed.







Step 2

➢ Press the *Application* softkey. The available power applications are displayed in the hotkey bar.

➢ Press the *Gated Output* hotkey to change to the *Gated Output* application.

The *Gated Output* power application shows the gated output power as a function of time.

A tolerance template (specified in the TIA/EIA-98 standard) is displayed. The settings (default at this time) and scalar results are displayed in the parameter line above the diagram and in a message box positioned in the diagram area.

Additional Information...

Alternative Settings and Measurements

... on Step 1

The menu group *Power* contains the functions to measure the received signal power. The *Power Configuration* popup menu configures all power measurements.

Softkeys and hotkeys

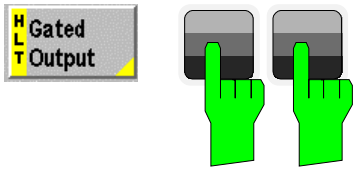
To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed across the hotkey bar below the diagram when the softkey is selected.

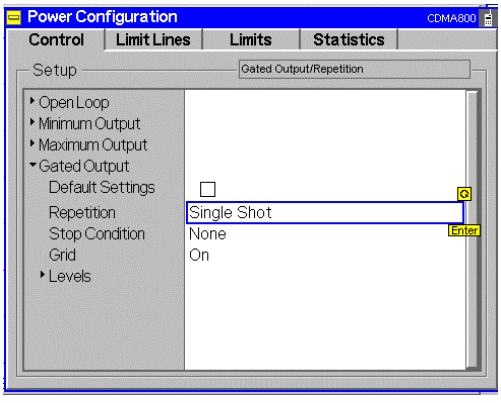
... on Step 2

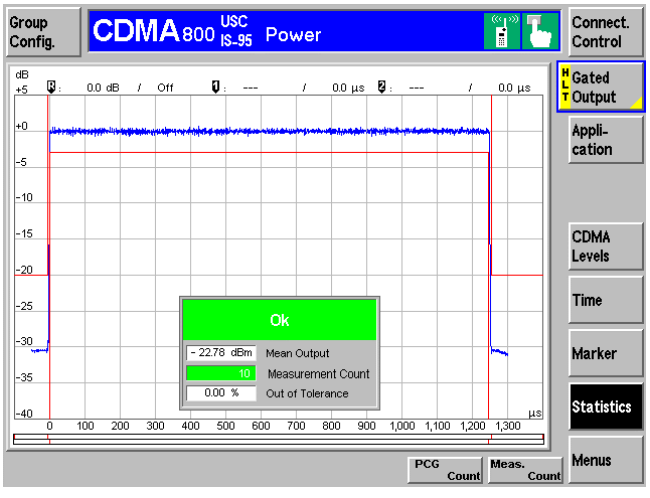
There are four power applications (in the hotkey bar).

- *Open Loop Time Response* measures the open loop power control time response to a step change in the forward channel power.
- *Minimum Output* measures the mobile station's minimum output power.
- *Maximum Output* measures the mobile station's maximum output power.
- *Gated Output* displays the time response of the mean output power for isolated gated-on power control groups.

☞ Chapter 4.







Step 3

- Press the measurement softkey twice to open the *Power Configuration* menu. In this example, the measurement softkey is labeled *Gated Output*.

The *Power Configuration* menu defines each of the power measurement applications. In this example, we will adjust a parameter of the *Gated Output* application.

- Press the *Control* hotkey to display the *Control* tab.
- Scroll down to view the *Gated Output* parameters.
- Press the *EXP/CMP* key to expand the menu table.
- Scroll to the *Repetition* parameter, press *Enter*, and set it to *Single Shot*.
- Press the *ESCAPE* key to close the *Power Configuration* menu and return to the main menu.

The power measurement is stopped after one statistic cycle. The status indication next to the *Gated Power* softkey is set to *HLT*.

Additional Information...

... on Step 3

Repetition mode

Repetition determines the repetition mode of the measurement (single shot or continuous).

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics.*

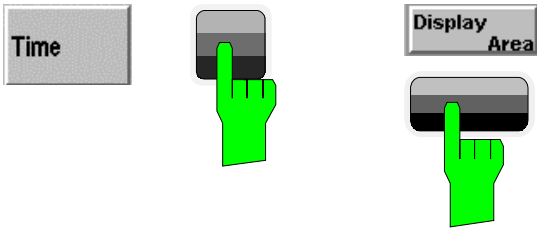
Continuous: The CMU continues the measurement until it is terminated explicitly or until the stop condition is met.

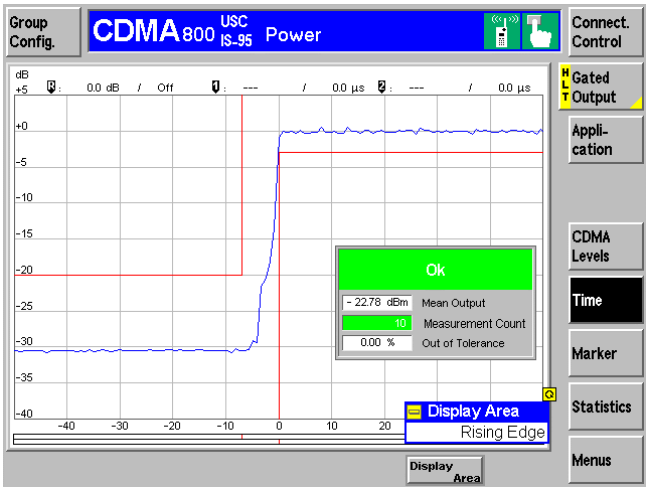
The Stop Condition setting can affect the Single Shot and Continuous repetition modes.

Alternative Settings and Measurements

Settings made in the *Power Configuration* menu apply only to the power measurements.

Settings made in the *Group Configuration* and *Connection Control* menus apply to the entire CDMA function group. Individual measurements settings override these settings.

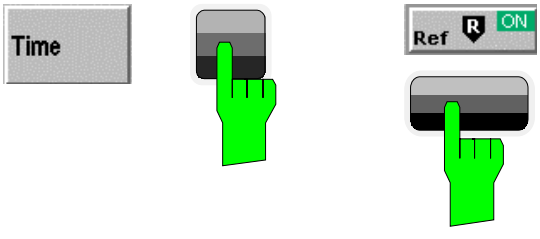


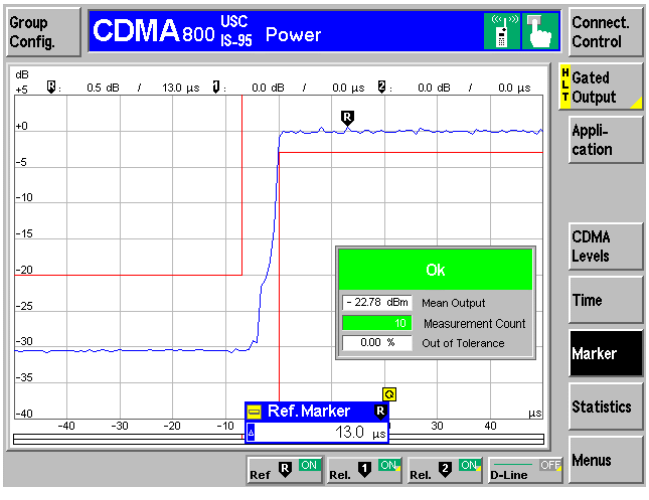


Step 4

- Press the *Time* softkey.
- Press the *Disp. Area* hotkey to display the popup window of zoom areas.
- Select *Rising Edge*.

The CMU zooms in on the front (rising) edge of the displayed trace.





Step 5

- Press the *Marker* softkey.
- Press the *Ref R* hotkey and enter a value to position the reference marker onto the trace.

The reference marker is positioned on the trace and the coordinates are displayed in the parameter line.

Additional Information...

Alternative Settings and Measurements

... on Step 4

Softkeys and hotkeys

To enlarge the diagram area of the graphical measurement menus, the left softkey column is suppressed. The functionality of each softkey on the right side is extended by hotkeys. These hotkeys are displayed in the hotkey bar below the diagram when the softkey is selected.

Configuration settings

Some of the softkey/hotkey combinations offer settings that can also be accessed via configuration menus. For example, the settings offered by the *CDMA Levels* softkey (for Gated Output) is equivalent to *Levels* in the *Control* tab (for Gated Output) of the *Power Configuration* menu. Identical settings overwrite each other.

Each measurement group and each application (within the group) stores its own configuration settings. For example, the Pilot Level setting for the Gated Output application is separate from the Pilot Level setting for the Open Loop time Resp. application.

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The *Application* softkey switches between the applications of the Power measurement.

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

The *Time* softkey defines the zoom area.

The *Marker* softkey sets markers and a D-line. (A D-line is used to mark levels and a reference point for markers.)

The *Statistics* softkey sets the number of measurement intervals per statistic cycle.

... on Step 5

Markers

Markers are a graphical tool used to locate points on a trace and read out their coordinates. A reference marker and two delta markers may be defined in the *Power* menu.

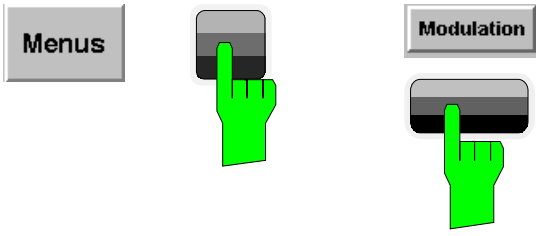
The reference marker measures the absolute level of the trace. The delta markers either measure the distance between their position and the reference marker (relative mode) or the absolute level (absolute mode).

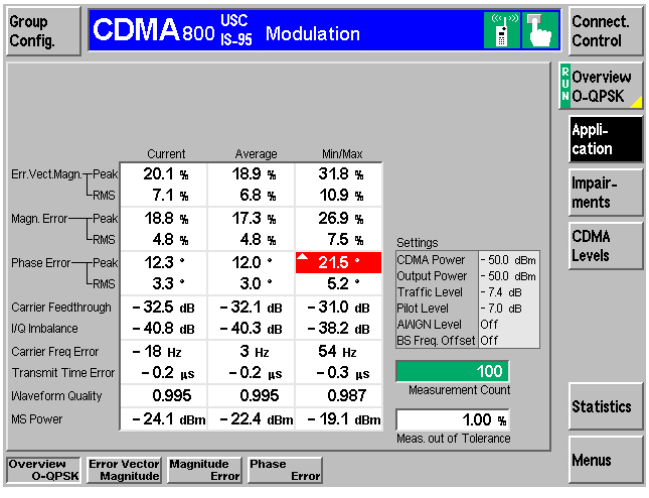
☞ Chapter 4.

In addition to markers, a D-line can be used to measure a particular level in the diagram and used as a reference point for markers.

Modulation Measurements

We can use the hotkey bar to switch over to the Modulation measurement.



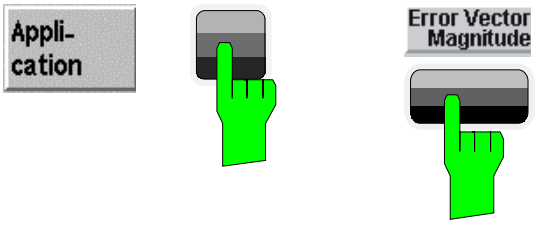


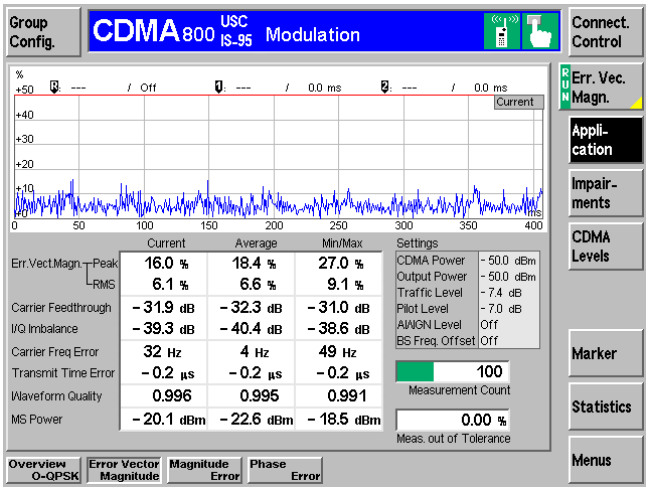
Step 1

- Press the *Menus* softkey to display the measurement groups in the hotkey bar.
- Press the *Modulation* hotkey to switch to the *Modulation* measurements.

The *Modulation - Overview* menu displays the main results of the Modulation measurement.

If a result exceeds the tolerances, the corresponding output field is red and an arrow pointing upwards or downwards indicates that the result is above or below the limit.





Step 2

- Press the *Application* hotkey to display the available Modulation applications in the hotkey bar.
- Press the *Error Vector Magnitude* hotkey to change to the application.

The *Modulation – Error Vector Magnitude* menu displays a graph of the *Error Vector Magnitude* as percentage vs. time.

The output fields below the graph correspond to the ones shown in the Overview application. Since we are viewing the *Error Vector Magnitude* application, the *Magnitude Error* and *Phase Error* are not shown.

Additional Information...

Alternative Settings and Measurements

... on Step 1

Statistical quantities

The table in the *Overview* menu reports peak and RMS-averaged values of quantities characterizing the errors of the modulation vector. In addition, the scalar modulation results *Carrier Feedthrough, I/Q Imbalance,* Carrier *Frequency Error*, *Transmission Time Error*, *Waveform Quality*, and *MS Power* are indicated.

The values in the three columns of the table are calculated as follows:

- The *Current* column contains the results for the current measurement.
- The *Average* column contains the current results averaged over the last statistic cycle.
- The *Max./Min.* column contains the extreme values of the current results for all measurements.

... on Step 2

Applications

Applications are different measurements belonging to the same measurement group. Each application is assigned its own set of configuration parameters allowing configuration of each application individually.

The *Modulation* menu comprises the four applications *Overview O-QPSK*, *Error Vector Magnitude*, *Magnitude Error*, and *Phase Error*.

Measured values and limits

The limits may be modified in the *Limits* tab of the *Modulation Configuration* menu which is opened by pressing the measurement softkey twice. The *Modulation Configuration* menu is similar to the *Power Configuration* menu explained on the previous pages.

The absolute values are given for modulation measurements. This is why the display modes Minimum and Maximum can not be selected separately. The CMU displays the extreme values with the correct sign.

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The measurement principle for phase and frequency errors is explained at the beginning of section *Modulation Measurement Menu.*

Contents

3 Manual Control

This chapter gives a brief overview of the operating concept and structure of the user interface for CDMA mobile phone 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 200 Operating manual.

Menu Structure

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

- The two function groups *CDMA Cellular* and *CDMA PCS MS*
- The two tests modes *Signalling* and *Non-Signalling* provided for each function group
- General configurations (Group Configuration, Connection Control), measurement groups (Analyzer/ Generator, Overview, Power, Modulation, Receiver Quality), and configurations specific to these measurement groups (Power Configuration, Modulation Configuration, Receiver Quality Configuration).

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

CDMA measurements are performed in one of the two modes *Signalling* or *Non-signalling*. The *Non-Signalling* mode is typically used for module tests or test of mobiles in a special "test mode". The *Signalling* mode measures the mobile phone performance under realistic operating conditions where the CMU mimics a CDMA base transceiver station.

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

Non-Signalling Mode

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

Signalling Mode

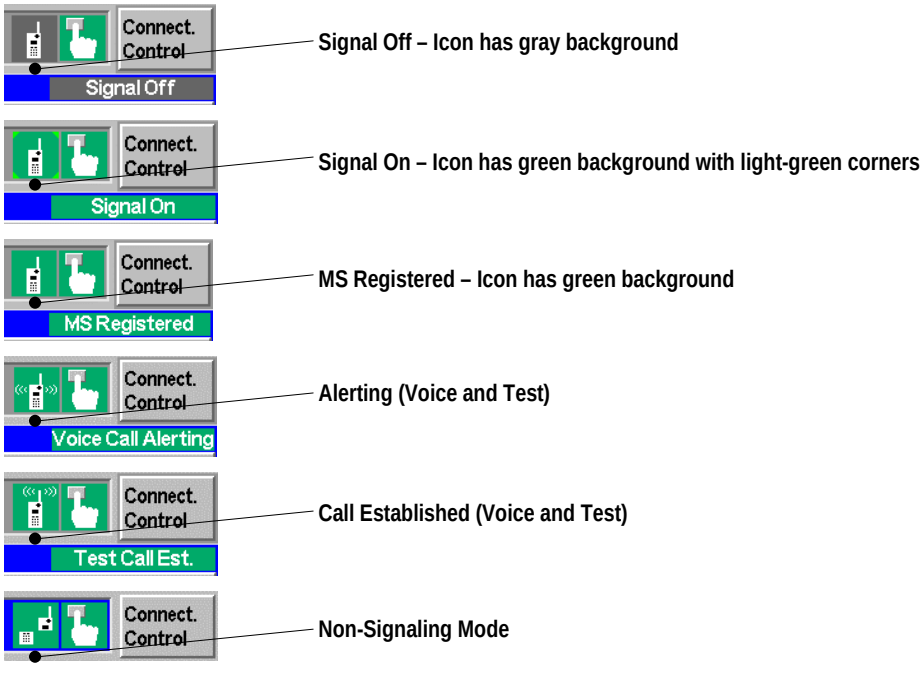
In the *Signalling* mode, the CMU first transmits a signal consisting of a pilot, sync, and paging channel. In subsequent steps, the mobile synchronizes to the channels, decodes the information transmitted, and performs a location update so that a call can be established from either the mobile or the CMU.

The signalling mode measures the mobile phone performance under realistic operating conditions where the CMU mimics a CDMA base transceiver station. The CMU is able to configure a broad range of network parameters and to determine the parameters characterizing the mobile. Measurements of the power versus time, modulation parameters, and receiver quality can be performed.

Symbols for Signalling Mode and State

The signalling mode and state is indicated to the left of the operating mode in each main menu and measurement menu.

The following icons (phone) represent each signalling mode and state:



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 *(Group Configuration, Connection Control)* or to a particular measurement.

Group Configuration

The *Group Config.* softkey is located on the left side of the title bar of each main and measurement menu. It opens a popup menu with tabs configuring the AWGN Bandwidth and Network/Standard.

All settings made in the *Group Config.* menu apply to the whole function group. Some are overwritten, if required for a particular measurement, using the softkeys and hotkeys offered in the measurement menus.

Connection Control

The *Connect. 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:

Non-Signalling mode:

- Signals generated and analyzed by the instrument
- RF connectors to be used and the external attenuation
- Reference frequency

Signalling mode:

- Actions changing the CMU's signalling state
- RF connectors to be used and the external attenuation
- A call or a handoff to another network
- Parameters of the network and the mobile station under test
- Base station parameters

All settings made in the *Connect. Control* menu apply to the whole function group.

Configurations of measurements

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

The repetition mode and stop condition for the measurement tolerances for the measured quantities, statistic count and display mode.

These settings are explained in more detail section General Settings on page 3.5).

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 200 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 (scalar) values and parameters are displayed in output fields, lists and tables.
- Traces are displayed in a Cartesian coordinate system (time forming the x-axis scale).

While the measurement is running, the indicated results are constantly updated. As shown in the table below, the measurement groups depend on the signalling mode.

Table 3-1 Measurement Groups in the Signalling and Non-Signalling Mode

Non-signalling	Signalling
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.	**Overview** Shows the settings for the traffic channel and speech mode and presents an overview of the basic scalar power and modulation results. The receiver parameters and various signalling parameters reported by the mobile station are displayed.
	Power The open loop time response and gated output are shown as a trace plotted over time. Single points of the trace may be evaluated by means of graphical tools (markers and display line). The power output (minimum and maximum) of the mobile station is measured.
	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.
	Receiver Quality Shows the settings and results of the frame error rate test reported by the mobile station.

General Settings

A number of settings can be made in several of the configuration menus assigned to the measurement groups *Power*, *Modulation* and *Receiver Quality*. In combination, these settings define the scope of the measurement, i.e. the number of bursts measured and the results displayed. The following brief overview is intended to avoid confusion of terms.

Application

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

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

Statistic Count

The *statistic count* is set in the *Statistics* tab of the configuration popup-menus assigned to the measurement groups.

The statistic count is equal to the integer number of waveform intervals which forms one measurement cycle. Together with the *stop condition,* the *repetition mode* determines when exactly the measurement is stopped.

Repetition Mode

The *repetition mode* is set in the *Control* tab of the configuration popup-menus assigned to the three measurement groups *Power*, *Modulation*, and *Receiver Quality.*

The *repetition mode* defines how many waveform intervals 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 statistic count.

Continuous The measurement is continued until explicitly terminated by the user.

Stop Condition

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

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

Halt on Error 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.

Display Mode

The *display mode* is set in the *Statistics* tab of the configuration popup-menus assigned to the two measurement groups *Power* and *Modulation.*

In the graphical measurement diagrams, the display mode defines which of the measured and calculated traces is displayed.

Traces are calculated from a set of test points with fixed abscissa values. These values are equidistantly distributed along the time axis.

Current	The current values are displayed.
Minimum	At each test point, the minimum measured value is displayed.
Maximum	At each test point, the maximum measured is displayed.
Minimum/ Maximum	At each test point, the extreme measured value is displayed, i.e. the maximum or minimum, whichever has a larger absolute value.
Average	At each test point, the arithmetic mean value of the last x number of waveform intervals is displayed where x is the number of waveform intervals forming one statistic count (the statistics window continuously moves in time).

Calculation of statistical quantities

The statistical functions *Average, Minimum, Maximum* and *Minimum/Maximum* are applied to a set of test points.

The result of a statistical operation depends on the parameter range considered. Following are some examples of statistical quantities.

1. In the *Power* menu, the quantity *Average Power* denotes the average power of the current power control groups.

2. In the *Modulation* menu the quantity *Frequency Error* is first calculated for the current waveform interval and entered in the *Current* column of the output table. The results in the *Minimum/Maximum* (*Average)* column correspond to the extreme value (the RMS value) of the *Current* results calculated over all measured waveform intervals.

Contents

4 Functions and their Applications

This chapter explains in detail all functions for the measurement of mobile stations supporting the CDMA standard. The CMU 200 with Option K81 (MS 800) or K82 (PCS) supports the Networks listed in Table 4-1.

Table 4-1: CDMA Networks and Standards Supported

Network	Standard
US Cellular	IS 95
US PCS	UB IS 95 or J-STD008
Japan Cellular	IS 95 or T53
China Cellular	IS 95
Korea PCS	UB IS 95 or J-STD008

The sample displays in this manual are related to the US Cellular Function Group.

The chapter is divided in two sections corresponding to the two function groups for module tests *(Non-Signalling)* and for mobile tests *(Signalling*). Within the two sections, the discussion is structured according to the provided measurements and configurations.

The description of each softkey, select or input field is followed by the corresponding remote-control commands.

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 principle:

Softkey Short function definition

Designation of select/input field Definition of field function.

Further description of the field: purpose, interaction with other settings, notes...

Parameter 1 Description of parameter 1

Parameter 2 Description of parameter 2

Further description of the parameters: purpose, interaction with other settings, notes...

Remote control `Remote-control command (long form) Parameter1 | Parameter2 ...`

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 CMU 200 Operating manual.*

CDMA Module Tests (Non-Signalling Mode)

The structure of this section is based on the configuration and measurement groups defined in the function group *CDMA Cellular MS, Non-Signalling* mode. The menus are dealt with in their order of operation:

1. General settings (Analyzer/Generator) and display of generator signals
2. Measurement menu (*Modulation*): performance of the measurements, output of measurement results, measurement configurations
3. Global configurations *(Group Configuration, Connection Control)*

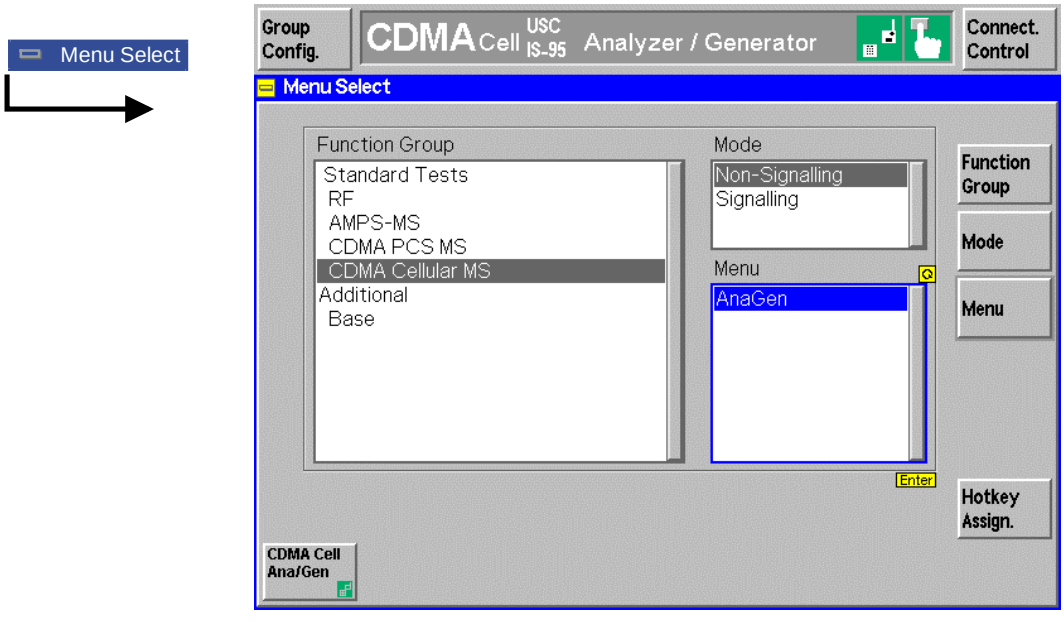


Figure 4-1: Non-Signalling Menu

Analyzer/Generator Measurement Menu

The *Analyzer/Generator* menu configures the signals of the RF generator and analyzer. At the same time, it controls the *Modulation* measurement and displays the current results.

The main menu *Analyzer/Generator* is opened from the main menu *Menu Select* (with associated key at the front of the instrument).

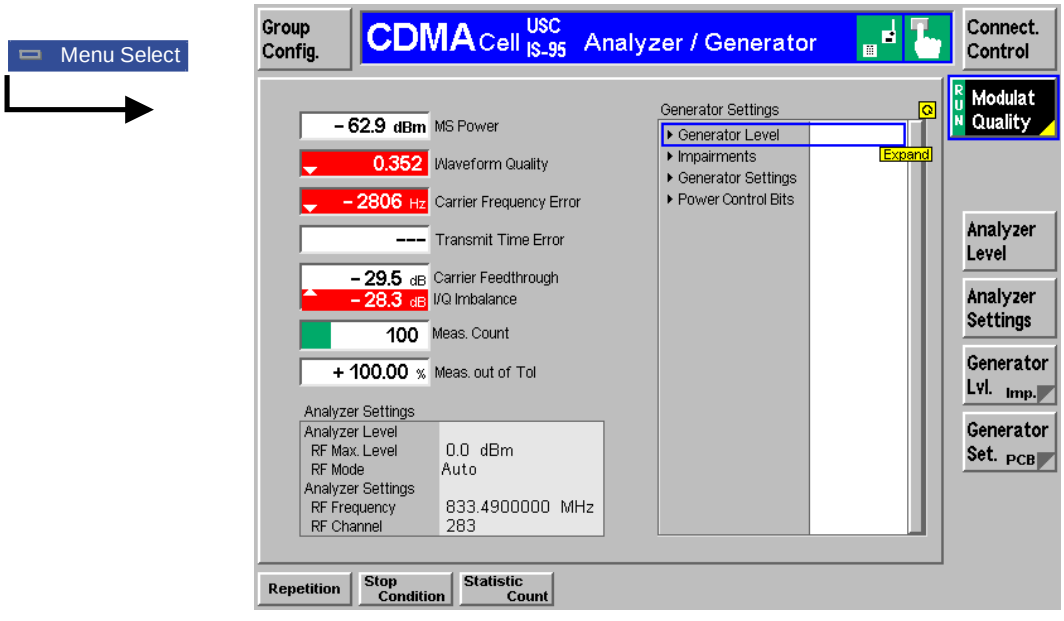


Figure 4-2: Measurement menu Analyzer / Generator

Softkey Selections

Modulation Quality

The *Modulation Quality* softkey controls the *Modulation* 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 *Modulation* softkey twice opens the *Modulation Configuration* popup menu. (Refer to page 4.57 about modulation configuration.)

Remote control

```
INITiate:MODulation
ABORt:MODulation
STOP:MODulation
CONTINUE:MODulation
```

Repetition

The *Repetition* hotkey selects the repetition mode for the measurement:

- *Single Shot*: The measurement is stopped after a statistic cycle, i.e. after the number of frames set. A stopped measurement is indicated by the status display *HLT* in the measurement softkey. The single shot measurement may not complete if the Stop Condition is met.

- *Continuous:* The CMU continues the measurement unless the Stop Condition for the measurement is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey.

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 over time, for example, for adjustments.

Remote control `CONFigure:MODulation:CONTrol <Repetition>`

Stop Condition

The *Stop Condition* hotkey selects one of two stop conditions for the measurement:

- *NONE:* Continue measurement even in case of error

- *On Limit Failure:* Stop measurement in case of error (tolerance exceeded)

The stop conditions may affect single-shot and continuous measurement settings.

Remote control `CONFigure:MODulation:CONTrol <StopCond>`

Statistic Count

The *Statistic Count* hotkey defines the length of the statistic cycles in waveform intervals/evaluation periods.

1 to 1000 Number of intervals per statistic cycle.

Remote control `CONFigure:MODulation:CONTrol <Statistics>`

Analyzer Level

The *Analyzer Level* softkey displays two hotkeys to set the analyzer settings.

RF MaxLevel

The *RF Max. Level* hotkey sets the maximum expected input level.

This parameter is identical with the maximum input level set in the popup menu *Group Configuration* (see page 4.16). The range of values depends on the RF input used. If an external input attenuation is reported to the instrument (see section RF Connectors (Connection Control – RF ⊶) on page 4.12, 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.

Input levels exceeding the *RF Max. Level* can not be measured; the corresponding measurement result fields indicate "– – –".

RF Mode

The *RF Mode* hotkey sets the analyzer mode to Auto or Manual.

Analyzer Settings

The *Analyzer Settings* softkey displays the hotkeys to adjust the analyzer settings. Pressing the softkey again switches the key to *Impairm.* and displays the Impairments hotkeys.

RF Frequency

The *RF Frequency* hotkey adjusts the frequency of the generated RF signal. This setting is independent of the RF Channel setting. Changing the RF Channel setting resets the RF Frequency setting to coincide with the selected RF Channel.

Remote control `[SENSe:]RFANalyzer:FREQuency <Number>`

RF Channel

The *RF Channel* hotkey defines the base station channel number (and frequency) of the generated RF signal.

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

Table 4-1 on page 4.1 lists the networks and standards supported by the CMU with the CDMA options.

Remote control `SOURce:RFGenerator:FREQuency:UNIT<Unit or Number>`

Generator Lvl.

The *Generator Lvl*. Softkey displays the hotkeys to set the generator levels. Pressing the softkey again switches the key to *Impairm.* and displays the Impairments hotkeys.

Gen. Control

The *Gen. Control* hotkey indicates the status of the RF generator (ON | OFF). Press the hotkey to display a popup window to change the status.

Remote control
```
INITiate:RFGenerator
ABORt:RFGenerator
```

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control `SOURce:RFGenerator:LEVel <CDMA_Power>`

Traffic Level

The *Traffic Level* hotkey displays a popup window to set the Traffic Channel level in the forward CDMA channel.

The Traffic Level specifies the FULL frame rate traffic channel level. If a frame rate other than FULL is used, the actual test traffic level must be determined as indicated below.

Frame Rate Correction

FULL	0 dB
HALF	–3 dB
QUARTER	–6 dB
EIGHTH	–9 dB

Remote control `SOURce:RFGenerator:LEVel <Traffic_Lev>`

Paging Level

The *Paging Level* hotkey displays a popup window to set the signal level of the paging channel in the forward CDMA channel relative to the total output power.

Remote control `SOURce:RFGenerator:LEVel <Paging_Lev>`

Sync Level

The *Sync Level* hotkey displays a popup window to set the signal level of the sync channel in the forward CDMA channel.

Remote control `SOURce:RFGenerator:LEVel <Sync_Lev> >`

Pilot Level

The *Pilot Level* hotkey displays a popup window to set the Pilot Channel level in the forward CDMA channel.

Remote control `SOURce:RFGenerator:LEVel <Pilot_Lev>`

OCNS Settings

The *OCNS Settings* hotkey displays a popup window showing the setting of the Orthogonal Channel Noise Simulator. When set to auto, the OCNS automatically adds power along with the sum of the data, traffic, paging, sync, and pilot levels so that their sum equals the nominal base station power.

Remote control `SOURce:RFGenerator:OCNS <Mode>`

Impairm.

The *Impairm.* softkey displays the hotkeys to adjust the AWGN generator and base station frequency offset. Pressing this softkey again switches the key to *Generator Lvl.* and displays the Generator Level hotkeys.

AWGN Level

The *AWGN Level* hotkey displays a popup window to turn on the Additive White Gaussian Noise generator and set the level for modulation. This provides noise to more closely simulate actual operating conditions.

Note: *The total output power of the CMU is the sum of the Forward CDMA signal plus the AWGN signal. When the Forward CDMA signal is within 6 dB of its maximum power output, the AWGN signal is turned off. Once the Forward CDMA signal is no longer within 6 dB of its maximum power, the AWGN signal level may be set to a new value.*

Remote control `SOURce:RFGenerator:IMPairments <AWGN_Lev>`

BS Carrier Freq. Offset

The *BS Carrier Freq. Offset* hotkey displays a popup window to adjust the carrier frequency of the Base Station. This setting is disabled if the RF Frequency is adjusted away from a standard RF Channel frequency.

Remote control `SOURce:RFGenerator:IMPairments <Freq_Offset>`

Generator Set.

The *Generator Set.* softkey displays the hotkeys to adjust the RF generator output. Pressing this softkey again switches the key to *PCB* and displays the Power Control Group hotkeys.

RF Frequency

The *RF Frequency* hotkey adjusts the frequency of the generated RF signal. This setting is independent of the RF Channel setting. Changing the RF Frequency disables the BS Carrier Frequency Offset adjustment.

This setting is reset if the RF Channel is changed.

Remote control `SOURce:RFGenerator:FREQuency <Number>`

RF Channel

The *RF Channel* hotkey defines 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.

Table 4-1 on page 4.1 lists the networks and standards supported by the CMU with the CDMA options.

Remote control `SOURce:RFGenerator:FREQuency:UNIT<Unit or Number>`

Traffic Channel

The *Traffic Channel* hotkey displays a popup window to set the traffic channel. The CMU automatically shifts an OCNS channel if channel conflicts occur. Changing this value immediately changes the traffic channel, and a hard handoff is performed if a call is established. Refer to page 4.6 for more information on OCNS channels.

Remote control `SOURce:RFGenerator:TCH <Channel>`

PN Offset

The *PN Offset* hotkey displays a popup window to set the PN offset. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Remote control `SOURce:RFGenerator:PNOFfset <PNOffset>`

Frame Offset

The *Frame Offset* hotkey displays a popup window to adjust the frame offset. Changing the Frame Offset immediately changes the traffic channel timing.

Remote control `SOURce:RFGenerator:FOFFset <FrameOffset>`

Rate Set

The *Rate Set* hotkey displays a popup window to set the vocoder (voice coder) rate. Rate Sets 1 (8 kbps) and 2 (13 kbps) are currently available.

Remote control `SOURce:RFGenerator:RATE <Rate>`

Frame Rate

The *Frame Rate* hotkey displays a popup window to set the frame rate to Full, Half, Quarter, or Eighth.

Remote control `SOURce:RFGenerator:FRATe <DataRate>`

PCB

The PCB softkey displays the power control bits hotkey. Pressing this softkey again switches the key to *Generator Set.* and displays the Generator Settings hotkeys.

Power Control Bits

The *Power Ctl. Bits* hotkey displays a popup window to set the power control bit mode to control the power level of the mobile station. The *HOLD* mode sends alternating up/down power control bits. The *ALL DOWN* mode forces the power control bits to the down state. The *ALL UP* mode forces the power control bits to the up state. The *RANGE TEST* repeats a pattern of sending a series of all up bits followed by a series of all down bits. In the *OFF* mode, no power control bits are sent.

Remote control `SOURce:RFGenerator:PCBits <PCBits>`

Measurement Results

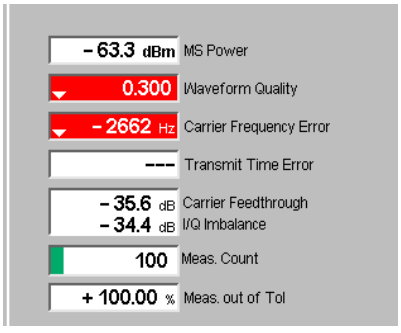


Figure 4-3: Measurement Display Results (Analyzer / Generator)

MS Power *MS Power* is the total transmitted power level from the mobile station.

Waveform Quality *Waveform Quality* is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal signal as defined in standard TIA/EIA-98.

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

Transmit Time Err. *Transmission Time Error* is the time offset between the mobile station'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.

Measurement Count *Measurement Count* defines the length of the statistic cycles in waveform intervals/evaluation periods.

1 to 1000 Number of intervals per statistic cycle.

Meas. out of Tol *Measurements our of Tolerance* is the percentage of waveform intervals that exceed the defined limits.

Remote control

```
READ[:SCALar]:MODulation[:RESult]?
FETCh[:SCALar]:MODulation[:RESult]?
SAMPle[:SCALar]:MODulation[:RESult]?
```

Connection Control

The menu group *Connection Control* while in the non-signalling mode, consists of popup menus to configure the inputs and outputs of the CMU and the respective signals in the function group *CDMA800MS Non-Signalling.*

The menu group is activated using the softkey *Connect. Control* to the right of the header of the measurement menu. The individual popup menus can be accessed using the hotkeys at the bottom of the screen.

Analyzer Control (Connection Control – Analyzer)

The popup menu *Analyzer* configures the signals measured by the CMU.

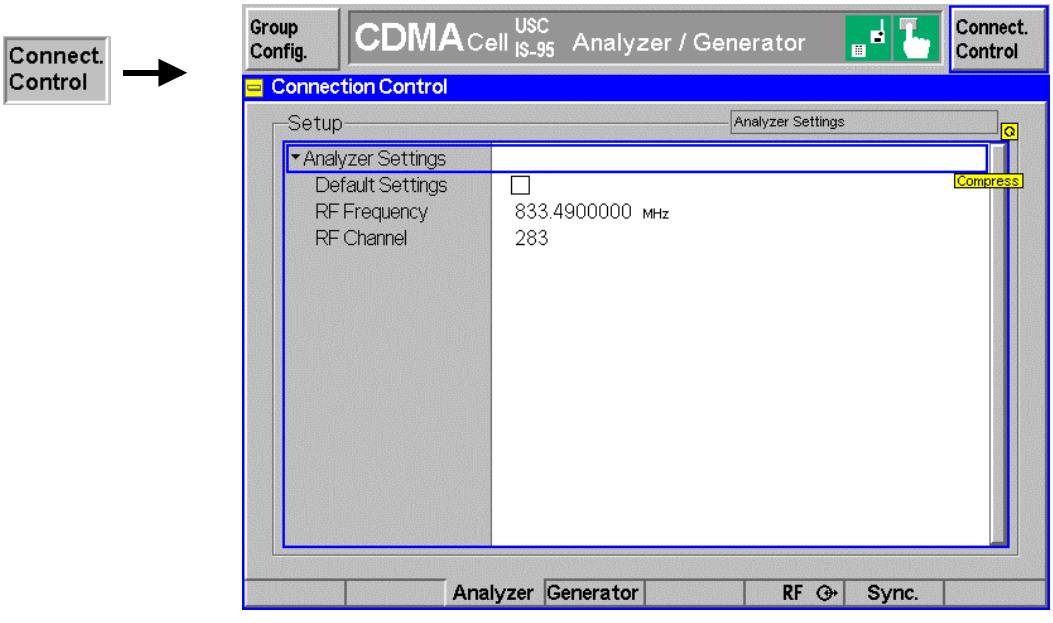


Figure 4-4: Connection Control – Analyzer Settings

Default Settings Checking this box resets all the Analyzer Settings to their default values.

Analyzer Settings The *Analyzer Settings* are explained under the softkey *Analyzer Settings* starting on page 4.5

Generator Control (Connection Control – Generator)

The popup menu *Generator* configures the signals generated by the CMU. Changes made here overwrite settings made via the hotkey popup windows.

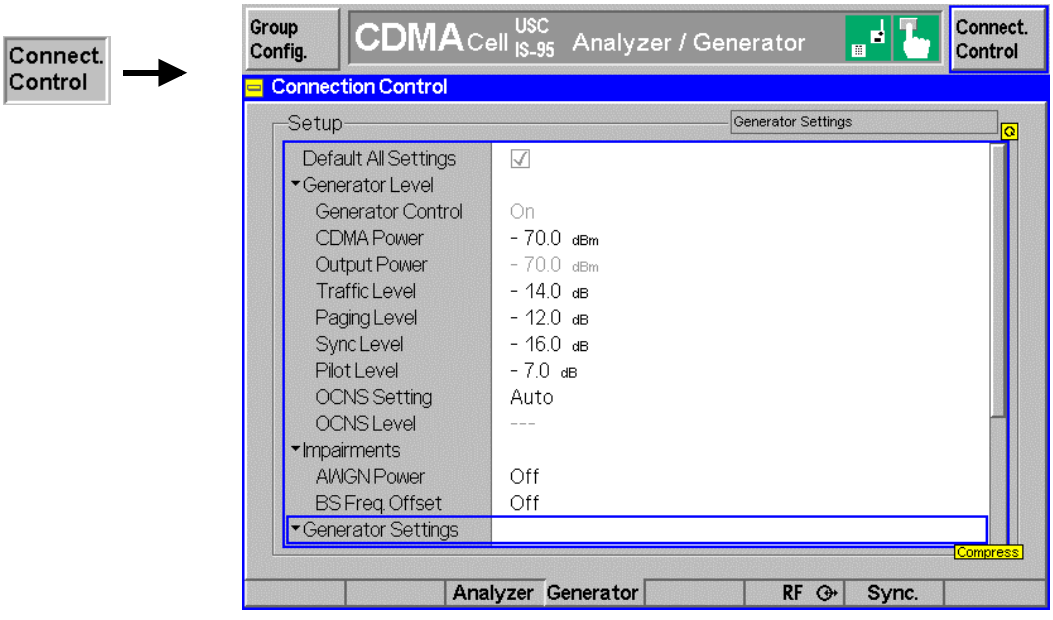


Figure 4-5: Connection Control – Analyzer Settings

Default All Settings Check this box to reset all Generator settings to their default values.

Generator Level The *Generator Level* settings are explained under the softkey *Generator Lvl*. starting on page 4.5.

Impairments The *Impairments* are explained under the softkey *Impairm.* starting on page 4.7.

Generator Settings The *Generator Settings* are explained under the softkey Generator Set. starting on page 4.7.

RF Connectors (Connection Control – RF ⊶)

The popup menu RF ⊶ selects the connectors for RF signals. This includes defining the following.

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

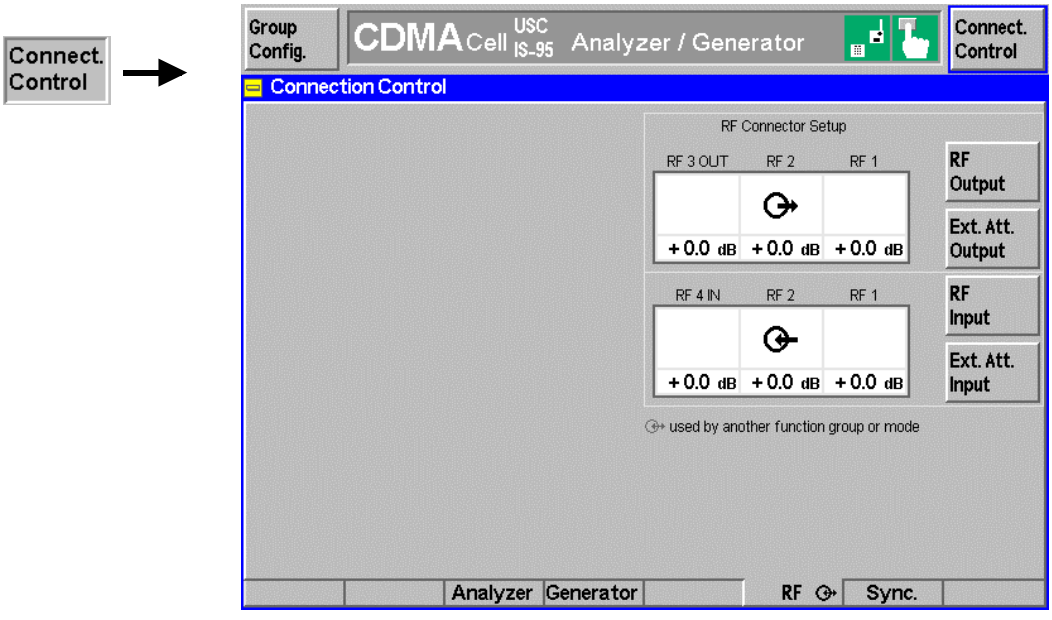


Figure 4-6: **Connection Control – RF connectors**

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.*

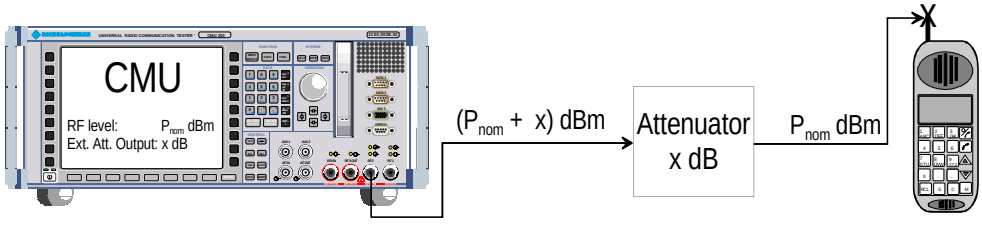
Remote control `OUTPut[:STATe] RF1 | RF2 | RF3`

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.*

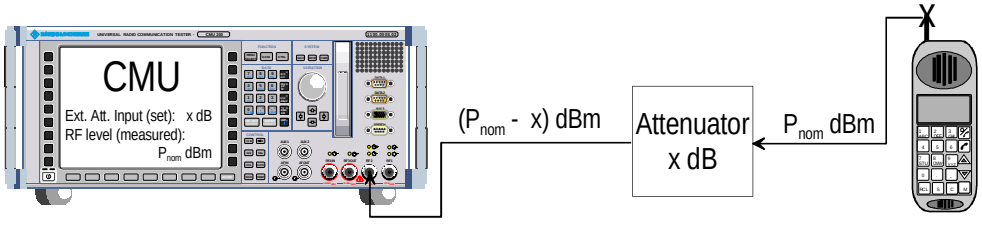
Remote control
```
INPut[:STATe] RF1 | RF2 | RF4
```

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]
```

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)*

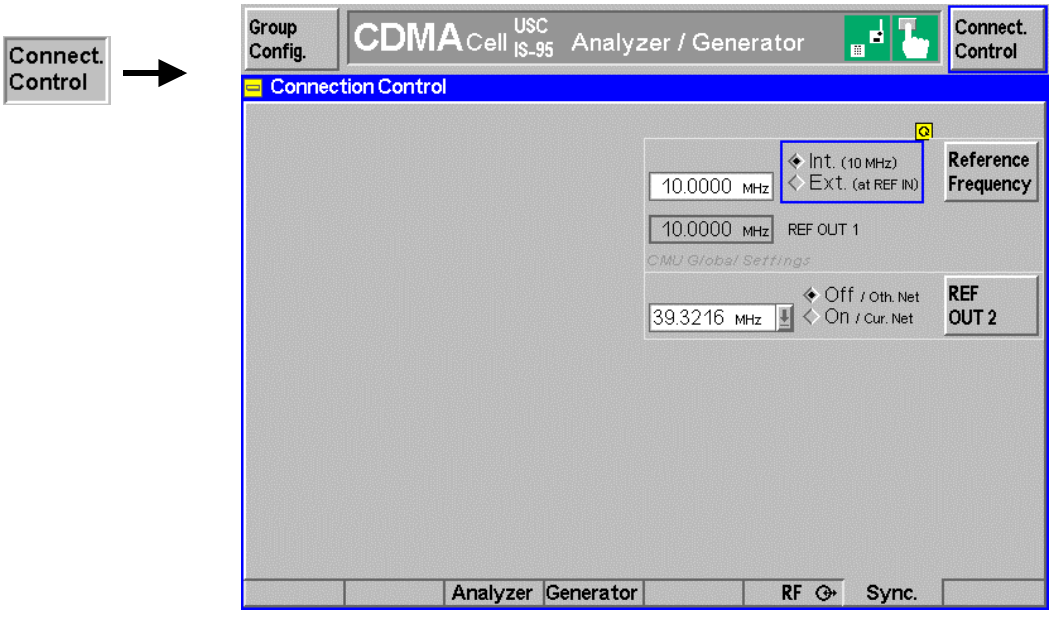


Figure 4-7: Connection Control – Synchronization

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:

1. *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.*
2. *In the case of external synchronization with squarewave signals (TTL) ensure correct signal matching to avoid reflections. Otherwise, resulting overshoots may cause trigger problems at the 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.*
3. *This configuration is valid in all CMU function groups.*

Remote control `SOURce:DM:CLOCk:FREQuency <Frequency>`

RF 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`

Group Configuration

The popup menu *Group Configuration* (while in Non-Signalling mode) contains tabs to configure the CDMA Non-Signalling function group globally (settings that are valid for all measurements within the function group). Most of these settings can be overwritten with the individual softkeys and popup input fields.

The popup menu *Group Configuration* is activated by pressing the softkey *Group Config.* at the top-left of each menu header. The individual popup menus are accessed using the hotkeys at the bottom of the screen.

Input Level (Group Configuration – Input Level)

The tab *Input Level* provides settings for the measured input level (see also section *Connection Control* on page 4.10):

- Maximum expected input level from the DUT *(Max. Level)* including the way how this level is defined *(Mode)*
- Attenuation or gain *(Attenuation)*

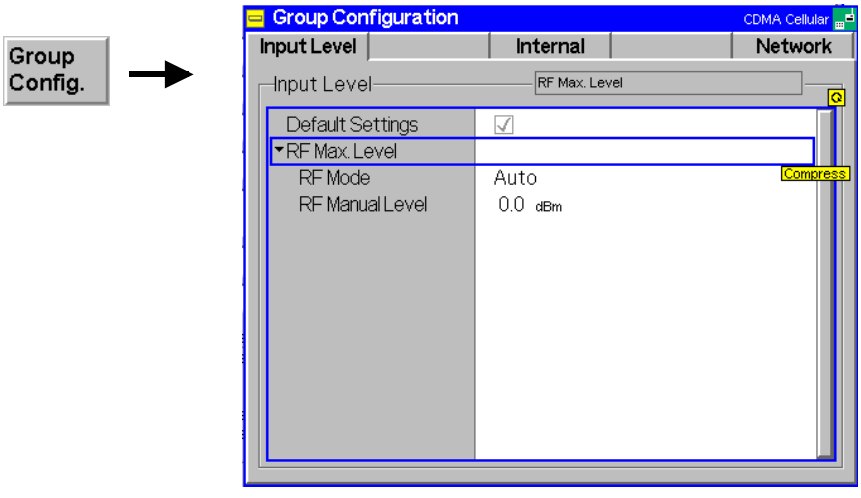


Figure 4-8: Group Configuration – Input Level

Default The field *Default* assigns the default setting to all fields of the tab *Input Level*.

Remote control `DEFault:LEVel ON | OFF`

Max. Level – Mode The *Max. Level* –Mode field sets the input attenuator and thus determines the maximum input level that can be measured. The maximum input level is displayed next to the softkey *Max. Level* in the main menu *Analyzer/Generator* (see page 4.3) and in the parameter lines above the graphical measurement menus.

Manual	Manual input of maximum input level
Auto	Automatic setting of maximum input level (autoranging) according to average burst power of applied signal

Remote control `[SENSe:]LEVel:MODE <Mode>`

External attenuation

The range of values depends on the RF input used. If an external input attenuation is reported to the instrument (see section *RF Connectors (Connection Control – RF* *)* on page 4.11), all levels measured are referred 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.

Input levels exceeding the *Max. Level* can not be measured; the corresponding measurement result fields indicate "– – –".

Error messages

If the value determined for *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 Max. Level
Re-edit	Max. Level is entered once again
Cancel	The last valid input value is maintained

When switching over to another input, the current value of *Max. Level* is automatically adapted, if required:

- Towards lower values to the maximum permissible 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. This is important to ensure safe switchover to manual setting.*

Remote control

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

Attenuation

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

Normal	Mixer level in normal range,
Low noise	Mixer level enhanced by +10 dB (full dynamic range of CMU, therefore recommended for *Power* measurements),
Low distortion	Mixer level reduced by –10 dB (high intermodulation spacing, therefore recommended for modulation measurements).

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

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

Remote control

```
[SENSe:]LEVel:ATTenuation NORMal | LNOise | LDIStortion
```

Internal Settings (Group Configuration – Internal)

The popup menu *Internal* configures the AWGN Bandwidth setting between either 1.23 MHz or 1.8 MHz.

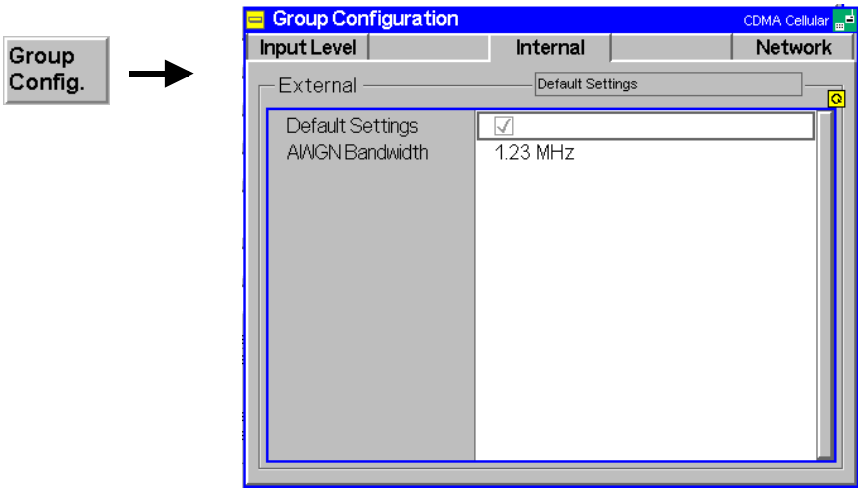


Figure 4-9: Group Configuration – Internal

Remote control
```
SOURce:INTernal:AWGN:BANDwidth B123 | B180
DEFault:INTernal ON | OFF
```

Network and Standard (Group Configuration – Network)

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

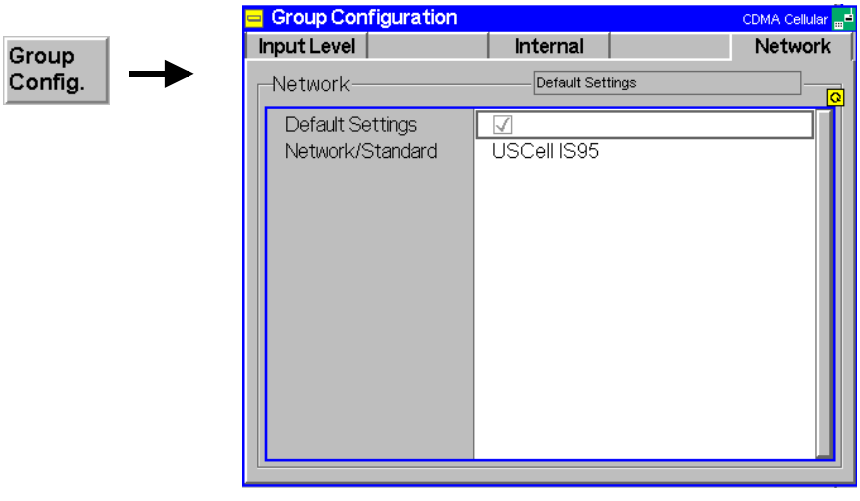


Figure 4-10: Group Configuration – Network

Remote control
```
CONFigure:NSTandard
  U95 | J95 | JT53 | C95 | UP95 | UP08 | KP95 | KP08
```

CDMA Measurements

The structure of this section is based on the configuration and measurement groups defined in function group *CDMACellular MS Signalling*. The menus are dealt with in the order of their operation:

1. Call setup to the mobile station *(Connection Control – Signalling)*
2. Overview of measurements and general settings *(Overview)*
3. Application menus *(Overview, Power, Modulation, Receiver Quality):* performance of the measurements, output of the measurement results, specific measurement configurations
4. Global configurations *(Connection Control, Group Configuration)*

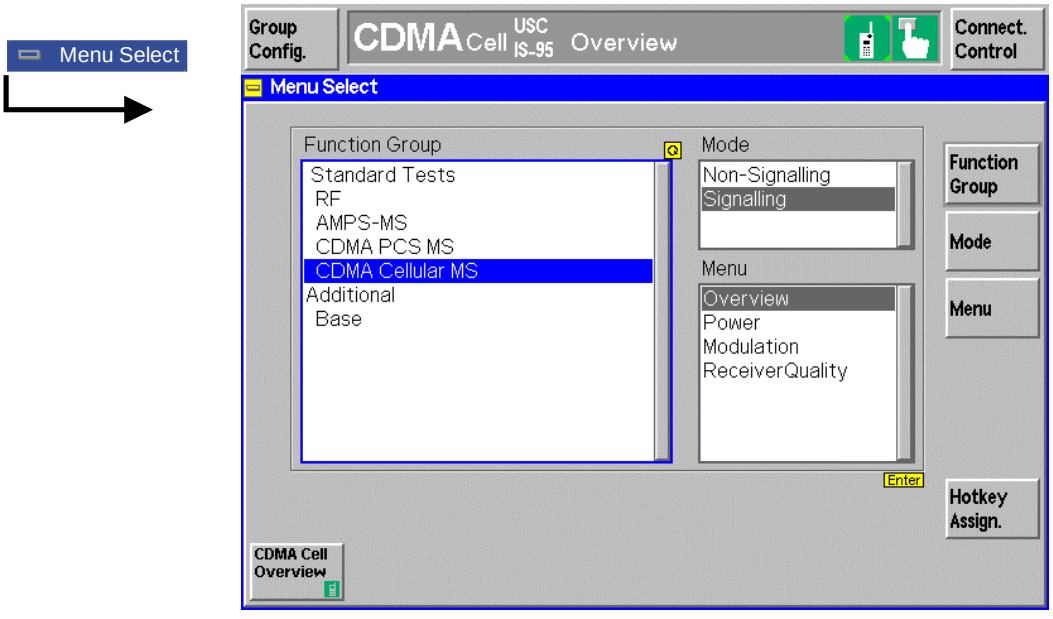


Figure 4-11: CDMA applications in Signalling mode

Since making measurements requires a connection to a mobile station, the CMU immediately displays the *Connect Control* screen when selecting the CDMA Signalling Mode.

Call Setup (Connection Control)

The *Connection Control* popup menu controls the signalling (call setup and release, services, signalling parameters) and configures the inputs and outputs with the external attenuation values and the reference frequency.

Since the measurement mode requires a connection to a mobile station, the menus for setting up a call (*Connection Control – Signalling)* appear automatically (unless disabled) after selection of the function group and mode *CDMA800MS Signalling* in the *Menu Select* menu. Pressing the softkey *Connect Control* (at the top right of every measurement menu) activates the *Connection Control* menus. The connection control menus are linked with each other through the hotkey bar at the bottom of the screen. Pressing the *Escape* key closes the active *Connection Control* menu and the CMU changes to the measurement mode.

In the following, the tab *Connection Control – Signalling* displayed during the call setup is described. The other tabs of the *Connection Control* menu are described at the end of this chapter beginning on page 4.69.

The term signalling summarizes all procedures necessary for call setup and release and for control of a connection in the mobile radio network. In the case of the CMU, a distinction is made between four different signalling states:

- Signal Off — CMU transmits no signal
- Signal On/MS Unregistered — CMU outputs a control channel signal to which a mobile station can synchronize
- MS Registered — Registration with the mobile station and location update performed
- Call Established — Call established with a mobile station

A number of control commands which can be initiated both by the CMU *(Call initiated from the CMU)* and by the mobile station *(Call initiated from MS)* switch between these states.

Most applications within the function group *CDMA Signalling* are only possible (or useful) in a particular signalling state (for example, handoff between various networks requires an existing connection between the CMU and mobile station, i.e. it is only possible in the *Call Established* state). Functionality of some menus vary depending on the signalling state.

Corresponding to the four possible signalling states, four different *Signalling* menus are available. When a signalling state is reached, the corresponding menu is opened automatically (exception: see softkey *Open Pop. autom.*).

Signalling Control (Signal Off State)

In the Signal Off state, the CMU does not output any RF signals. The popup menu *Signalling (Signal Off)* provides the following information.

- The signalling parameters status and measured average-power of the mobile station *(Power).*
- The most important parameters characterizing the frequency of the signal sent by the CMU in the *Signal On (BS Signal)* state.
- Activates the RF channel signal for the call setup to the mobile station *(Signal On)*.

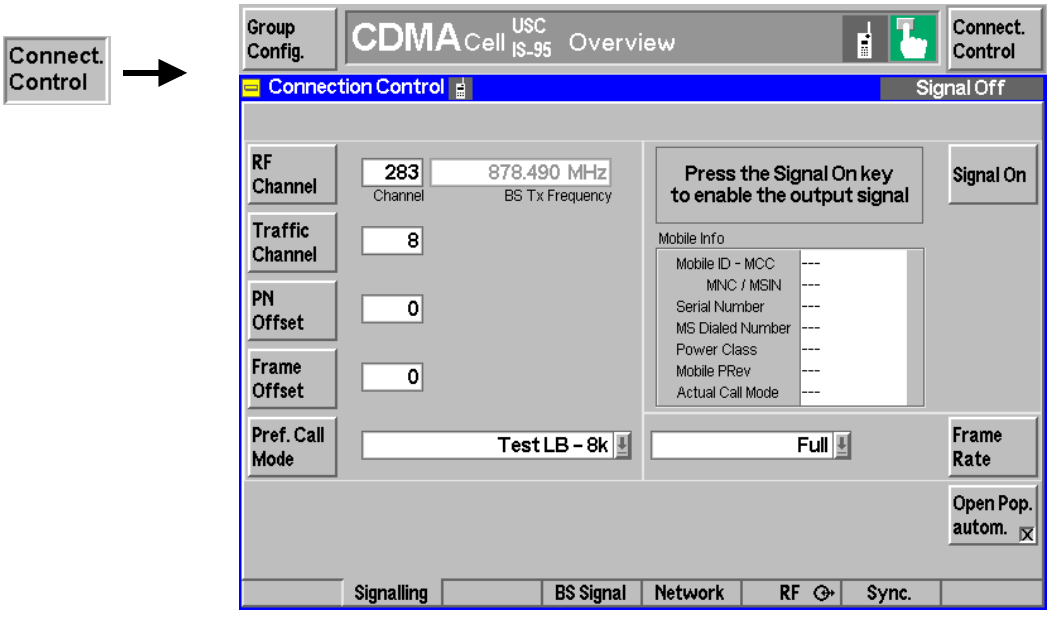


Figure 4-12: Connection Control – Signalling (Signal Off)

Header Message A header Message displayed in each Signalling index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Press the Signal On key to enable the output signal` is displayed.

Mobile Info This display window lists the current conditions of the connection to the mobile station. With the signal off, the mobile station can not register so no information is displayed at this time.

RF Channel The *RF Channel* softkey sets the base station channel number (and frequency) of the generated RF signal. The frequency is not adjustable but can be offset using the *Impairments* softkey found in the individual applications or configuration screens.

In most cases, the default setting will successfully establish a call to the mobile under test. The RF Channel may need to be changed if there is interference from other base stations or signals at or near the same frequency.

Remote control `CONFigure:BSSignal:SIGNalling:RFCHannel <Number>`

Traffic Channel

The *Traffic Channel* softkey sets the traffic channel to a value between 2 and 31 or 33 and 63 (inclusive).

Remote control `CONFigure:BSSignal:SIGNalling:TCH <Number>`

PN Offset

The *PN Offset* softkey sets the PN offset to a value between 0 and 511. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Remote control `CONFigure:BSSignal:SIGNalling:PNOFfset <Number>`

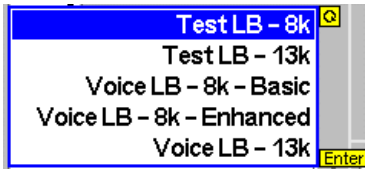
Frame Offset

The *Frame Offset* softkey can be set to a value between 0 and 15 (inclusive). Changing the Frame Offset immediately changes the traffic channel timing.

Remote control `CONFigure:BSSignal:SIGNalling:FOFFset <Number>`

Pref. Call Mode

The *Pref. Call Mode* softkey displays a list of call modes available to use when establishing a call to the mobile station. (The choice made here is the preferred method.) If the mobile does not support the selected call mode, the CMU and mobile station negotiate a call mode. This will be reported in the Mobile Info window after the mobile station has registered with the CMU.



In the Test Loopback modes, the CMU separates random data at a specified frame rate and sends this data to the mobile. The mobile echoes this data back to the CMU.

In the Voice Loopback modes, the mobile sends digitized voice to the CMU. The CMU echoes this back two seconds later.

CDMA measurements require that a test loop back call be established with the mobile station. The voice loopback modes are used to place a voice call to the mobile.

Remote control `CONFigure:BSSignal:SIGNalling:CMODe <Mode>`

Signal On

The *Signal On* softkey switches on the RF generator. Switching the RF generator on changes the Signalling state from the Signal Off state to the Signal On state and the CMU waits for the mobile station to register.

Remote control `PROCedure:Signalling:ACTion SON`

Frame Rate

The *Frame Rate* softkey allows you to set the frame rate to Full, Half, Quarter, or Eighth when establishing a test loopback call.

Remote control `CONFigure:BSSignal:SIGNalling:FRATe <Rate>`

Open Pop. autom.

The *Open Pop. autom.* softkey activates or suppresses the automatic display of the popup menu *Signalling*.

In the default setting (box checked), the *Signalling* menu opens whenever a call is not established (due to a change of the signalling state or of the function group).

Deselecting (box unchecked) suppresses the automatic pop up of the *Signalling* menu. The *Signalling* menu can always be opened by selecting the *Signalling* hotkey in the *Connect Control* menu group.

Signalling Control (Signal On State)

The menu *MS Connect Control Signal On* provides information on:

- The signal transmitted by the CMU *(BS Signal)*
- Traffic channel and offsets
- The call mode to be used
- The status and result of the standby power and access probe power measurement *(Power)*

It also contains softkeys leading to other signalling states:

- Deactivating the channel signals *(Signal Off)*
- Establishing a call to the mobile station if registration has taken place (*Call Mobile* state *Call Established)*

The popup menu *Signalling (Signal On)* is opened after activation of the signal on the CMU (Softkey *Signal On* in the popup menu *Signalling (Signal Off)*). It is replaced by the Signalling (*MS Registered)* menu if the mobile station registers with the CMU signal. It is replaced by a *Signalling (Call Established)* menu if the mobile station sets up a call to the CMU or if a mobile that is already registered is called via the *Call Mobile* softkey.

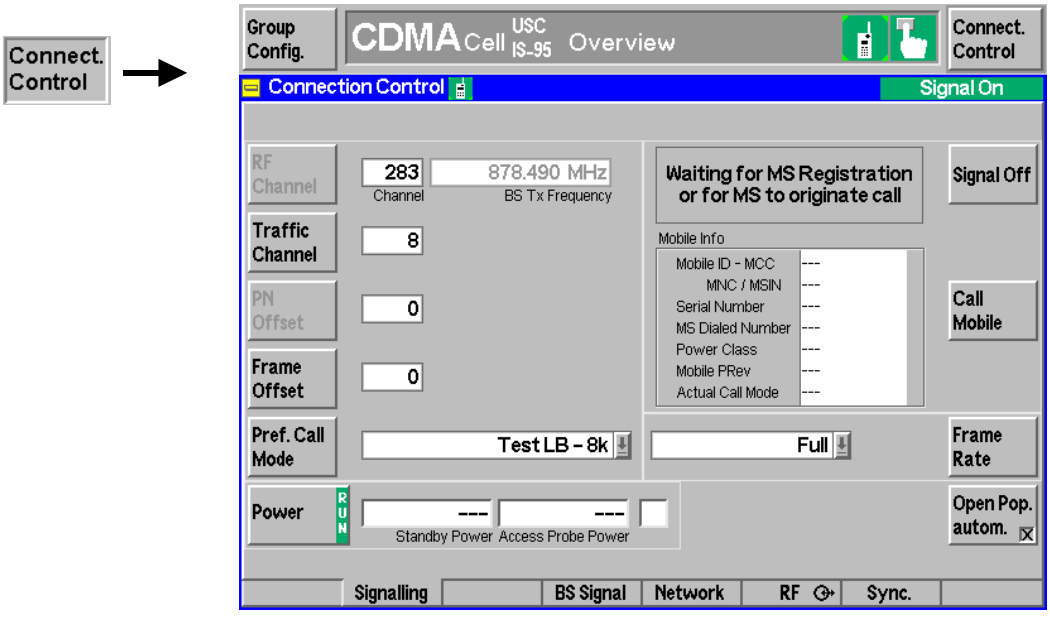


Figure 4-13: Connection Control – Signalling (Signal On)

Header Message A header message displayed in each *Signalling* index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Waiting for MS Registration or for MS to originate call` is displayed.

Mobile Info The signalling information box displays the mobile ID number.

RF Channel

The *RF Channel* softkey is only active during the Signal Off state. The current setting is displayed for reference. Refer to the Signal Off section beginning on page 4.21.

Remote control
```
CONFigure:BSSignal:SIGNalling:RFCHannel <Number>
PROCedure:BSSignal:SIGNalling:RFCHannel <Number>
```

Traffic Channel

The *Traffic Channel* softkey sets the traffic channel to a value between 2 and 31 or 33 and 63 (inclusive).

Remote control
```
CONFigure:BSSignal:SIGNalling:TCH <Number>
```

PN Offset

The *PN Offset* softkey is only active during the Signal Off state. The current setting is displayed for reference. Refer to the Signal Off section beginning on page 4.22.

Remote control
```
CONFigure:BSSignal:SIGNalling:PNOFfset <Number>
```

Frame Offset

The *Frame Offset* softkey can be set to a value between 0 and 15 (inclusive). Changing the Frame Offset immediately changes the traffic channel timing.

Remote control
```
CONFigure:BSSignal:SIGNalling:FOFFset <Number>
```

Pref. Call Mode

The *Pref. Call Mode* softkey displays a list of call modes available to use when establishing a call to the mobile station. (The choice made here is the preferred method.)

Refer to the Pref. *Call Mode* softkey in the Signal Off section beginning on page 4.22 for more details.

Remote control
```
CONFigure:BSSignal:SIGNalling:CMODe <Mode>
```

Power

The *Power* softkey controls the *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 mobile station's *Standby Power* and *Access Probe Power* fields are blank until the mobile station registers.

Signal Off

The *Signal Off* softkey switches off the CMU's RF signal.

Switching the signal off causes the CMU to change to the *Signal Off* state.

Remote control
```
PROCedure:Signalling:ACTion SOFF
```

Call Mobile

The *Call Mobile* softkey attempts to set up a call to the mobile station using the mobile ID from the previous registration. The type of call is dependent on the Call Mode selected. If successful, the CMU goes to the Call Established state. The displayed connection control screen displays either the voice call or test loopback call screen depending on the type of call being established. The type of call is defined by the Call Mode setting.

If the mobile ID does not match, a call will not be established.

If a call is established, the CMU displays the Call Established State. Refer to page 4.69.

If the mobile registers but fails to establish a call with the CMU, the CMU will display the *Connection Control MS Registered* screen. Refer to page 4.26.

Remote control `PROCedure:SIGNalling:ACTion CTM`

Frame Rate

The *Frame Rate* softkey allows you to set the frame rate to Full, Half, Quarter, or Eighth when establishing a test loopback call.

Remote control `CONFigure:BSSignal:SIGNalling:FRATe <Rate>`

Open Pop. autom.

The *Open Pop. autom.* softkey activates or suppresses the automatic display of the *Signalling* page in the *Connection Control* menu.

In the default setting (box checked), the *Signalling* menu opens whenever a call is not established (due to a change of the signalling state or of the function group).

Deselecting (box unchecked) suppresses the automatic pop up of the *Signalling* menu. The *Signalling* page can always be opened by selecting the *Signalling* tab in the *Connect Control* menu group.

Signalling Control (MS Registered State)

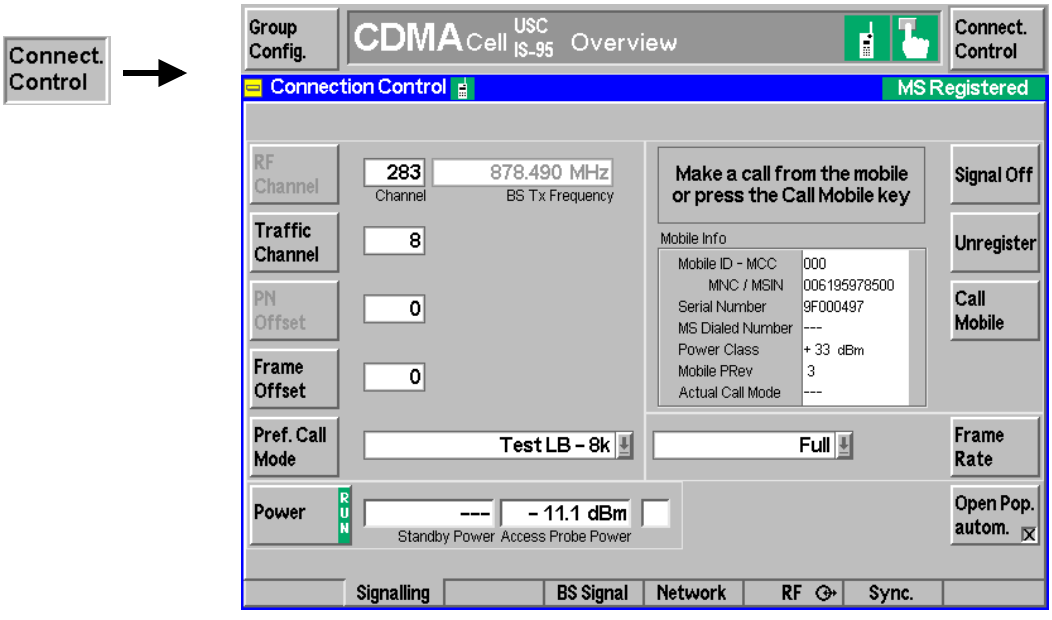


Figure 4-14: Connection Control – Signalling (MS Registered)

Header Message A header Message displayed in each Signalling index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Make a call from the mobile or press the Call Mobile key` is displayed.

Mobile Info In the MS Registered state, the display box contains the mobile identification and power class information.

RF Channel

The *RF Channel* softkey is only active during the Signal Off State. The current setting is displayed for reference. Refer to the Signal Off section beginning on page 4.21.

Remote control `CONFigure:BSSignal:SIGNalling:RFCHannel <Number>`

Traffic Channel

The *Traffic Channel* softkey sets the traffic channel to a value between 2 and 31 or 33 and 63 (inclusive).

Remote control `CONFigure:BSSignal:SIGNalling:TCH <Number>`

PN Offset

The *PN Offset* softkey is only active during the Signal Off State. The current setting is displayed for reference. Refer to the Signal Off section beginning on page 4.21.

Remote control `CONFigure:BSSignal:SIGNalling:PNOFfset <Number>`

Frame Rate

The *Frame Rate* softkey allows you to set the frame rate to Full, Half, Quarter, or Eighth when establishing a test loopback call.

Remote control `CONFigure:BSSignal:SIGNalling:FRATe <Rate>`

Pref. Call Mode

The *Pref. Call Mode* softkey displays a list of call modes available to use when establishing a call to the mobile station. (The choice made here is the preferred method.)

Refer to the Pref. *Call Mode* softkey in the Signal Off section beginning on page 4.22 for more details.

Remote control `CONFigure:BSSignal:SIGNalling:CMODe <Mode>`

Power

The *Power* softkey controls the *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. Two measurements are reported.

Standby Power displays the power level of the mobile station while it is not transmitting.

Access Probe Power displays the power level of the mobile station's access probes during its registration. A mobile station transmits access probes during its power on cycle, at the CMU's timer based registration setting (refer to page 4.76), and when the mobile initiates a call.

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

Signal Off

The *Signal Off* softkey switches off the CMU's RF signal.

Switching the signal off causes the CMU to change to the signalling state Signal Off.

Remote control `PROCedure:Signalling:ACTion SOFF`

Call Mobile

The *Call Mobile* softkey attempts to set up a call to the mobile station using the mobile ID from the previous registration. The type of call is dependent on the Call Mode selected. If successful, the CMU goes to the Call Established state. The displayed connection control screen displays either the voice call or data call screen dependent on the Call Mode established.

If the mobile ID does not match, a call will not be established.

If a call is established, the CMU displays the Call Established State. Refer to page 4.69.

If the mobile registers but fails to establish a call with the CMU, the CMU remains in the *Connection Control MS Registered* screen.

Remote control `PROCedure:SIGNalling:ACTion CTM`

Unregister

The *Unregister* softkey unregisters the CMU from the mobile station and returns the CMU to the MS Unregistered state (refer to page 4.23).

Remote control `PROCedure:Signalling:ACTion UNRegister`

Frame Rate

The *Frame Rate* softkey allows you to set the frame rate to Full, Half, Quarter, or Eighth when establishing a test loopback call.

Remote control `CONFigure:BSSignal:SIGNalling:FRATe <Rate>`

Open Pop. autom.

The *Open Pop. Autom.* softkey contains a field that activates or suppresses the display of the popup menu *Signalling* (Signal Off state).

In the default setting (box checked), the *Signalling* menu opens whenever a call is not established (due to a change of the signalling state or of the function group).

Deselecting the check box suppresses the automatic pop up of the signalling menu. The *Signalling* menu can be opened by selecting the *Signalling* tab in the *Connect Control* menu group.

Overview of the Function Group

The *Overview* main menu provides an overview of the function group *CDMA800MS Signalling*, the current measurement status, and the most important scalar parameters and measurement results.

The *Overview* menu can be opened from the main menu *Menu Select* (with associated key at the front of the instrument). The *Overview* menu also opens after closing the Connection Control – Signalling configuration menu or after a call is established.

From here, the configuration menus *Group Configuration* and *Connection Control* menus are accessible as well as all measurement menus using the hotkeys at the bottom of the screen.

Note: *The configuration settings made while in the* Overview *application (with either the softkeys or the* Overview Configuration *menus) apply only to the measurements presented here. For example, the Overview measurement screen provides some power and modulation measurements but the configuration settings made here do not affect the configuration settings made within the* Power *or* Modulation *applications.*

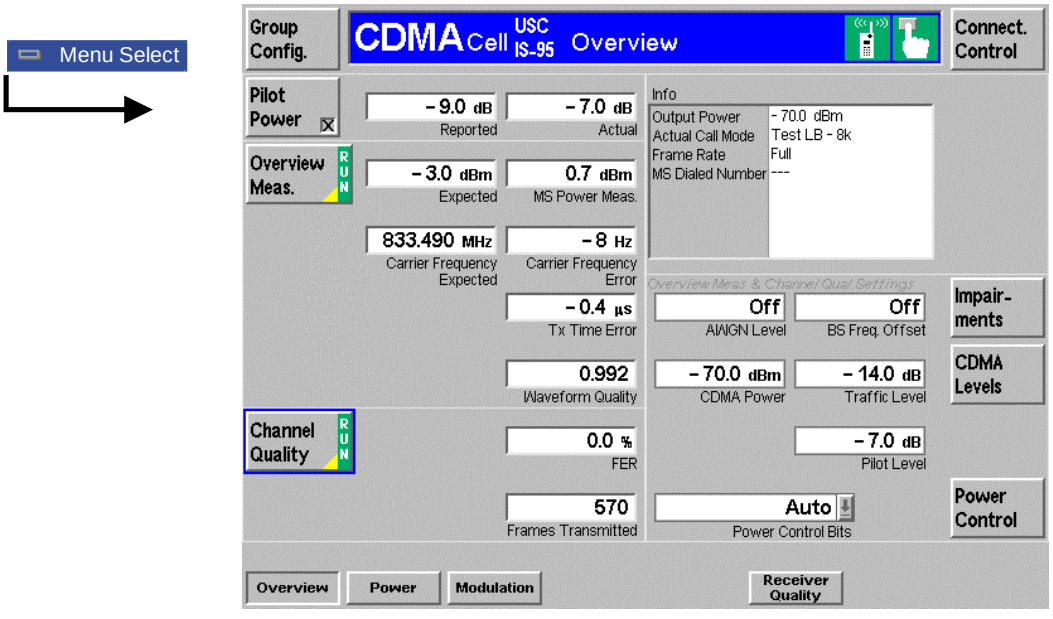


Figure 4-15: Function Overview – Main Menu Overview

The panels on the left side report the following basic measurement results:

- *Pilot Power* displays the pilot power reported from the mobile station and the actual pilot power sent by the CMU. Select the Pilot Power softkey and place an X in the box to activate the report. The *Actual* field is the Pilot Level value entered with the *CDMA Levels* softkey.
- *Overview Meas.* starts the power and modulation measurements and informs on their current status (*RUN | HLT | OFF).* The measurement results are discussed under *Power Measurements* beginning on page 4.32. and *Modulation Measurements* beginning on page 4.47.
- *Channel Quality* starts the Receiver Quality measurement and displays the frame error rate and the number of frames transmitted. The measurement results are discussed under *Receiver Quality Measurements* beginning on page 4.61.

- The *Info* window displays the following information:
  - Output Power — This is the total output power of the CMU.
  - Actual Call Mode — With a call established, the actual call mode is displayed. This may be different than the Preferred Call Mode selection made in the Connection Control Signalling screen.
  - Frame Rate — This is the current frame rate.
  - MS dialed Number — This is the number dialed for calls originated by the mobile.

The remaining three softkeys (Impairments, CDMA Levels, and Power Control) configure the measurements in the Overview application.

Impair-ments

The *Impairments* softkey allows you to adjust the AWGN level and the Base Station frequency offset.

The *AWGN* field allows you to activate and adjust the Additive White Gaussian Noise (AWGN) generator. This power is added to the CDMA Power level. Refer to page 4.7 for additional information.

The *BS Freq Offset* field allows you to enter a value to offset the base station's carrier frequency.

Remote control

```
CONFigure:OVERview:MCQuality:IMPairments
<AWGN_Lev>,<Freq_Offset>
```

CDMA Levels

The *CDMA Levels* softkey allows you to adjust the CDMA Power, Traffic Level, and Pilot Level.

The *CDMA Power* field allows you to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

The *Traffic Level* field allows you to set the Traffic Channel level in the forward CDMA channel.

The *Pilot Level* field allows you to set the pilot power level in the forward CDMA channel.

Remote control

```
CONFigure:OVERview:MCQuality:LEVel
  <CDMA_Power>,<Traffic_Lev>,<Pilot_Lev>
```

Power Control

The *Power Control* softkey displays a popup window to define how the power control bits are sent from the CMU to the mobile station. The power control bits control the mobile station's total output power (closed loop power control).

Note: *Changing the Power Control Bits mode from AUTO could allow the mobile station's power level to change to a level where measurements can no longer be made.*

Auto	Auto mode is a closed loop operation and the proper power control bits are sent as needed to control the power level.
Hold	Hold mode sends alternating up/down power control bits.
All Down	All Down mode forces the power control bits to the down state. This will cause an established call to be dropped.
All Up	All Up mode forces the power control bits to the up state.
Range Test	Range Test mode sends a sequence of UP power bits followed by a sequence of DOWN power bits. This may cause an established call to be dropped.
Off	Off mode disables the power control bits and the bits are not sent to the mobile station.

Remote control `CONFigure:OVERview:MCQuality:PCBits <PCBits>`

Power Measurements

The menu group *Power* contains the functions to measure the received signal power. The *Power Configuration* popup menu configures all power measurements.

The *Power* menu is typically opened using the hotkey *Power* (see Figure 4-16). The initial screen returns to the power application last accessed.

Note: This menu is also accessible from the main menu screen by pressing the Menu Select *front panel key and selecting CDMA>Signalling>Power.*

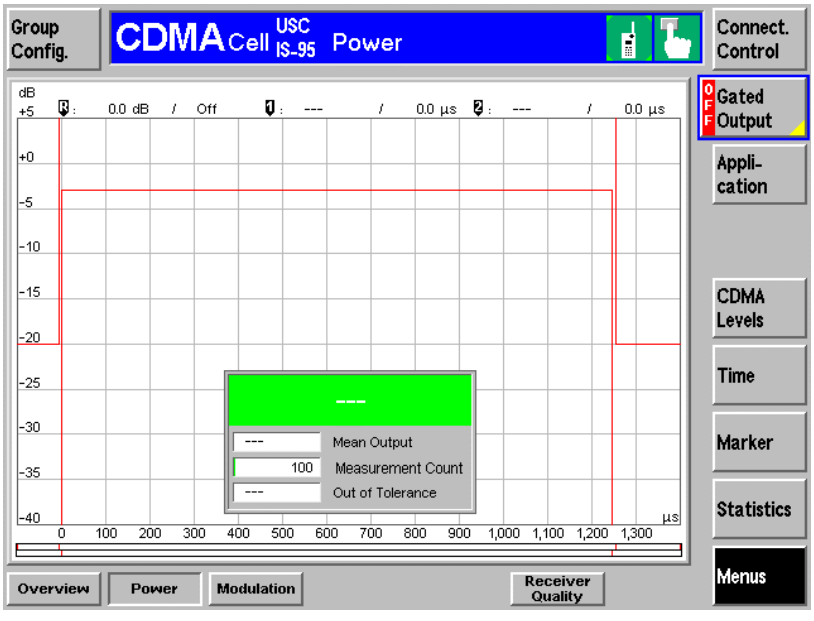


Figure 4-16: Power measurement menu (Gated Output displayed)

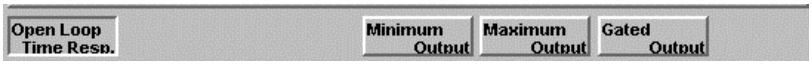
The measurement softkey indicates the current power application and its status (*RUN* | *HLT* | *OFF*). This softkey also opens and closes the *Power Configuration* menu. The power measurements configuration description begins on page 4.42.

Softkey Selections

Each power measurement provides similar softkey and hotkey menu selections. The softkeys and hotkeys common to all power applications are described here. Softkeys specific to an application are described within the application topic.

Appli-cation

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



Open-Loop Time Resp

The *Open Loop Time Response* hotkey changes the power measurement application to display the open loop power control time response to a step change in the forward channel power.

Remote control `INITiate:POWer:OLTResponse`

Minimum Output

The *Minimum Output* hotkey changes the power measurement application to measure the minimum power output of the mobile station.

Remote control `INITiate:POWer:MIOutput`

Maximum Output

The *Maximum Output* hotkey changes the power measurement application to measure the maximum power output of the mobile station.

Remote control `INITiate:POWer:MIOutput`

Gated Output

The *Gated Output* hotkey changes the power measurement to display the time response of the mean output power for isolated gated-on power control groups.

Remote control `INITiate:POWer:GOUTput`

CDMA Levels

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels. Refer to the specific application for details about each hotkey.

Menus

The *Menus* softkey displays the hotkey bar for switching to the other measurement menus.

Measurement Results

The CMU measures power by calculating the average power over a measurement interval. The measurement interval is 1229.5 chip intervals (0.5 ms).

The *Open Loop Time Response* application measures the open loop power control time response to a step change in the forward channel power.

The *Minimum Output* application measures the mobile station's minimum output power. The screen displays a table of the measured values of the total channel power and the waveform quality of the signal.

The *Maximum Output* application measures the mobile station's maximum output power. The screen displays a table of the measured values of the total channel power and the waveform quality of the signal.

The *Gated Output* application measures the time response of the mean output power for isolated gated-on power control groups.

Measurement results are explained for each application.

Open Loop Time Response

The Open Loop Time Response application measures the open loop power control time response to an increase or decrease of the total base station power. The power step direction is set with either the *Power Stepping* softkey or in the *Power Configuration* menu in the *Control* tab.

Each press of the *ENTER (CONT/HALT)* adjusts the power to the next level as defined by the power step parameter.

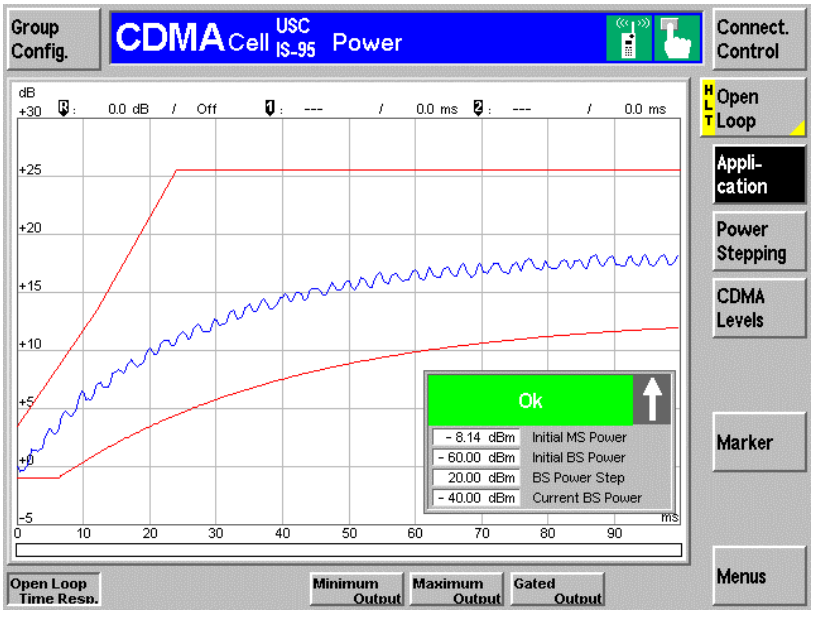


Figure 4-17: Measurement menu Power – Open Loop Time Response

The *Open Loop Time Response* application includes the following softkeys/hotkeys.

Power Stepping

The *Power Stepping* softkey displays a hotkey to change the direction of the base station's power step

Up Down

The *UP Down* hotkey sets the direction of the power step used in the measurement. You can change the step size in the *Power Configuration - Control* menu. The *Initial BS Power* setting is the reference level for the power step.

Remote control `CONFigure:POWer:OLTResponse:PSDirection <Power>`

CDMA Levels

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

Initial BS Power

The *Initial BS Power* hotkey displays a popup window to set the base station's initial power level. The power steps are reference to this level.

Remote control `CONFigure:POWer:OLTResponse:IBSPower <Power>`

Traffic Level

The *Traffic Level* hotkey displays a popup window to set the Traffic Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:OLTResponse:LEVel <Traffic_Lev>`

Pilot Level

The *Pilot Level* hotkey displays a popup window to set the Pilot Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:OLTResponse:LEVel <Pilot_Lev>`

Marker

The *Marker* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.80 for detailed information about markers.

The measurement screen for Open Loop can be divided into three groups:

- Scalar measurement results (parameter lines)
- Graph (a trace plotted as a function of time)
- Info Box (displaying measurements)

Parameter lines 1 and 2

Measurement graph

Info box

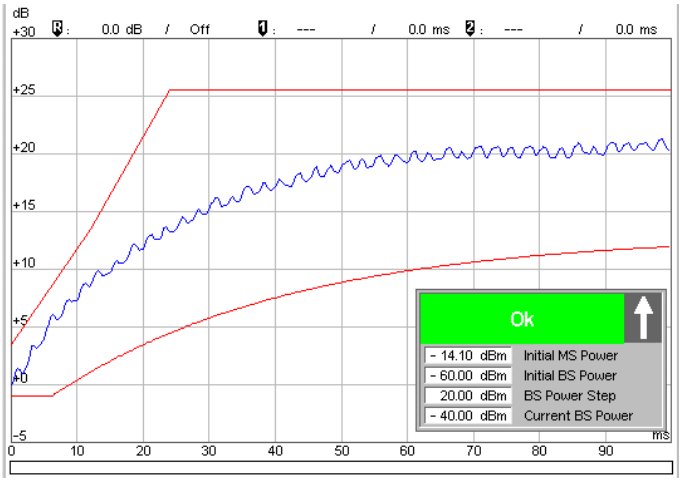


Figure 4-18: Measurement results (Open Loop)

Parameter Lines Scalar measurement results and settings are indicated in the two parameter lines above the test diagram and in the info box (a popup window in the middle of the graphical screen).

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

Initial BS Power

BS Power Step

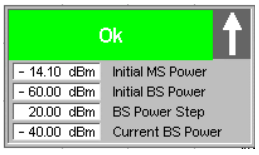
Current BS Power

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*)

Info Box



The info box contains measurements concerning the open loop time response application. The arrow indicates the direction of the next power step. If a parameter exceeds its set limits, the info box turns red and displays the parameter exceeded and the current setting of that parameter.

Remote control

Settings are read out using the query form of the setting command.

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 current power as a function of time.

Minimum Output

The *Minimum Output* application instructs the mobile station to reduce its output power to its minimum level. (This is in part done by setting the power control bits to the All Down mode.) The screen displays four measured values of the total channel power and the waveform quality of the signal. The application uses the values selected for CDMA Power, Traffic Level, and Pilot Level accessed either by the *CDMA Levels* softkey or in the *Power Configuration* menu in the *Control* tab.

- Current is the current values of the measurement interval.
- Maximum and Minimum are the extreme values (and their polarity) of all measurement intervals since the measurement started.
- Average is the value of a number of measurement intervals averaged together (defined by the *Measurement Count* setting).
- Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK signal as defined in standard TIA/EIA-98.

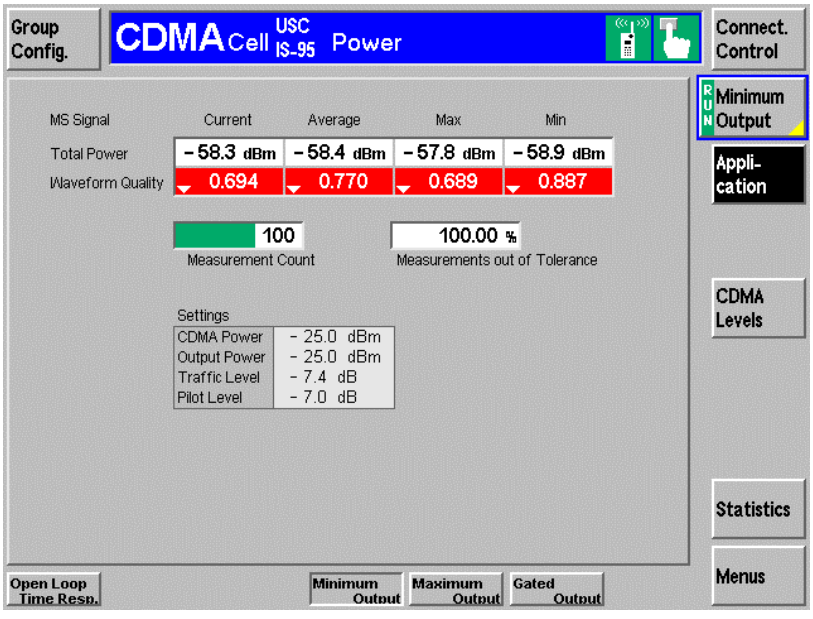


Figure 4-19: Measurement menu Power – Minimum Output

The *Minimum Output* application includes the following softkeys/hotkeys.

CDMA Levels

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control `CONFigure:POWer:MIOutput:LEVel <CDMA_Power>`

Traffic Level

The *Traffic Level* hotkey displays a popup window to set the Traffic Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:MIOutput:LEVel <Traffic_Lev>`

Pilot Level

The *Pilot Level* hotkey displays a popup window to set the Pilot Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:MIOutput:LEVel <Pilot_Lev>`

Statistics

The *Statistics* softkey displays the hotkey to define the measurement count.

Measurement Count

The *Measurement Count* hotkey defines the number of measurement intervals per statistic cycle.

Remote control `CONFigure:POWer:MIOutput:CONTrol:STATistics <Statistics>`

Maximum Output

The *Maximum Output* application instructs the mobile station to increase its output power to its maximum level. The screen displays four measured values of the total channel power and the waveform quality of the signal. The application uses the values selected for CDMA Power, Traffic Level, and Pilot Level accessed either by the *CDMA Levels* softkey or in the *Power Configuration* menu in the *Control* tab.

- Current is the current values of the measurement interval.
- Maximum and Minimum are the extreme values (and their polarity) of all measurement intervals since the measurement started.
- Average is the value of a number of measurement intervals averaged together (defined by the *Measurement Count* setting).
- Waveform Quality is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK signal as defined in standard TIA/EIA-98.

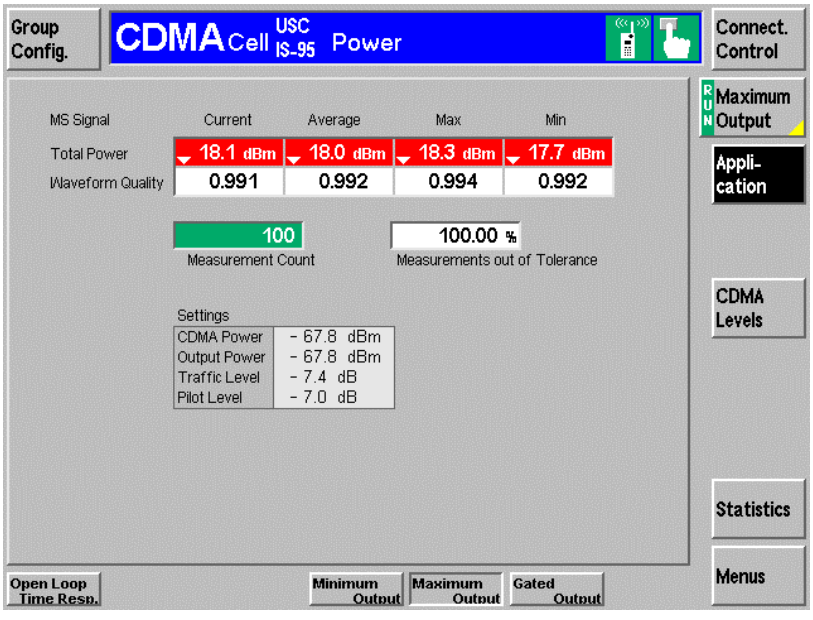


Figure 4-20: Measurement menu Power – Maximum Output

CDMA Levels

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control `CONFigure:POWer:MAOutput:LEVel <CDMA_Power>`

Traffic Level

The *Traffic Level* hotkey displays a popup window to set the Traffic Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:MAOutput:LEVel <Traffic_Lev>`

Pilot Level

The *Pilot Level* hotkey displays a popup window to set the Pilot Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:MAOutput:LEVel <Pilot_Lev>`

Statistics

The *Statistics* softkey displays a hotkey to define the measurement count.

Measurement Count

The *Measurement Count* hotkey defines the number of waveform intervals per statistic cycle.

Remote control `CONFigure:POWer:MAOutput:CONTrol:STATistics <Statistics>`

Gated Output

The *Gated Output* application measures the time response of the mean output power for isolated gated-on power control groups.

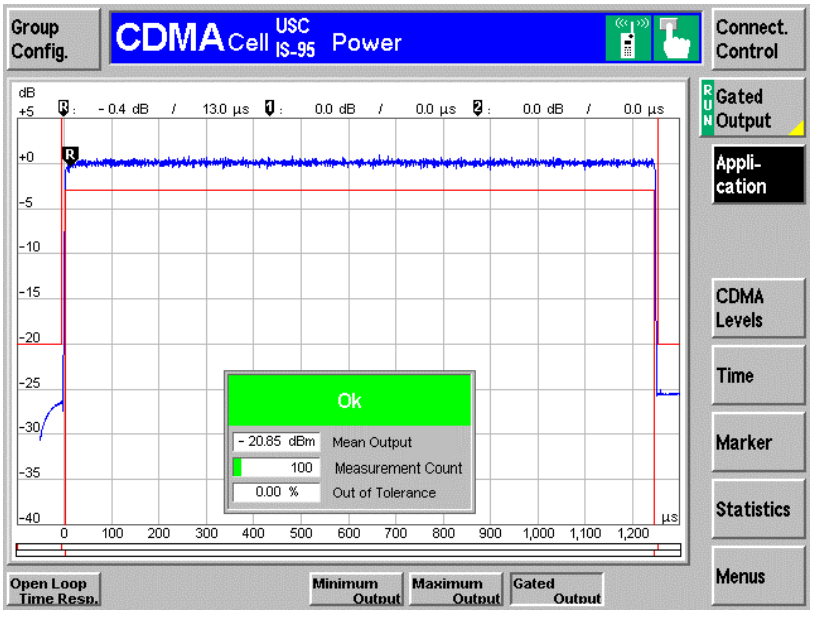


Figure 4-21: Measurement menu Power – Gated Output

CDMA Levels

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control `CONFigure:POWer:GOUTput:LEVel <CDMA_Power>`

Traffic Level

The *Traffic Level* hotkey displays a popup window to set the Traffic Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:GOUTput:LEVel <Traffic_Lev>`

Pilot Level

The *Pilot Level* hotkey displays a popup window to set the Pilot Channel level in the forward CDMA channel.

Remote control `CONFigure:POWer:GOUTput:LEVel <Pilot_Lev>`

Time

The *Display Area* softkey displays a hotkey to define how the signal interval is displayed.

Display Area

The Display Area hotkey displays a popup window to select how the waveform interval is displayed.

Full Display graphs the entire waveform interval from rising edge to falling edge.

Rising Edge magnifies and graphs the rising edge of the waveform interval.

Falling Edge magnifies and graphs the falling edge of the waveform interval.

Marker

The *Marker* softkey positions up to three markers and a baseline (D-Line) in the test diagram and outputs their values. Refer to page 4.80 for detailed information about markers.

Statistics

The *Statistics* softkey displays hotkeys to define the power control group count and the measurement count.

PCG Count

The *PCG Count* hotkey defines the number of power control groups to use per statistic cycle.

Remote control `CONFigure:POWer:GOUTput:PCGCount < Pcgcount >`

Measurement Count

The *Measurement Count* hotkey defines the number of waveform intervals per statistic cycle.

Remote control `CONFigure:POWer:GOUTput:CONTrol:STATistics <Statistics>`

The measurement screen for Gated Output can be divided into two groups:

- Scalar measurement results (parameter lines)
- Graph (a trace plotted as a function of time)

Parameter line

Measurement graph

Info box

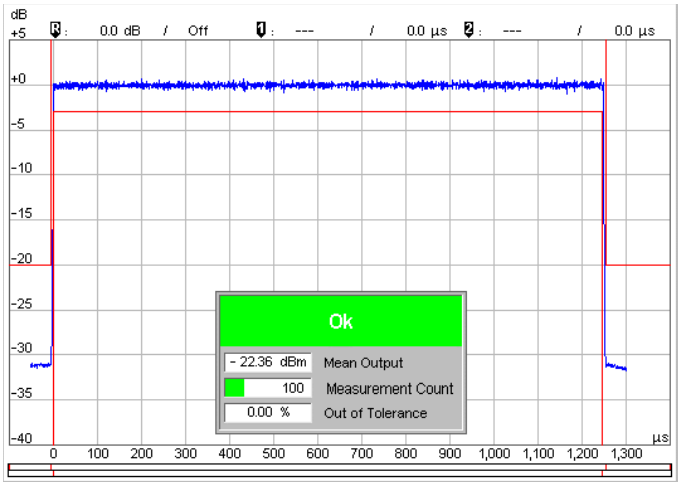


Figure 4-22: Display of measurement results (Gated Output screen)

Parameter line

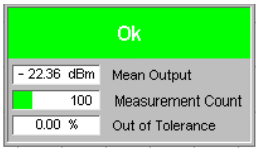
The parameter line contains the position of each active marker. Off is displayed if the marker is not active.

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*)

Info Box



The info box displays measurements concerning the gated output application. If any parameter exceeds the set limits, the info box turns red.

Remote control

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

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 measured power as a function of time.

Remote control

```
READ:ARRay:POWer:GOUTput?
FETCh:ARRay:POWer:GOUTput?
SAMPle:ARRay:POWer:GOUTput?
```

Power Configuration

The popup menu *Power Configuration* contains four tabs that define the parameters of power measurements.

Pressing the power measurement softkey twice opens the popup menu *Power Configuration*. It is possible to change between the index cards by pressing the associated hotkeys. Use the *EXP/CMP* front panel key to expand or compress the list of settings displayed.

Power Configuration – Control

The *Control* tab controls all four power measurement applications. Each application lists the available settings to control the measurements for the application.

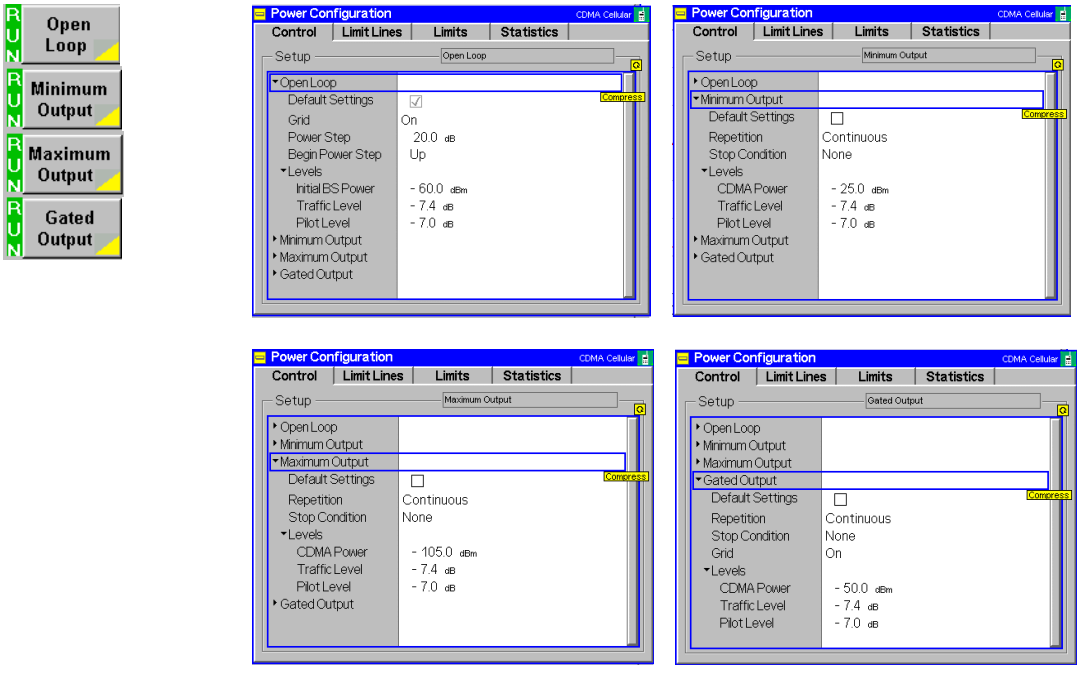


Figure 4-23: Power Configuration – Control

Each setting is described below. Not all settings are available for all power measurement applications.

Default Settings The *Default Settings* assigns default values to all parameters of the *Control* index card for the individual measurement.

Grid The *Grid* field switches the grid on or off in the graphical test diagram. By default, the grid is switched on.

Power Step *Power Step* sets the power step size for the Open Loop Time Response application.

Remote Control `CONFigure:POWer:OLTResponse:PSTep <Power>`

Begin Power Step *Begin Power Step* sets the direction of the initial power step for the Open Loop Time Response measurement.

Remote Control `CONFigure:POWer:OLTResponse:PSDirection <Power>`

Levels *Levels* sets the power levels independently for each power application.

Initial BS Power *Initial BS Power* sets the CDMA power prior to the initial power step of the Open Loop Time Response measurement.

CDMA Power *CDMA Power* sets the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Traffic Level *Traffic Level* sets the forward traffic channel level in the forward CDMA channel.

Pilot Level *Pilot Level* sets the level of the Pilot Channel in the forward CDMA channel.

Remote Control
`CONFigure:POWer:OLTResponse:IBSPower <Power>`
`CONFigure:POWer:OLTResponse:LEVel <Traffic_Lev>,<Pilot_Lev>`
`CONFigure:POWer:MIOutput:LEVel <CDMA_Power>,<Traffic_Lev>,<Pilot_Lev>`
`CONFigure:POWer:MAOutput:LEVel <CDMA_Power>,<Traffic_Lev>,<Pilot_Lev>`
`CONFigure:POWer:GOutput:LEVel <CDMA_Power>,<Traffic_Lev>,<Pilot_Lev>`

Repetition *Repetition* determines the repetition mode as described below.

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics* (refer to page 4.46). The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey.

Single shot should be selected only if a single measurement result is required under fixed conditions.

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

The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing 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, refer to Chapter 6 of this manual.*

The Stop Condition setting can affect the Single Shot and Continuous repetition modes.

Stop Condition *Stop Condition* selects one of two stop conditions for the measurement:

NONE	The measurement continues even if tolerances are exceeded.
On Limit Failure	The measurement is stopped when a tolerance is exceeded.
Note:	*The Stop Condition setting can affect the Single Shot and Continuous repetition modes.*

Remote control
```
CONFigure:POWer:MIOutput:CONTrol:REPetition
CONFigure:POWer:MAOutput:CONTrol:REPetition
CONFigure:POWer:GOUTput:CONTrol:REPetition
```

Power Configuration – Limit Lines

The *Limit Lines* tab defines the limit lines for the Gated Output application. Limit lines are a graphical tool for defining and monitoring tolerance values.

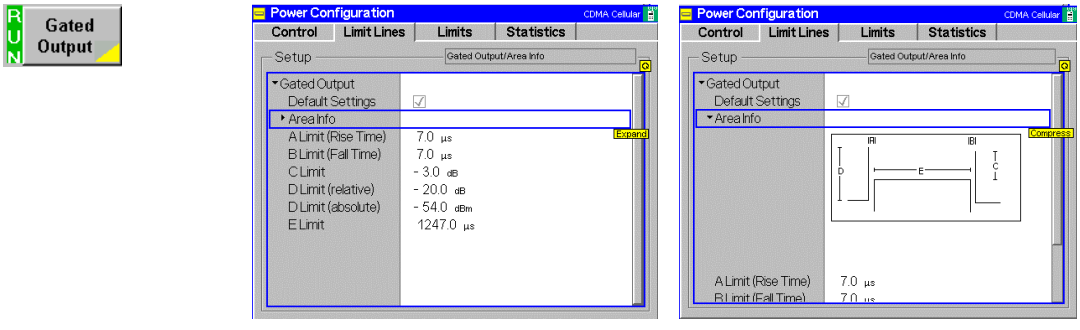


Figure 4-24: Power Configuration – Limit Lines

Default Settings *Default Settings* assigns default values to all parameters of the *Control* index card for the individual measurement.

Remote control
```
DEFault:POWer:GOUTput:LIMit
```

Area info (Limit Line Definitions)

A Limit (Rise Time)	Sets the maximum rise time.
B Limit (Fall Time)	Sets the maximum fall time.
C Limit	Sets the minimum level of the gated-on power relative to the mean output power.
D Limit (relative)	Sets the maximum level of the gated-off power relative to the mean output power.
D limit (absolute)	Sets the absolute maximum level of the gated-off power.
E Limit	Sets the minimum gated-on time.

Remote control
```
CONFigure:POWer:GOUTput:CAMMax:LIMit:LINE:SYMMetric
[:COMBined]:VALue
```

Power Configuration – Limits

The *Limits* tab defines tolerance limits for the Minimum and Maximum power applications display.

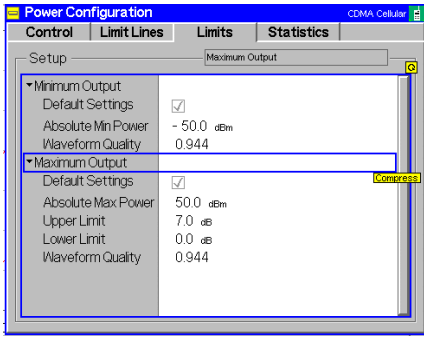


Figure 4-25: Power Configuration – Limits

Minimum Output

Absolute Min Power — *Absolute Minimum Power* sets the minimum power level of the mean output power.

Waveform Quality — *Waveform Quality* sets the minimum value acceptable for the calculated waveform quality.

Remote control — `CONFigure:POWer:MIOutput:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue`

Maximum Output

Absolute Max Power — *Absolute Maximum Power* sets the maximum power level of the mean output power.

Upper Limit — *Upper Limit* sets the maximum level of the mean output power relative to the MS nominal maximum output power.

Lower Limit — *Lower Limit* sets the minimum level of the mean output power relative to the MS nominal maximum output power.

Waveform Quality — *Waveform Quality* sets the minimum value acceptable for the calculated waveform quality.

Remote control — `CONFigure:POWer:MAOutput:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue`

Power Configuration – Statistics

The *Statistics* tab defines the number of waveform intervals constituting a statistic count.

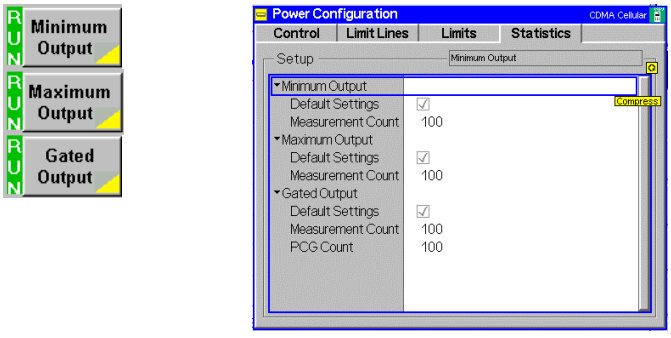


Figure 4-26: Power Configuration – Statistics

Default Settings *Default Settings* assigns default values to all parameters of the *Statistics* index card for the individual measurement.

Measurement Count *Measurement Count* defines the length of the statistic cycles in waveform intervals/evaluation periods.

1 to 1000 Number of intervals per statistic cycle.

Remote control
```
CONFigure:POWer:MIOutput:CONTrol:STATistics
CONFigure:POWer:MAOutput:CONTrol:STATistics
CONFigure:POWer:GOUTput:CONTrol:STATistics
```

PCG Count *PCG Count* defines how many power control groups are used for the gated output measurement.

Remote control
```
CONFigure:POWer:GOUTput:PCGCount
```

Modulation Measurements

The menu group *Modulation* contains several applications to measure the modulation parameters such as frequency error, waveform quality of the mobile station, 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 CMU measures the modulation accuracy by calculating the Phase Error, Magnitude Error, and Error Vector Magnitude of the modulated signal from the mobile station. Figure 4-27 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 mobile station) 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 mobile station 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 Inphase and Quadrature reference components are based on an O-QPSK waveform as specified in the TIA/EIA/95 standards publication.

The measurement interval is 1229 1/2 chip intervals (0.5 ms). The graphical displays represents 500 chips.

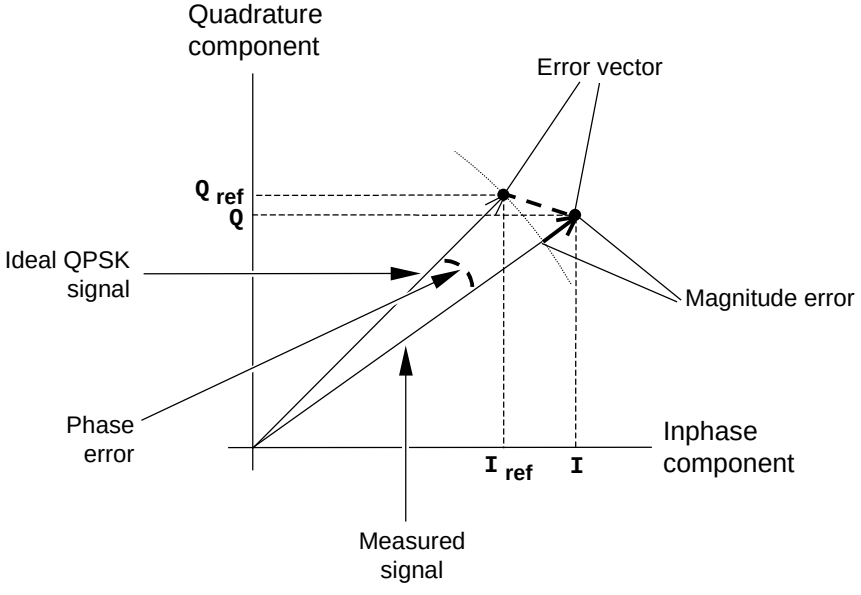


Figure 4-27: Modulation errors

The *Modulation* menu is typically opened using the hotkey *Modulation* (see Figure 4-28). The initial screen returns to the modulation application last accessed.

Note: *This menu is also accessible from the main menu screen by pressing the Menu Select front panel key and selecting CDMA>Signalling>Modulation.*

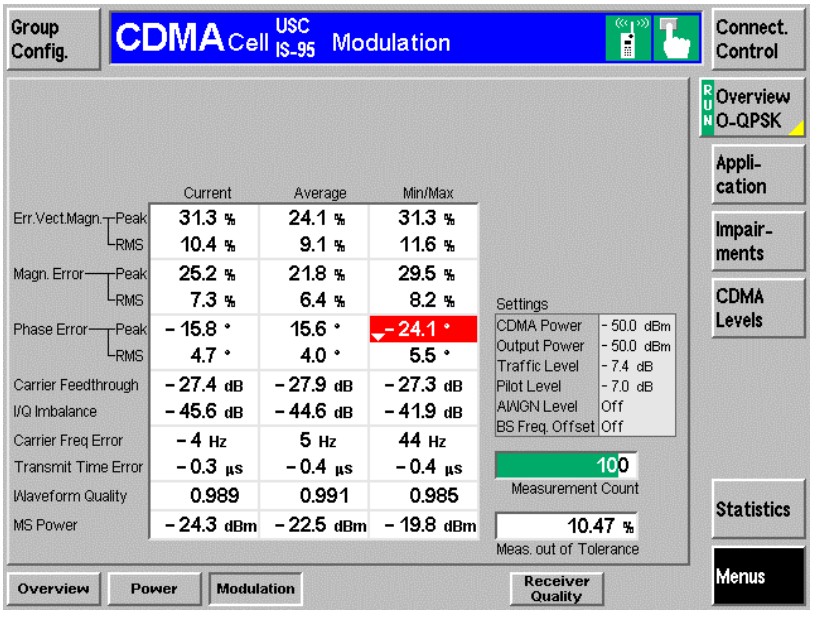


Figure 4-28: Modulation Measurement Menu

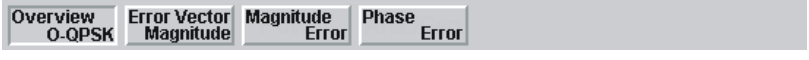
The measurement softkey indicates the current modulation measurement and its status *(RUN | HLT | OFF)*. This softkey also opens and closes the *Modulation Configuration* menu. The modulation configuration descriptions begin on page 4.57.

Softkey Selections

Each modulation measurement provides the same softkey and hotkey selections. (*Overview O-QPSK* doesn't contain a *Marker* softkey since there is no graphical display.) The descriptions of the common keys immediately follows.

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 O-QPSK

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

Remote control

```
INITiate:MODulation:OVERview
ABORt:MODulation:OVERview
STOP:MODulation:OVERview
CONTinue:MODulation:OVERview
```

Phase Error

The *Phase Error* hotkey displays the Phase Error measurement. The Phase Error measurement description begins on page 4.51.

Remote control
```
INITiate:MODulation:PERRor
ABORt:MODulation:PERRor
STOP:MODulation:PERRor
CONTinue:MODulation:PERRor
```

Magnitude Error

The *Magnitude Error* hotkey displays the Magnitude Error measurement. The Magnitude Error measurement description begins on page 4.55.

Remote control
```
INITiate:MODulation:MERRor
ABORt:MODulation:MERRor
STOP:MODulation:MERRor
CONTinue:MODulation:MERRor
```

Error Vector Magnitude

The *Error Vector Magnitude* hotkey displays the Error Vector Magnitude. The Error Vector Magnitude measurement description begins on page 4.56.

Remote control
```
INITiate:MODulation:EVMagnitude
ABORt:MODulation:EVMagnitude
STOP:MODulation:EVMagnitude
CONTinue:MODulation:EVMagnitude
```

Impair-ments

The *Impairments* softkey displays a set of hotkeys to adjust the AWGN and BS frequency offset.

AWGN

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.7 for additional information.

Remote control
```
CONFigure:MODulation:OEMP:IMPairments <AWGN_Lev>
```

BS Freq. Offset

The *BS Freq. Offset* hotkey adjusts the carrier frequency of the Base Station.

Remote control
```
CONFigure:MODulation:OEMP:IMPairments <Freq_Offset>
```

CDMA Levels

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control
```
CONFigure:MODulation:OEMP:LEVel <CDMA_Power>
```

Traffic Level

The *Traffic Level* hotkey displays a popup window to set the Traffic Channel level in the forward CDMA channel.

Remote control
```
CONFigure:MODulation:OEMP:LEVel <Traffic_Lev>
```

Pilot Level

The *Pilot Level* hotkey displays a popup window to set the Pilot Channel level in the forward CDMA channel.

Remote control

```
CONFigure:MODulation:OEMP:LEVel <Pilot_Lev>
```

Markers

The *Markers* softkey displays a set of hotkeys to activate the reference markers on the graphical display. A detailed description of the markers begins on page 4.80.

Statistics

The *Statistics* softkey displays a set of hotkeys to set the Display Mode and define the measurement count.

Display Mode

The *Display Mode* hotkey defines which measured values are shown graphically. The setting appears in the upper right hand corner of the graphical display.

Current	Displays the measured value for current measurement interval.
Max/Min	Displays the extreme value of a number of measurement intervals and the polarity.
Average	Displays the average value of a number of measurement intervals.

Meas. Count

The *Meas. Count* hotkey defines the number of waveform intervals per statistic cycle.

1 to 1000	Number of measurement intervals per statistic cycle. Refer to page 4.59 for more information about statistic configuration.

Remote control

```
CONFigure:MODulation:OVERview:CONTrol:STATistics
<Statistics>
CONFigure:MODulation:EVMagnitude:CONTrol:STATistics
<Statistics>
CONFigure:MODulation:MERRor:CONTrol:STATistics <Statistics>
CONFigure:MODulation:PERRor:CONTrol:STATistics <Statistics>
```

Menus

The *Menus* softkey displays the hotkeys bar for changing to other measurement menus (Overview, Power, and Receiver Quality).

Measurement Results

The modulation measurement screens are similar for each modulation application. (The Overview application does not provide a graph.) The descriptions of the graphs and common output data immediately follows. 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

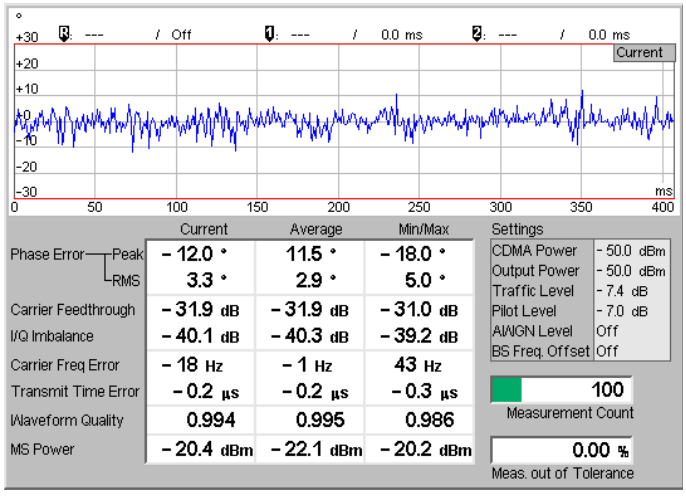


Figure 4-29: Modulation Results Display

Parameter Line The parameter line contains the position of each active marker. Off is displayed if the marker is not active.

R Measured error and time of the reference marker.

1 Measured error and time of marker 1 (setting *absolute*) or the difference from reference marker (setting *relative*).

2 Measured error and time of marker 2 (setting *absolute*) or the difference from reference marker (setting *relative*).

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.

Measurement The *Measurement Count* is the number of intervals since the start of the measurement. The bar graph represents a percentage of intervals measured

Interval based on the number of intervals set in the Measurement Count in the Statistics 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 *Measurement Count* setting).

Any values exceeding the defined limits appear with a red background. Limit values are set in the Modulation Configuration menus.

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

Phase Error	Refer to page 4.54
Magnitude Error	Refer to page 4.55
Error Vector Magnitude	Refer to page 4.56

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 mobile station's signal and the CMU's signal.

Waveform Quality — *Waveform Quality* is the modulation accuracy of the transmitted signal. The waveform quality is obtained by comparing the transmitted signal to an ideal O-QPSK signal as defined in standard TIA/EIA-98.

MS Power — *MS Power* is the total transmitted power level from the mobile station.

Overview O-QSPK

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 is displayed for each modulation application. The average values (positive or negative) are calculated over a user definable number of measurement counts. The Min/Max values are the extreme values from the start of the measurement.

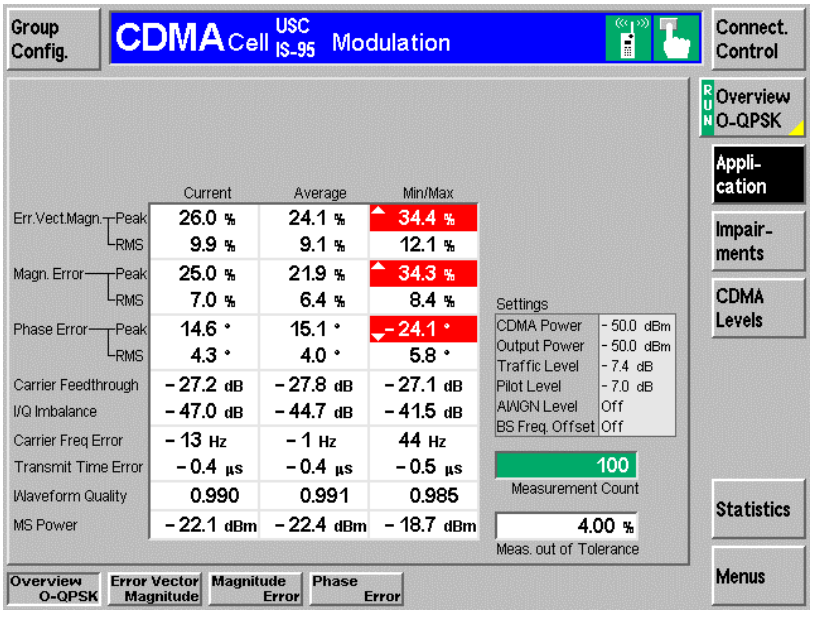


Figure 4-30: Overview O-QSPK display

Phase Error Measurement

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

The graphical output represents the current interval of the measurement.

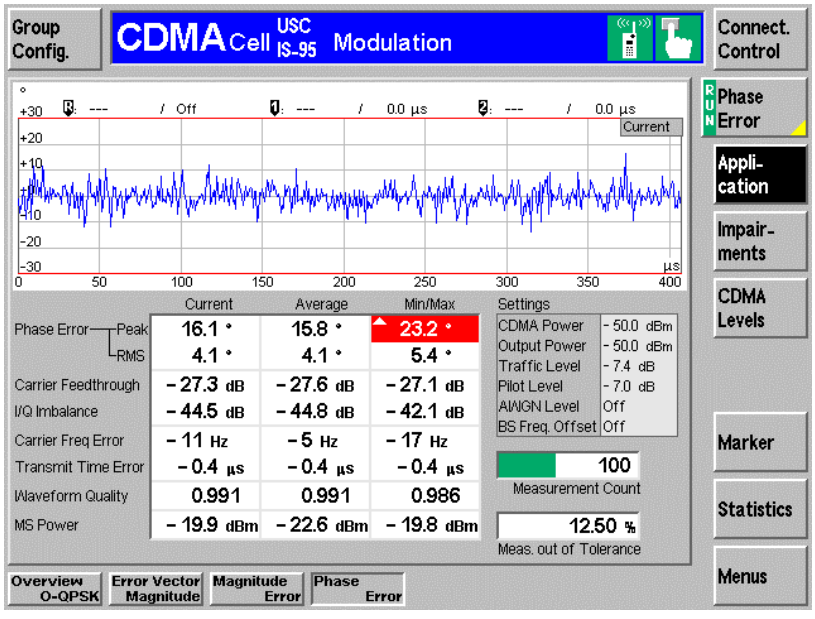


Figure 4-31: Phase Error display

Output Table The first two rows of data are specific to the selected modulation measurement. The information in the remaining rows are identical for each modulation measurement.

Phase Error (Peak) (RMS) The peak and the RMS phase error values of the current measurement interval are displayed. In addition, the average and extreme values are calculated.

Magnitude Error (ME) Measurement

Magnitude Error is the difference in magnitude (in percent) between the received signal waveform and an ideal O-QPSK signal waveform. The magnitude error is the difference in amplitude between the measured signal from the mobile station transmitter and an ideal signal waveform at the detection points.

The graphical output represents the current interval of the measurement.

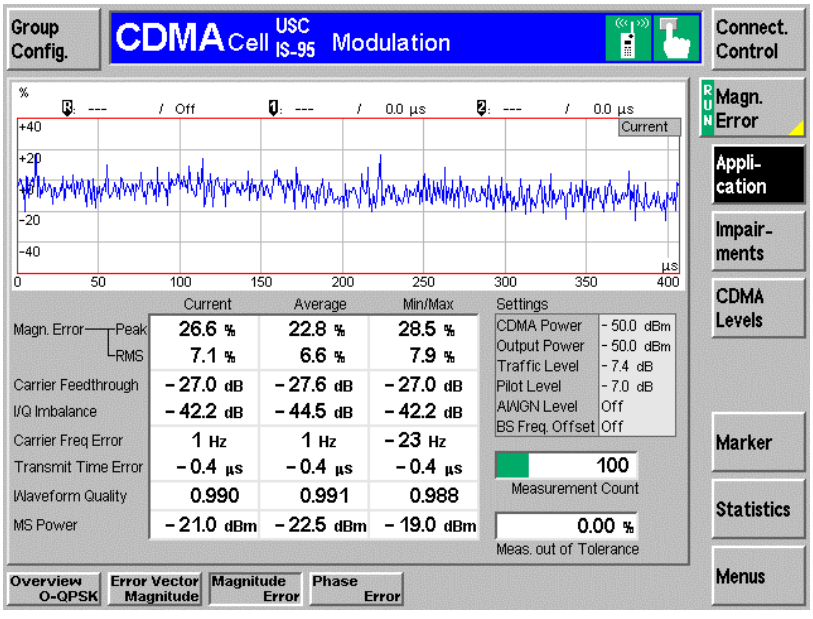


Figure 4-32: Magnitude Error display

Output Table The first two rows of data are specific to the selected modulation measurement. The information in the remaining rows are identical for each modulation measurement.

Magnitude Error (Peak) (RMS) The peak and the RMS magnitude error values of the current waveform interval are displayed. In addition, the average and extreme values are calculated.

Error Vector Magnitude (EVM) Measurement

Error Vector Magnitude is a calculated percentage of vector error (at the detection points) between the received signal and an ideal signal. The Error Vector Magnitude application plots a graph of the vector error as percentage versus. time.

The graphical output represents the current interval of the measurement.

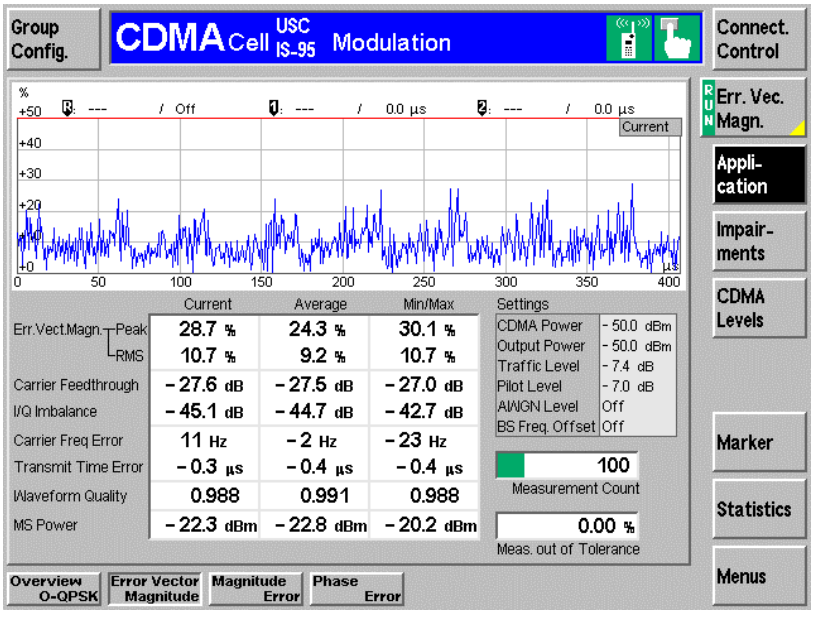


Figure 4-33: Error Vector Magnitude display

Output Table The first two rows of data are specific to the selected modulation measurement. The information in the remaining rows are identical for each modulation measurement.

Error Vector Magnitude (Peak) (RMS) The peak and the RMS error vector magnitudes of the current waveform interval are displayed. In addition, the average and extreme deviations are calculated.

Modulation Configuration

The popup menu *Modulation Configuration* contains three tabs that 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 EXP/CMP key to expand or compress the list of settings displayed.

Modulation Configuration Control

The *Control* tab controls the modulation measurement applications by determining:

- Impairments
- CDMA Levels
- Repetition Mode
- Stop Condition

These parameters are common for all modulation applications.

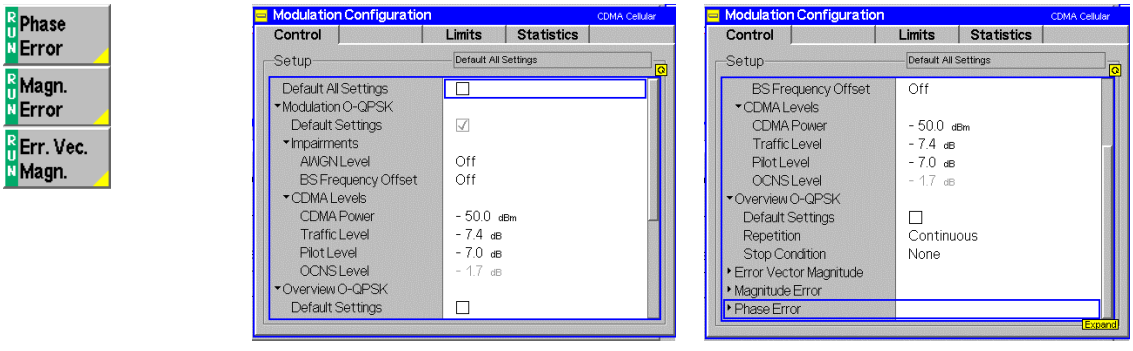


Figure 4-34: Modulation Control Configuration Display

Default All Settings — *Default All Settings* assigns default values to all parameters of the *Control* tab.

Default Settings — *Default Settings* (located below each application heading) assigns default values to the parameters of the specific application.

Repetition — *Repetition* determines the repetition mode.

Single Shot: The measurement is stopped after a statistic cycle, i.e. after the number of waveform intervals/evaluation periods set in the configuration menu *Statistics* (refer to page 4.46). The *Stop Condition* setting may stop the measurement before completion of a cycle. A stopped measurement is indicated by the status display *HLT* in the measurement softkey.

Single shot should be selected if only a single measurement result is required under fixed conditions.

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

The continuous measurement is suitable for monitoring the evolution of a measured quantity in time, for example when performing 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, refer to chapter 6 of this manual.*

The Stop Condition setting can affect the Single Shot and Continuous repetition modes.

Stop Condition *Stop Condition* selects one of two stop conditions for the measurement:

NONE The measurement continues even if tolerances are exceeded

On Limit Failure The measurement is stopped when a tolerance is exceeded

Note: *The stop condition may affect the single-shot and continuous measurement repetition modes.*

AWGN Level *AWGN Level* turns on the Additive White Gaussian Noise generator. Refer to page 4.7 for additional information.

BS Frequency Offset *BS Frequency Offset* adjusts the carrier frequency of the Base Station.

CDMA Power *CDMA Power* sets the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Traffic Level *Traffic Level* sets the forward traffic channel level in the forward CDMA channel.

Pilot Level *Pilot Level* sets the level of the Pilot Channel in the forward CDMA channel.

OCNS *OCNS* displays the level of the Orthogonal Channel Noise Simulator. The OCNS automatically adds power along with the sum of the data, traffic, paging, sync, and pilot levels so that their sum equals the nominal base station power.

Grid *Grid* switches the grid on or off in the graphical test diagram. The default setting is on.

Modulation Configuration Limits

The *Limits* tab allows you to set the limits for the modulation measurements. Two sets of limits are configurable for each measurement: the Current and Maximum/Minimum measurement limits and the Average measurement limits.

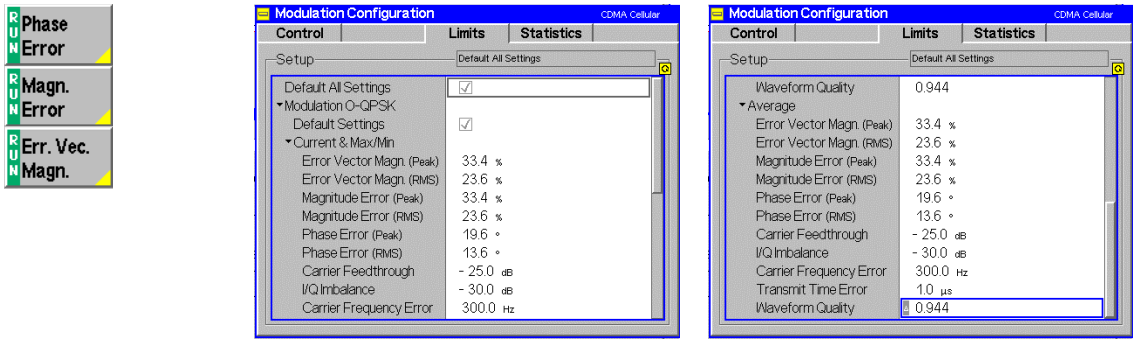


Figure 4-35: Modulation Limits Configuration Display

Default All Settings — The *Default All Settings* switch assigns default values to all parameters of the modulation *Limits* tab.

Default Settings — *Default Settings* assigns default values to all parameters of the *Limits* tab for all modulation measurements reported in the Overview O-QPSK display.

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).

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

Modulation Configuration Statistics

The *Statistics* tab defines the number of measurement intervals constituting a statistic cycle.

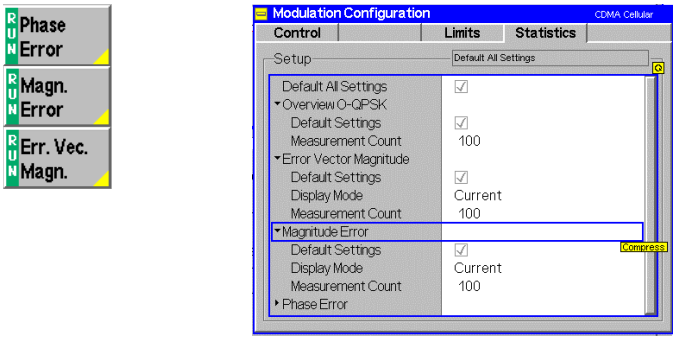


Figure 4-36: Modulation Statistics Configuration Display

Default All Settings

The *Default All Settings* switch assigns default values to all parameters of the modulation *Statistics* tab.

Default Settings

The *Default Settings* switches located below each application heading assigns default values to all parameters of the specific application.

Display Mode

Display Mode sets which measurement values are displayed as a graph.

- *Current* Measured value for the current waveform interval
- *Max/Min* Extreme value over a number of waveform intervals.
- *Average* Average value over a number of waveform intervals

The number of cycles for the calculation of the statistic values *Minimum/Maximum* and *Average* depends on the repetition mode set in the *Control* tab.

- Single shot: Display of minimum, maximum and average value from the performed statistic cycle.
- Continuous: Display of minimum and maximum values from all waveform intervals already measured. The average value refers to the last statistic cycle using a sliding window effect.

Measurement Count

Measurement Count defines the length of the statistic cycles in waveform intervals/evaluation periods.

- *1 to 1000* Number of intervals per statistic cycle.

Receiver Quality Measurements

The menu group *Receiver Quality* measures parameters which characterize the transmission quality of the complete transmission path from the CMU to the device under test (mobile station) and back. Assuming no transmitter errors, this allows assessment of the mobile station's receiver performance at various RF power levels.

The measurements in the menu group *Receiver Quality* assume that a call has been set up (signalling state *Call Established)*.

The Receiver Quality measurements are based on the comparison of the output signal sent by the CMU with the signal received and decoded by the device under test (mobile station).

The mobile station must return the received signal to the CMU in loop back mode.

Because of the higher signal level, the transmission errors produced on the way back (from the mobile station to the CMU) can usually be neglected. However, frames destroyed on the way back are detected in a cyclic redundancy check (CRC) and counted. They are not taken into account in the calculation of transmission errors.

The quality of the mobile station transmitter can be tested separately in the *Modulation* measurement.

The *Receiver Quality* measurement is typically activated by pressing the *Receiver Quality* hotkey (see Figure 4-37).

Note: *This menu is also directly accessible from the main menu screen.*

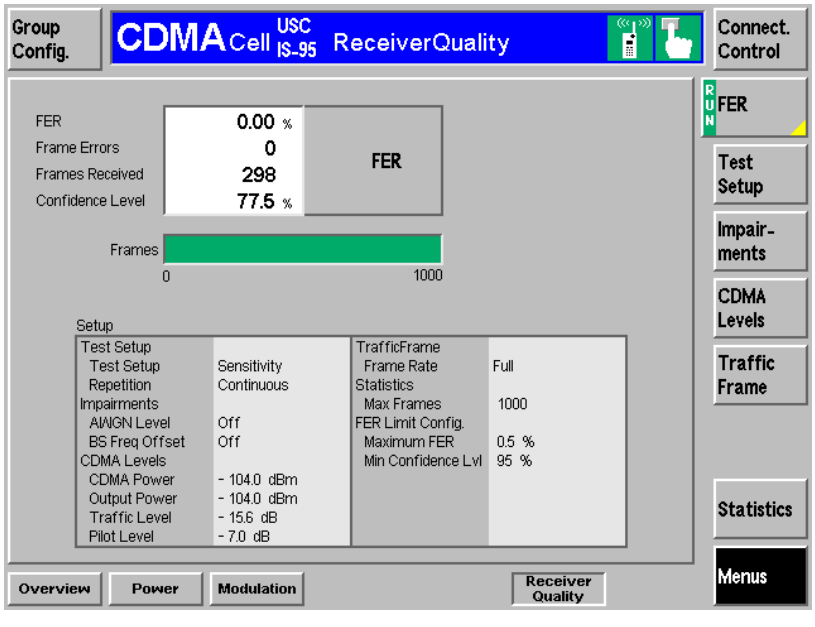


Figure 4-37: Receiver Quality Measurement menu

The measurement softkey indicates status of the measurement *(RUN | HLT | OFF)* and opens the configuration menu *Receiver Quality Configuration*.

Softkey Selections

Test Setup

The *Test Setup* softkey displays a set of hotkeys to select one of the test setups to use as the parameters for the receiver quality test.

Sensitivity

The *Sensitivity* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA-98 for sensitivity testing.

Dyn. Range

The *Dynamic Range* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA-98 for dynamic range testing.

TCH Demod

The *Traffic Channel Demodulation* hotkey contains predefined parameter settings to test the receiver quality as defined in standard TIA/EIA-98 for traffic channel demodulation testing.

User 1

The *User 1* hotkey is available to store user defined parameters for testing receiver quality.

User 2

The *User 2* hotkey is available to store user defined parameters for testing receiver quality.

Repetition

The *Repetition* hotkey displays a popup window to select the repetition mode of the measurement between continuous and single shot.

Remote control

```
CONFigure:RXQuality:FER:TSETup <TestSetup>

INITiate:RXQuality:FER
ABORt:RXQuality:FER
STOP:RXQuality:FER
CONTinue:RXQuality:FER
```

Impair-ments

The *Impairments* softkey displays a set of hotkeys to adjust the AWGN and BS frequency offset.

AWGN

The *AWGN* hotkey activates and adjusts the Additive White Gaussian Noise (AWGN) generator. Refer to page 4.7 for additional information.

Remote control

```
CONFigure:RXQuality:FER:TSETup<nr>:IMPairments <AWGN_Lev>
```

BS Freq. Offset

The *BS Freq Offset* hotkey adjusts the carrier frequency of the Base Station.

Remote control

```
CONFigure:RXQuality:FER:TSETup<nr>:IMPairments <Freq_Offset>
```

CDMA Levels

The *CDMA Levels* softkey displays a set of hotkeys to adjust the CDMA power and channel levels.

CDMA Power

The *CDMA Power* hotkey displays a popup window to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Remote control `CONFigure:RXQuality:FER:TSETup<nr>:LEVel <CDMA_Power>`

Traffic Level

The *Traffic Level* hotkey displays a popup window to set the Traffic Channel level in the forward CDMA channel.

Remote control `CONFigure:RXQuality:FER:TSETup<nr>:LEVel <Traffic_Lev>`

Pilot Level

The *Pilot Level* hotkey displays a popup window to set the Pilot Channel level in the forward CDMA channel.

Remote control `CONFigure:RXQuality:FER:TSETup<nr>:LEVel <Pilot_Lev>`

Traffic Frame

The *Traffic Frame* softkey displays a hotkey to adjust the frame rate.

Frame Rate

The *Frame Rate* hotkey displays a popup window to set the frame rate to Full, Half, Quarter, or Eighths.

Remote control `CONFigure:RXQuality:FER:TSETup<nr>:FRATe <Rate>`

Statistics

The *Statistics* softkey displays a hotkey to adjust the maximum number of frames.

Max Frame

The *Max. Frame* hotkey displays a popup window to set the maximum number of frames.

Remote control `CONFigure:RXQuality:FER:TSETup<nr>:CONTrol:STATistics <Max_Frames>`

Measurement Results

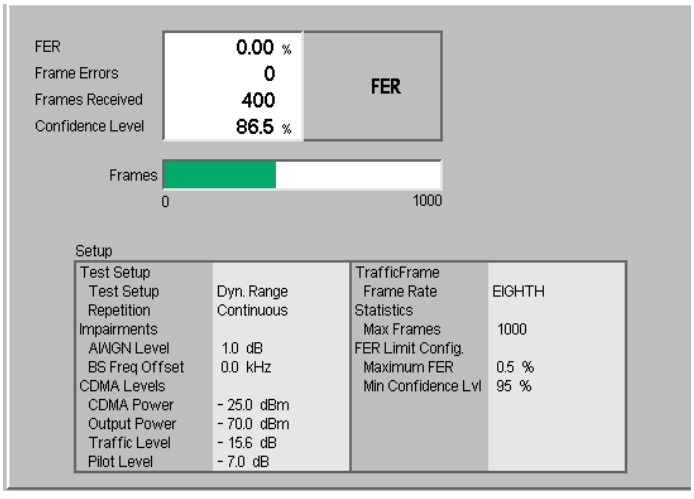


Figure 4-38: Measurement Display Results (Receiver Quality)

FER *FER* displays the percentage of the Frame Error Rate over the total number of received frames.

Frame Errors *Frame Errors* lists the total number of frame errors.

Frames Received *Frames Received* lists the total number of frames received. This number is used for the calculation of the FER.

Confidence Level *Confidence Level* indicates the statistical probability that the true FER is within limits based on the current number of frame errors compared to the number of frames received.

Frames *Frames* is a bar graph indicating the measurement progress.

Receiver Quality Configurations

The popup menu *Receiver Quality Configuration* contains three tabs to set the parameters of the receiver Quality measurements.

Pressing the measurement softkey at the top right in the measurement menu activates the popup menu Receiver Quality Configuration. It is possible to change between the index cards by pressing the associated hotkeys. Use the EXP/CMP key to expand or compress the list of settings displayed.

Receiver Quality Configuration Control

The *Control* tab controls the receiver quality measurements by determining

- The Repetition mode
- The Stop Condition for the measurement
- Power Levels
- AWGN generator
- BS carrier frequency offset
- Frame rate

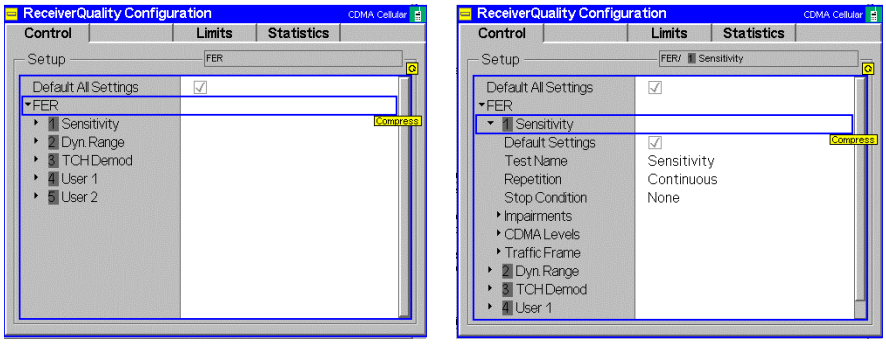


Figure 4-39: Receiver Quality Configuration Control

Default The first *Default* switch overwrites all settings in the *Control* tab with default values. Default switches are available for each application to set individual tests to their default settings.

Test Name The test name allows you to enter a descriptive name for the test based on the parameters you set. The default test names can be renamed to more accurately describe you test or you can create two new tests using the User1 and User2 selections. The name entered here displays in the hotkey bar for Test Setup softkey.

Repetition

Repetition selects the repetition mode:

- *Single Shot*: The measurement is stopped after a statistic cycle, i.e. after the number of frames set. A stopped measurement is indicated by the status display *HLT* in the measurement softkey. The single shot measurement may not complete if the Stop Condition is met.
- *Continuous:* The CMU continues the measurement unless the Stop Condition for the measurement is met. The measurement results are valid after one statistic cycle; however, the measurement is continued, and the output is continuously updated. An ongoing measurement is indicated by the status display *RUN* in the measurement softkey.

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 over time, for example, for adjustments.

Stop Condition

Stop Condition selects one of two stop conditions for the measurement:

- *NONE:* Continue the measurement even in the event of errors.
- *Confidence Limit Exceeded:* Stop the measurement when the confidence level exceeds the set limit. This indicates the probability that the true FER is less than the set FER limit.
- *Frame Limit Exceeded:* Stop the measurement when the number of frame errors exceed the set limit.
- *Any Limit Exceeded:* Stop the measurement if either the *Confidence Limit* or *Frame Limit* is exceeded.

The stop conditions may affect single-shot and continuous measurement settings.

AWGN Level

AWGN Level turns on the Additive White Gaussian Noise generator. Refer to page 4.7 for additional information.

BS Frequency Offset

BS Frequency Offset adjusts the carrier frequency of the Base Station.

CDMA Power

CDMA Power sets the total CDMA output power. The CDMA Power level does not include the AWGN power level.

Traffic Level

Traffic Level sets the forward traffic channel level in the forward CDMA channel.

Pilot Level

Pilot Level sets the level of the Pilot Channel in the forward CDMA channel.

Frame Rate

Frame Rate sets the frame rate to Full, Half, Quarter, or Eighth.

Receiver Quality Configuration Limits

The *Limits* tab defines tolerance limits for the maximum frame error allowed and the confidence level of the error rate.

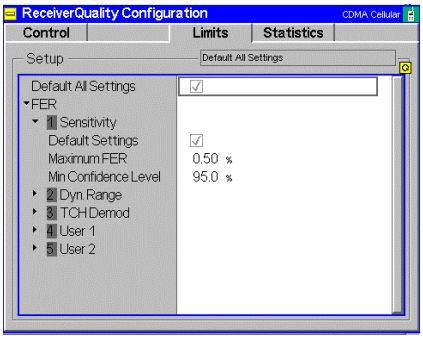


Figure 4-40: Receiver Quality Configuration Limits

Default

The *Default All Settings* switch overwrites all settings in the *Limits* tab with default values.

The *Default Setting* switches under each measurement heading sets the settings for that measurement to its default settings.

Max FER

The *Max FER* sets the maximum frame error rate allowed before indicating an error.

Min Confidence Level

The *Min Confidence Level* sets the minimum confidence level of the error rate that must be met without indicating an error.

Receiver Quality Configuration Statistics

- The *Statistics* tab defines the maximum number of frames used for the measurement.

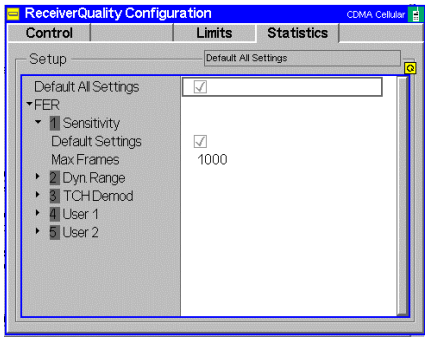


Figure 4-41: Sensitivity Configuration Statistics

Default The *Default All Settings* switch overwrites all settings in the *Statistics* tab with default values.

The Default Setting switches under each measurement heading sets the settings for that measurement to its default settings.

Max Frames The *Max Frames* sets the maximum number of frames used to calculate the frame error rate.

Popup Menu Connection Control

The menu group *Connection Control* controls the signalling procedures (call setup and release, services, signalling parameters) and determines the inputs and outputs with the external attenuation values and the reference frequency.

Since the measurements in signalling mode require an existing connection to a mobile station, the menus for setting up the call (*Connection Control - Signalling*) appear immediately after selecting the Function Group and Mode *CDMA Cellular MS Signalling* in the Menu Select menu (unless the auto popup is disabled). The connection control menus can be accessed any time by pressing the *Connect Control* softkey at the top right corner in every measurement menu. The hotkey bar (at the bottom the screen) links the measurement menus together. Pressing the *Escape* key or the *Connect Control* softkey closes the connection control menu and the CMU changes to the measurement mode.

The tab *Connection Control - Signalling* displayed during registration is described in section *CDMA Measurements with Signalling* beginning on page 4.14. The remaining tabs of the *Connection Control - Signalling* menu are described here.

Signalling Control with Call Established (Connection Control - Call Established)

The popup menu Signalling (Call Established) provides information on the signalling parameters of the mobile station (Mobile Info) and permits the signalling parameters to be entered.

The softkeys *Signal Off* and *Call Release* lead to different signalling states. Signal Off returns the CMU to the Signal Off state and Call Release returns the CMU to the MS Registered state.

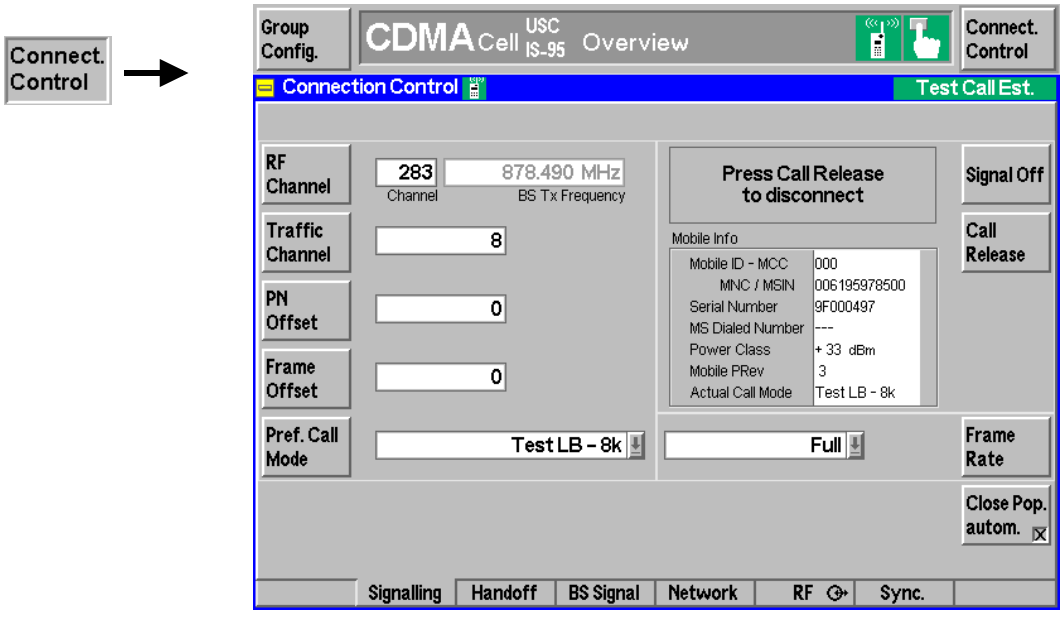


Figure 4-42: Connection Control – Signalling (Test Call Established)

Header Message

A header Message displayed in each Signalling index card provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Press Call Release to disconnect` is displayed.

Mobile Info

In the Call Established state, the display box contains the mobile identification and power class information, and the actual call mode type established.

RF Channel

The *RF Channel* softkey defines the base station channel number (and frequency) of the generated RF signal.

In most cases, the default setting will successfully establish a call to the mobile under test. This setting may need to be changed if there is interference from other base stations or signals at or near the same frequency.

Remote control

```
PROCedure:BSSignal:SIGNalling:RFCHannel <Number>
```

Traffic Channel

The *Traffic Channel* softkey sets the traffic channel to a value between 2 and 31 or 33 and 63.

Remote control

```
PROCedure:BSSignal:SIGNalling:TCH <Number>
```

PN Offset

The *PN Offset* softkey sets the PN offset to a value between 0 and 511. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Remote control

```
PROCedure:BSSignal:SIGNalling:PNOFfset <Number>
```

Frame Offset

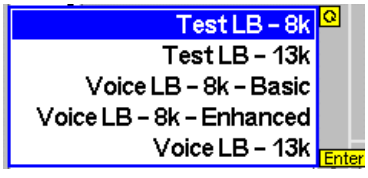
The *Frame Offset* softkey can be set to a value between 0 and 15. Changing the Frame Offset immediately changes the traffic channel timing, and a hard handoff is performed.

Remote control

```
PROCedure:BSSignal:SIGNalling:FOFFset <Number>
```

Pref. Call Mode

The *Pref. Call Mode* softkey displays a list of call modes available to use when establishing a call to the mobile station. (The choice made here is the preferred method.) If the mobile does not support the selected call mode, the CMU and mobile station negotiate a call mode. This will be reported in the Mobile Info window after the mobile station has registered with the CMU.



CDMA measurements require that a test loop back call be established with the mobile station. The voice loopback modes are used to place a voice call to the mobile.

Remote control

```
PROCedure:BSSignal:SIGNalling:CMODe <Mode>
```

Signal Off

The *Signal Off* softkey switches off the CMU's control channel.

By switching off the signal, the call is disconnected and the CMU changes to the signalling state *Signal Off*.

Remote control `PROCedure:Signalling:ACTion SOFF`

Call Release

The *Call Release* softkey releases the call from CMU to the mobile station. The CMU returns to the Connection Control MS Registered state (refer to page 4.26).

Remote control `PROCedure:Signalling:ACTion CRELease`

Frame Rate

The *Frame Rate* softkey allows you to set the frame rate to Full, Half, Quarter, or Eighth when establishing a test loopback call.

Remote control `CONFigure:BSSignal:SIGNalling:FRATe <Rate>`

Close Pop. autom.

The Close Pop. autom. softkey contains a field to activate or suppress display of the popup menu Signalling (Call Established state).

In the default setting (box checked), the popup menu is closed as soon as the signalling state call established is reached or a handoff is performed.

Deselecting the check box requires that the popup menu be closed explicitly (using the *Escape* key) to continue to the measurement.

Handoff to Another Network (Connection Control - Handoff)

The popup menu *Handoff* initiates a handoff of the established call to a different network. Since a call needs to be established, this menu is only available in the *Call Established* signalling state. The handoff includes:

- Selection of the target network (*Destination Selection*) and the handoff parameters (*Destination Parameter* and *Destination Defaults*)
- Start of the handoff procedure (*Handoff*)
- Display and modification of the parameters of the original network (*Origin Parameter*)

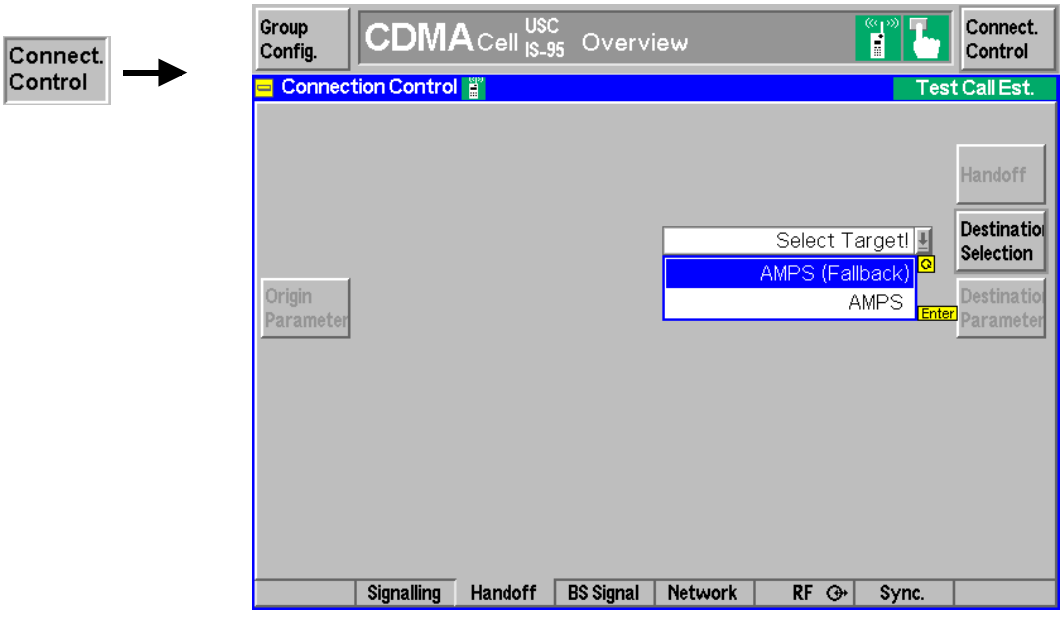


Figure 4-43: Connection Control – Handoff

Header Message

A header Message displayed in each Signalling menu provides the current instrument state or indicates how to proceed to get to other signalling states. In this instance, the message `Press the "Handoff" key to perform a Handoff from the Origin to the Destination Network` is displayed.

Destination Selection

The *Destination Selection* softkey selects the target network for the handoff.

A handoff destination with fallback (AMPS Fallback) causes the CMU to return to the function group of the origin network after the call is released.

The Destination Selection list is automatically adapted to the connected mobile. From the CDMA network, a handoff to the analog (AMPS) network is supported.

Once the selection is confirmed (pressing the *Enter* key) the menu changes to the *Handoff Preparation* screen. The entire Connection Control menu is mapped onto the target function group making it possible to edit the *Destination* parameters, the *BS Signal*, and the *Network* parameters of the target network.

Remote control

```
STATus:HANDoff:TARGet:LIST?
CONFigure:HANDoff:TARGet <Target>
```

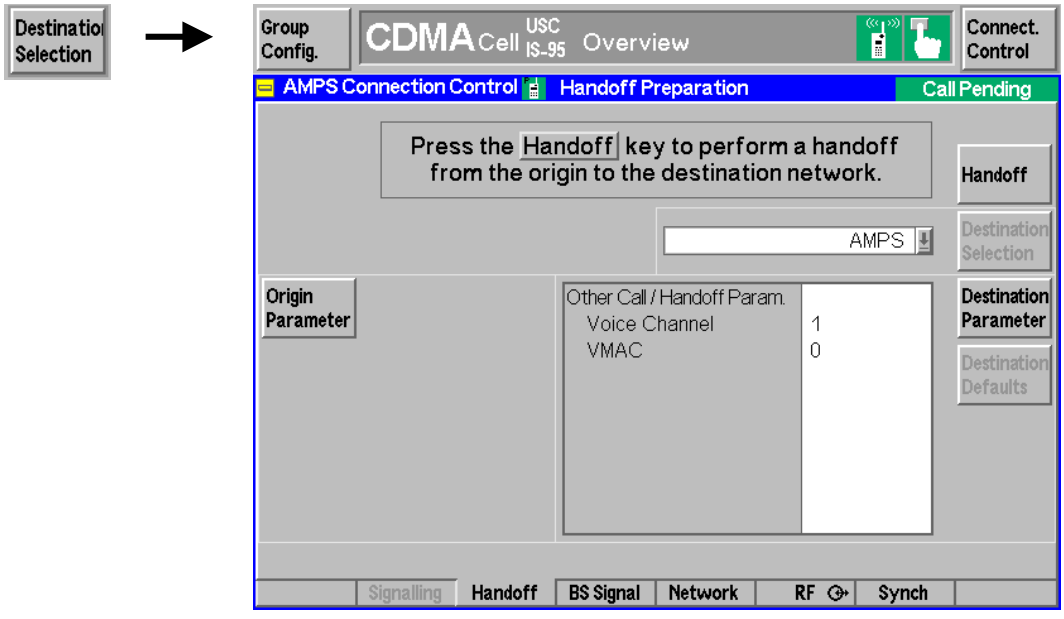


Figure 4-44: Connection Control – Handoff (Cont.)

Handoff	The *Handoff* softkey initiates the handoff to the target network.
Destination Parameter	The *Destination Parameter* softkey sets the parameters of the target network for handoff.
Destination Defaults	The *Destination Defaults* softkey sets the parameters of the target network to default values.
Origin Parameter	The *Origin Parameter* softkey cancels the handoff procedure and resets the CMU to the *Call Established* signalling state.

Signals of the CMU (Connection Control - BS Signal)

The popup menu *BS Signal* configures the signals of the CMU (which simulates a base station transmitting a control channel and a traffic channel signal), selects frequency offset, and indicates the transmission parameters. The range of functions of the menu depends on the signalling state:

- Some signal settings must be performed before a call is sent to the mobile station. They are available in the signalling states *Signal Off, Signal On,* and *MS Registered*.
- Parameters of the mobile station are only available after the call has been set up (i.e. in the signalling state *Call Established*).

Signal Parameters (Signal States Off, On, Registered)

The popup menu *BS Signal* configures the signals of the CMU. Use the EXP/CMP key to expand or compress the list.

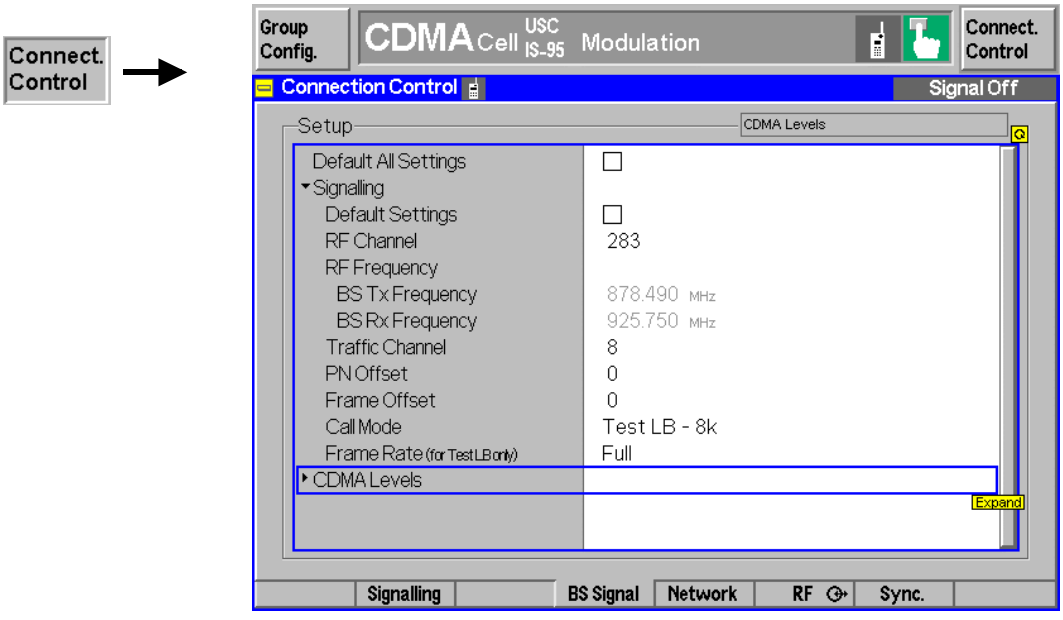


Figure 4-45: Connection Control – BS Signal

Default

The *Default All Settings* switch overwrites all settings in the *Limits* tab with default values.

The *Default Setting* switches under each subhead only affects the items under that subhead.

Signalling

RF Channel — *RF Channel* defines the base station channel number (and frequency) of the generated RF signal.

RF Frequency — The Base Station's Transmit Frequency and Receive Frequency are displayed. The frequencies displayed are dependent on the setting of the RF Channel.

Traffic Channel — *Traffic Level* sets the forward traffic channel level in the forward CDMA channel.

PN Offset — *PN Offset* allows you to set the PN offset. Changing the PN offset changes the timing of the pilot channel, the timing and contents of the sync channel message, and the long code mask of the paging channel.

Frame Offset — *Frame Offset* allows you to set a frame offset. Changing the Frame Offset immediately changes the traffic channel timing, and a hard handoff is performed.

Call Mode	*Call Mode* allows you to choose the call mode available to use when establishing a call to the mobile station. (The choice made here is the preferred method.) Refer to the Pref. *Call Mode* softkey in the Signal Off section beginning on page 4.22 for more details.
Frame Rate	*Frame Rate* allows you to set the frame rate to Full, Half, Quarter, or Eighth when establishing a test loopback call.

CDMA Levels

CDMA Power	*CDMA Power* allows you to set the total CDMA output power. The CDMA Power level does not include the AWGN power level.
Traffic Level	*Traffic Level* allows you to set the Traffic Channel level in the forward CDMA channel. The Traffic Level specifies the FULL frame rate traffic channel level.
Paging Level	*Paging Level* allows you to set the signal level of the paging channel in the forward CDMA channel relative to the total output power.
Sync Level	*Sync Level* allows you to set the signal level of the sync channel in the forward CDMA channel.
Pilot Level	*Pilot Level* allows you to set the Pilot Channel level in the forward CDMA channel.

Network Parameters (Connection Control - Network)

The popup menu *Network* displays the current network settings to match that of the mobile station under test. Use the EXP/CMP key to expand or compress the list.

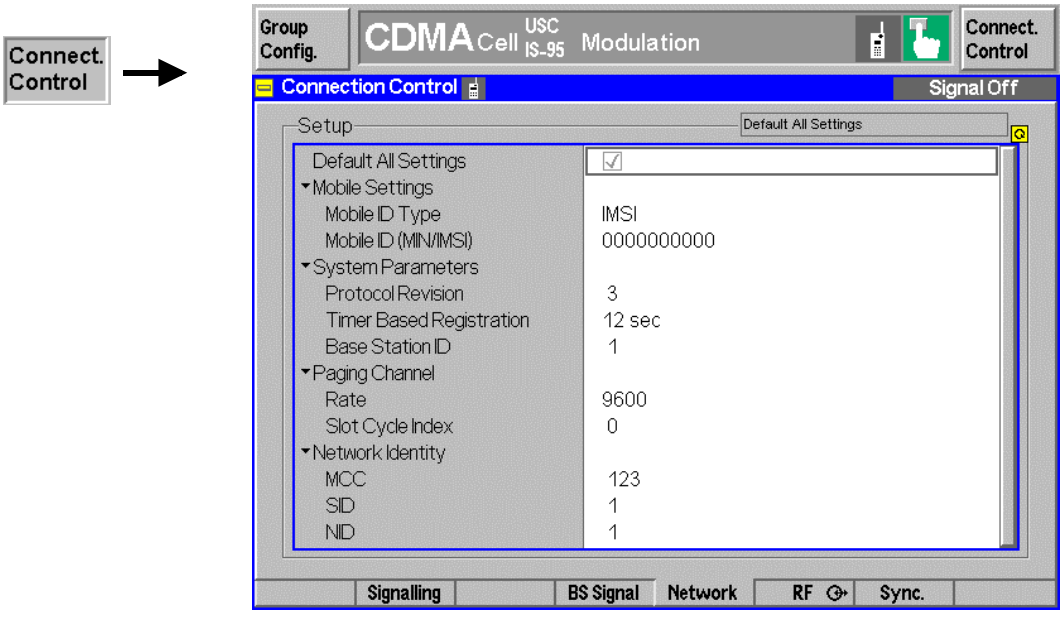


Figure 4-46: Connection Control – Network Parameters

Mobile Settings

Mobile ID Type

Mobile ID Type allows you to set the type of ID number of the mobile station (MIN or IMSI).

Mobile ID (MIN/IMSI)

Mobile ID (MIN/IMSI) allows you to enter the MIN or IMSI (mobile ID) of the mobile station. You are not required to provide this information. However, entering the mobile ID provides the tester with the necessary information so that you can use the *CALL MOBILE* softkey without waiting for registration. This number is retained from the last entered value or the last mobile station to register with the tester.

For some protocol revisions, you can choose either a MIN or an IMSI mobile ID. For other protocol revisions, a choice of mobile ID is not available.

Note: *The CMU requires either a MIN or an IMSI mobile identification type.*

System Parameters

Protocol Revision

Protocol Revision sets the preferred version of the protocol for the CMU to use. The selections are:

1 = TIA/EIA/IS-95
2 = TIA/EIA/IS-95-A
3 = TIA/EIA/TSB-74

Timer Based Registration	*Timer Based Registration* sets the interval that the mobile station is to use to register with the tester. You can set a range of values from 12 seconds to approximately 2 minutes. If set to OFF, the mobile station discontinues periodic registration with the tester.
Base Station ID	*Base Station ID* sets the base station identification.

Paging Channel

Rate	*Rate* sets the paging rate of the base station's paging channel.
Slot Cycle Index	*Slot Cycle Index* sets which slot cycle the paging channel uses.

Network Identity

MCC	MCC is the Mobile Country Code.
SID	SID is the System Identification.
NID	NID is the Network Identification.

RF Connectors (Connection Control - RF ⟳)

The popup menu *RF* ⟳ selects the connectors for RF signals. This includes defining the following.

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

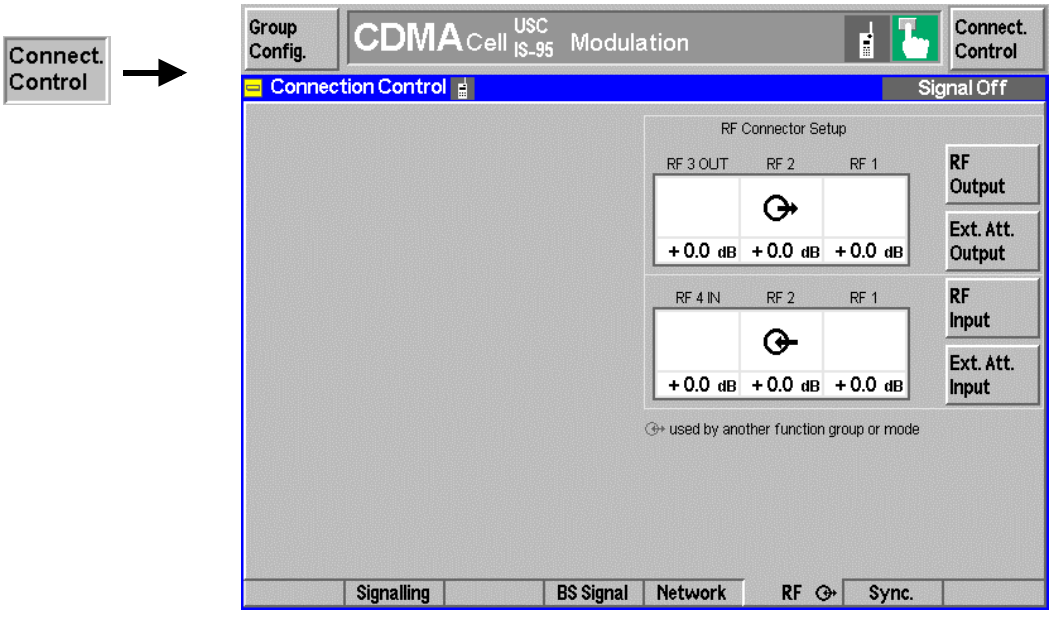


Figure 4-47: Connection Control – RF Connectors

The functions of this menu are described in the CDMA800MS Non-Signalling section beginning on page 4.11

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)*

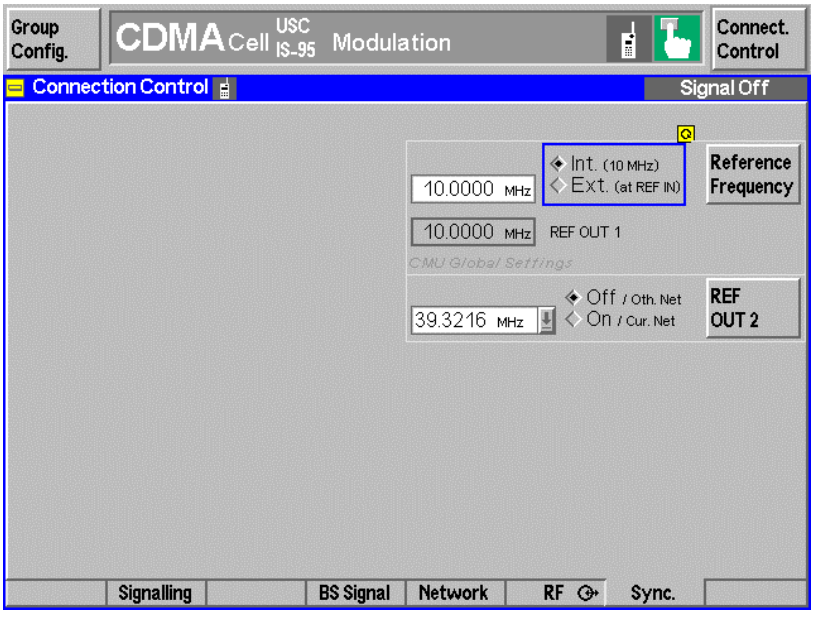


Figure 4-48: Connection Control – Synchronization

The functions of this menu are described in the CDMA800MS Non-Signalling section beginning on page 4.14

Group Configuration

The popup menu *Group Configuration* (while in Signalling mode) contains tabs to globally configure the CDMA Signalling function group (settings that are valid for all measurements within the function group). Most of these settings can be overwritten in the individual measurement menus using the softkeys and popup input fields.

The popup menu *Group Configuration* is activated by pressing the softkey *Group Config*. at the top-left of each menu header. The individual popup menus are accessed using the hotkeys at the bottom of the screen.

Internal Settings (Group Configuration – Internal)

The *Internal* tab configures the AWGN Bandwidth setting between either 1.23 MHz or 1.8 MHz.

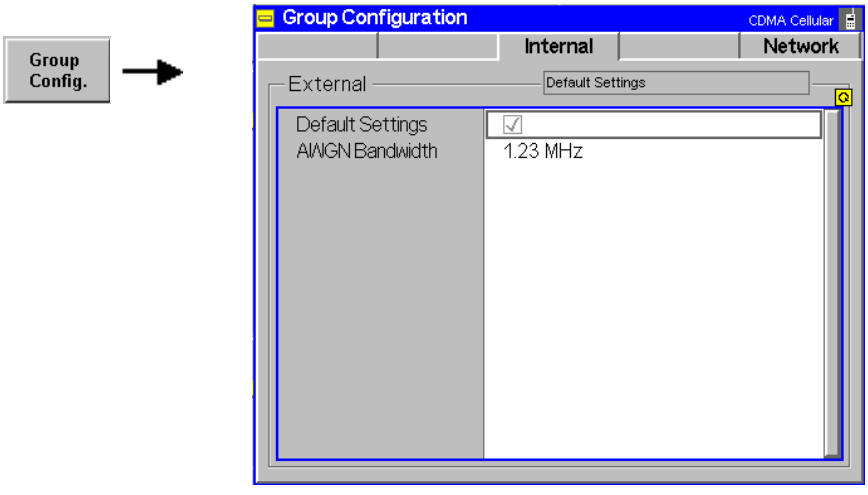


Figure 4-49: Group Configuration – Internal

Network and Standard (Group Configuration – Network)

The *Network* tab defines which network and standard is used for testing.

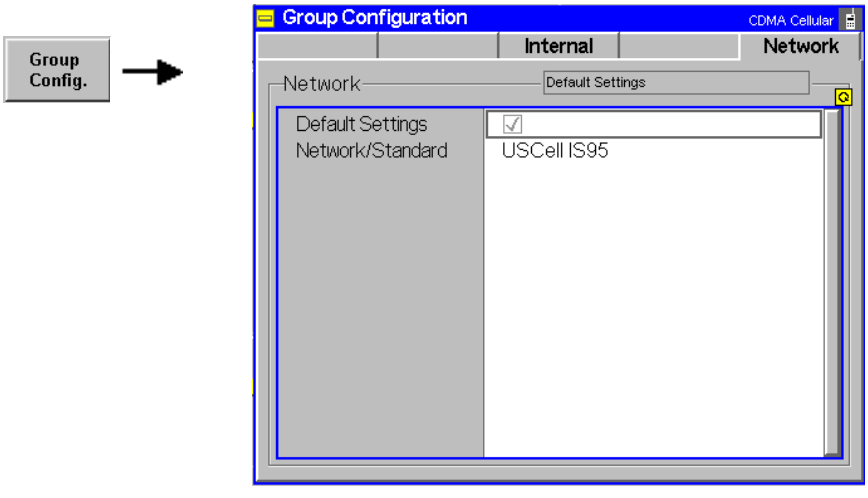


Figure 4-50: Group Configuration – Network

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

The *Ref* 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 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

The *Delta* 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 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.

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5 Remote Control – Basics

This chapter gives a survey of the basic features and concepts of CDMA 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 CDMA remote control commands, including their parameters, default values and ranges of all numerical parameters.

Function groups and test modes

Commands for the various CDMA-MS function groups are largely identical, however, the ranges of numerical values and some default settings may differ. All differences are explicitly quoted for each function group.

Commands for the two modes *Signalling* and *Non-Signalling* are listed separately although many of them have the same syntax.

Addressing

The CMU 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_CDMA_Cell_MS_SIG, "INITiate:POWer")
ibwrt(h_CDMA_PCS_MS_SIG, "INITiate:POWer")
ibwrt(h_CDMA_PCS_MS_NSIG, "INITiate:POWer")
```

provided that the variables `h_CDMA_Cell_MS_SIG, 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.

Order of commands

The commands are arranged to form groups belonging to the same measurement or to the same type of configurations. These command groups are identified by the second-level keyword (as in `POWer`). Applications belonging to a measurement group (see Chapter 5 of the CMU operating manual) are identified by the third-level keyword of each command (as in `MODulation: EVMagnitude`). Chapter 6 is organized as follows:

CDMA Non-Signalling:

General configurations (second-level keywords `NSTandard, LEVEL, INTernal, EXTernal, RFANalyzer, RFGenerator, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`)

Measurement groups: `MODulation`

CDMA Signalling:

General configurations and signalling (`NSTandard, LEVel, INTernal, SIGNalling, HANDoff, BSSignal, NETWork, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`).

Measurement groups: (second/third-level keywords `MSSinfo, SAPPower, OVERview:POWer, OVERview:MODulation, OVERview:CQUality, POWer:OLTResponse, POWer:MIOutput, POWer:MAOutput, POWer:GOUTput, MODulation:OVERview, MODulation: EVMagnitude, MODulation:PERRor, MODulation:MERRor, RXQuality:FER`).

The structure of Chapter 6 differs from Chapter 4 *(Functions and their Application)* where the measurements are presented first and configurations pertaining to the whole function group and test mode are reported at the end of each section.

The menu of the graphical user interface corresponding to a group of commands is quoted at the beginning of each section. Alphabetical lists of all commands are annexed to Chapter 6.

SCPI Conformity

In view of the particular requirements of CDMA 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 *Power*, *Modulation,* and *Receiver Quality* 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 CDMA measurements.

Measurement Groups

The measurement groups are referred to as *measurement objects* (keyword <meas_obj>) in remote control. For CDMA measurements, the following measurement objects are defined:

Table 5-1 : Measurement objects in the Signalling and Non-Signalling Mode

Non Signalling	Signalling
MODulation... Waveform quality, Frequency Error, Transmit Time Error, Carrier Feedthrough, and I/Q Imbalance statistical results and the results of the limit check can be evaluated.	**POWer...** Power as a function of time including statistical evaluations and the results of the limit check.
	MODulation... Phase error of the waveform interval as a function of time. The frequency error, average and RMS phase error, statistical results and the results of the limit check can be evaluated.
	RXQuality:FER Frame error rate test with limit check.

The measurement objects in Table 5-1 are complemented by groups of commands used to retrieve results that are automatically provided by the mobile station (e.g. the receiver parameters reported by the mobile phone). These command groups do not represent real measurement objects; they consist of queries only and are called pseudo measurement objects. For an overview, see the list of remote control commands at the end of Chapter 6.

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.

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 (POWer | MODulation) or a frame (RXQuality). In an RXQuality:FER measurement, the STATistics parameter denotes the number of frames to be averaged per iteration step (search cycle).	CONFigure:<meas_obj>:CONTrol:STATistics **1 ... 1000 | NONE** (<meas_obj> = OVERview:CQUality | POWer... | MODulation...) CONFigure:RXQuality:FER:TSETup<nr>:CONTrol:STATistics **1 ... 20000**
Repetition mode Single Shot	The measurement is stopped after one statistics cycle.	CONFigure:<meas_obj>:CONTrol:REPetition **SINGleshot**, <StopCondition>, <Stepmode> (<meas_obj> = OVERview... | POWer... | MODulation...| RXQuality:FER:TSETup<nr>)
Continuous	The measurement is continued until stopped explicitly or by a limit failure. The statistics window for the calculation of average results is continuously shifted (continuous averaging).	CONFigure:<meas_obj>:CONTrol:REPetition **CONTinuous**, <StopCondition>, <Stepmode> (<meas_obj> = OVERview... | POWer... | MODulation...| RXQuality:FER:TSETup<nr>)
Counting	Repeated single shot measurement with configured statistics cycles.	CONFigure:<meas_obj>:CONTrol:REPetition **1 ... 1000**, <StopCondition>, <Stepmode> (<meas_obj> = POVERview... | POWer... | MODulation...| RXQuality:FER:TSETup<nr>) 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 | MMAX <meas_obj> = POWer:TIME | MODulation:DEViation 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> = OVERview... | POWer... | MODulation...`
		`<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.
		`CONFigure:RXQuality:FER:TSETup<nr>:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue`

Limit lines	For Gated Output Power, a tolerance template consisting of several areas can be defined.	`CONFigure:POWer:GOUTput:CAMMax:LIMit:LINE:SYMMetric[:COMBined] <Limit_line_param.>` <Limit_line_param.> represents a set of numbers pinning down the power template .
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?`
	Possible results of the scalar limit check are listed on the right side. Further messages assessing, e.g., the power ramp or the result of the BER test in general, may be issued in particular cases (see detailed command description in Chapter 6).	`NMAU` not matching, underflow `NMAL` not matching, overflow `INV` measured value invalid `OK` no limit failure

Status Reporting System

A general description of SCPI status registers and of the status reporting system is given in Chapter 5 of the CMU operating manual. This section is devoted to the particular features concerning CDMA 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 CONDition part, the STATus:OPERation register contains information on which actions the instrument is being executing or, in the EVENt part, information on which actions the instrument has exe-

cuted 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>:...`

CDMA mobile tests comprise the two signalling modes *Non-Signalling* and *Signalling* for the function groups *CDMA Cellular MS* and *CDMA PCS MS* so that a total of 2 secondary addresses is used. In the two status registers for the *Non Signalling* mode the bit assignment is as follows:

Table 5-4: Non-Signalling bits used in the STATus:OPERation:SUM1|2:CMU<nr> sub-registers

Bit-No.	Meaning	Symbol in `STAT:OPER:SYMB...`
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	**RFNS**

In the two status registers for the *Signalling* mode the bit assignment is as follows:

Table 5-5:Signalling bits used in the STATus:OPERation:SUM1|2:CMU<nr> sub-registers

Bit-No.	Meaning	Symbol in `STAT:OPER:SYMB...`
0	**Call from Mobile** This bit is set when the CMU receives a call from the mobile under test.	**CFM**
1	**Release from Mobile** This bit is set when the connection to the mobile is being released.	**RFM**
2	**Loss of Radio Link** This bit is set if the CMU had to leave the signalling state "Call Established" (because of a low signal etc.).	**LORL**
3	**Mobile Registered** This bit is set when a registration was successfully performed.	**MREG**
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	**RFNS**
7	**Mobile Deregistered** This bit is set if the CMU had to leave the signalling state "Registered" (because of a low signal etc.).	**MDER**
9	**Traffic Channel Active** This bit is set when voice data is transmitted via the analog voice channel.	**TCH**
11	**RF Input overdriven** This bit is set if one of the three RF input connectors is overdriven.	**RFIO**
12	**RF Input underdriven** This bit is set if one of the three RF input connectors is underdriven.	**RFIU**

Special Terms and Notation

Below we list some particular features in the syntax of the CDMA 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:POWer:MAOutput:CONTrol:STATistics <Statistics>`

Commands with the keyword *POWer* in the second level belong to the power 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 MS maximum output power.

Measurement object

The term *measurement object* denotes a group of remote control commands relating to the same group of measured quantities. E.g., all commands concerning the measurement of the signal power form a common measurement object.

A pseudo-measurement object concerns quantities which do not actually have to be measured because they are automatically obtained during the signalling process (e.g. the receiver parameters reported by the mobile phone).

Combined measurements

To limit the number of remote control command and their parameters scalar quantities of the same measurement object are always measured together and output in lists.

To limit the number of remote control commands, scalar results are always measured together and output in lists. Arrays (e.g. the traces for `POWer` and `MODulation` measurements) are output as lists of values separated by commas; it is possible to retrieve either the whole list (see commands `READ:ARRay`... etc.) or the values located in a number of subranges that are part of the total measurement range (see commands `READ:SUBarrays`...; the subarrays are defined via `CONFigure:SUBarrays`...).

Parameters

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 list separated by commas (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:POWer:MAOutput:CONTrol:STATistics <Statistics>`

with <Statistics> = 1 ... 1000 | NONE

possible command syntax: `CONF:POW:MAO: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.

{ }

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). Within a section, the commands are listed by alphabetical order.

Parameters: The *Parameter* column lists the parameters of the commands.

Remarks: The *Remarks* column gives additional information about the commands which

- Have no query form (no query)
- Have only a query form (query only)
- Can be used both as setting commands and as queries (with query, this applies to all commands belonging to one of the two preceding categories)

Alphabetical Lists Chapter 6 concludes with an alphabetical command list for both test modes.

Contents

6 Remote Control – Commands

In the following, all remote-control commands for the function groups *CDMA800/1900* will be 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).

- The measurement modes *Non-Signalling* and *Signalling* are presented separately.
- Within the measurement modes, first the general configuration and then the individual measurement groups (test objects) are dealt with.
- Measurement groups that are identical in both test modes *(`POWer, MODulation...`)* are presented in a separate section between the two test modes.

General notes on remote control in the function group *CDMACellular MS* 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 200 basic instrument.

CDMA Module Tests (Non-Signalling)

In the *Non-Signalling* mode, an RF test signal can be generated and an RF signal with CDMA characteristics is analyzed. No signalling parameters are transferred.

Group Configuration

The remote-control commands in this section are used to configure the measurements in the function group *CDMA800/1900-MS Non Signalling* globally, i.e., they provide settings that are valid for all measurements within the function group. They correspond to the settings in the popup menu of the softkey *Group Config.* located to the left of the headline of each main menu.

Network Standards – Subsystem NSTandard

The *NSTandards* system switches over between the different CDMA network standards.

CONFigure:NSTandard <*Standard*>			Network Standard	
<Standard>	Description of parameters	Def. value	Def. unit	Unit ring
For CDMA Cellular MS				
U95 | J95 | JT53 | C95	US Cell IS95 Japan Cell IS95 Japan Cell T53 China Cell IS95	U95	–	
For CDMA PCS MS				
UP95 | UP08 | KP95 | KP08	US PCS UBIS95 US PCS JSTD008 Korea PCS UBIS95 Korea PCS JSTD008	UP95	–	
Description of command			Sig. State	FW vers.
This command activates the test mode according to one of the provided CDMA network standards.			all	V2.50

Subsystem LEVel (Input Level)

The subsystem *LEVel* determines the input level for the currently used input. It corresponds to the tab *Input Level* in the popup menu *Group Configuration*.

[SENSe:]LEVel:MAXimum <*Level*>				Max. Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–48 dBm to + 47 dBm –62 dBm to + 33 dBm –85 dBm to –6 dBm	Maximum input level for RF 1 Maximum input level for RF 2 Maximum input level for RF 4 IN	0.0 0.0 0.0	dBm dBm dBm	
Description of command				FW vers.
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).				V2.50

[SENSe:]LEVel:MODE <*Mode*>				Mode
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
AUTO | MANUAL	Maximum input level mode for RF	AUTO		
Description of command				FW vers.
This command defines the maximum expected input level mode.				V2.50

DEFault:LEVel <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the LEVel 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)*.				V2.50

Subsystem INTernal (AWGN Generator)

The subsystem *INTernal* determines the bandwidth of the internal Additive White Gaussian Noise generator. It corresponds to the tab *Internal* in the popup menu *Group Configuration*.

SOURce:INTernal:AWGN:BANDwidth *<Bwidth>*			AWGN Bandwidth	
<Bwidth>	Description of parameters	Def. value	Def. unit	Unit ring
B123 | B180	1.23 MHz bandwidth 1.80 MHz bandwidth	B123	–	
Description of command				FW vers.
This command determines the bandwidth of the calibrated wideband signal simulating white noise.				V2.50

DEFault:INTernal *<Enable>*			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the INTernal 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)*.				V2.50

Connection Control

The remote-control commands presented in this section determine inputs and outputs used as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect. Control*, located to the right of the headline of each main menu.

Note:*The settings provided in the* Signalling *tab of the* Connect. Control *menus are also accessible from the Analyzer/Generator menu; they are described in section* Analyzer/Generator *on page 6.5.*

Subsystem for Input and Output (External Attenuation at the Connectors)

The subsystem for input and output configures the input and output connectors. The subsystem corresponds to the tab *RF* in the popup menu *Connect. Control*.

INPut[:STATe] <*State*> — RF Input

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 | RF2 | RF4	Connector RF 1 used as input Connector RF 2 used as input Connector RF 4 IN used as input	RF2	–	

Description of command	FW vers.
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.	V2.50

OUTPut[:STATe] <*State*> — RF Output

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 | RF2 | RF3	Connector RF 1 used as output Connector RF 2 used as output Connector RF 3 OUT used as output	RF2	–	

Description of command	FW vers.
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.	V2.50

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*>
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*> Ext. Att. Input

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB	Value for external attenuation at the input <nr>, where <nr> = 1,2	0.0	dB	
-90 dB to +90 dB	Value for external attenuation at the input <nr>, where <nr> = 4	0.0		

Description of command	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.	V2.50

[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude] <*Attenuation*>
SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude] <*Attenuation*> Ext. Att. Output

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB	Value for external attenuation at output <nr>, where <nr> = 1,2	0.0	dB	
-90 dB to 90 dB	Value for external attenuation at output <nr>, where <nr> = 3	0.0		

Description of command	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.	V2.50

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 <*Mode*> REF OUT 2

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	

Description of command	FW vers.
This commands switches the system clock specific to the network at the *REF OUT 2* connector on or off.	V2.50

SOURce:DM:CLOCk:FREQuency <Frequency> REF OUT 2

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
NCD1 | NCD2 | NCD3 | NCD4	39.3216 MHz System Clock Frequency 19.6608 MHz System Clock Frequency 13.1072 MHz System Clock Frequency 9.8304 MHz System Clock Frequency	NCD1		

Description of command	FW vers.
This command determines the system clock frequency applied to *REF OUT 2*.	V2.50

Analyzer/Generator

Subsystem RFANalyzer (Analyzed RF Signals)

The subsystem *RFANalyzer* specifies which type of RF signals can be analyzed. It corresponds to the softkey *Analyzer Settings* in the measurement menu *Analyzer/Generator*.

[SENSe:]RFANalyzer:FREQuency <*Number*> RF Frequency

<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0.200 000 MHz to 2 700 . 000 000 MHz	Input frequency Default Input Frequency for following standards: US Cell IS95 Japan Cell IS95 Japan Cell T53 China Cell IS95 US PCS UB-IS-95 US PCS J-STD08 Korea PCS UB-IS-95 Korea PCS J-STD08	 833.490 000 915.950 000 915.950 000 891.962 000 1851.250 1851.250 1753.750 1753.750	MHz	

Description of command	FW vers.
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 CDMA 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 mobile to CMU).	V2.50

[SENSe:]RFANalyzer:FREQuency:UNIT <*Unit*> Frequency Unit

<Unit>	Description of parameters	Def. value	Def. unit	Unit ring
Hz | KHZ | MHZ | GHZ | CH	Frequency unit or Channel Number Default Channel number for following standards: USCellIS95 JapanCellIS95 JapanCellT53 ChinaCellIS95 USPCSUB-IS-95 USPCSJ-STD08 KoreaPCSUB-IS-95 Korea PCS J-STD08	 283 76 76 79 25 25 75 75	CH	

Description of command	FW vers.
This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as a CDMA channel number. Frequency units must be used to select input signals that are outside the designated channel range.	V2.50

Generator Object "RFGenerator" – Generator control

The subsystem *RFGenerator* configures the RF signals generated by the CMU. It corresponds to the softkey *Generator Lvl.* and the hotkey *Gen. Control* in the measurement menu *Analyzer/Generator*.

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.	V2.50

FETCh:RFGenerator:STATus? Generator Status

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | ERR	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	

Description of command	FW vers.
This command is always a query. It returns the current generator status.	V2.50

Generator Settings – Subsystem RFGenerator

The subsystem *RFGenerator:..* configures the generated RF signal. It corresponds to the softkeys *Generator Lvl.* and *Generator Set.* and the associated hotkeys.

SOURce:RFGenerator:LEVel
<CDMA_Power>,<Traffic_Lev>,<Paging_Lev>,<Sync_Lev>,<Pilot_Lev> RF Level

<Level>	Description of command			FW vers.
	CDMA Power for following RF OUT:			
–144.0 dBm to –33.0 dBm |	RF1, 0.0 dB ext. atten.	0.0	dBm	
–144.0 dBm to –16.0 dBm |	RF2, 0.0 dB ext atten.	0.0	dBm	
–97.0 dBm to 7.0 dBm	RF3 OUT , 0.0 dB ext. atten	0.0	dBm	
–20.0 dB to –7.0 dB | OFF,	Traffic Level	–14.0	dB	
–20.0 dB to –7.0 dB | OFF,	Paging Level	–12.0	dB	
–20.0 dB to –7.0 dB | OFF,	Sync Level	–16.0	dB	
–20.0 dB to –7.0 dB | OFF	Pilot Level	–7.0	dB	

Description of command	FW vers.
This command determines all RF generator levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel, the forward paging channel, the forward sync channel, and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.	V2.50

SOURce:RFGenerator:OCNS *<Mode>*				OCNS Settings
<Level> (for query only	Description of parameters	Def. value	Def. unit	Unit ring
OCNS Level | OFF	OCNS level relative to CDMA power OCNS generator off	–	dB	
<Mode> (for setting command)	Description of parameters	Def. value	Def. unit	Unit ring
AUTO | OFF	Use calculated OCNS level OCNS generator off	AUTO	–	
Description of command				FW vers.
This command determines the level of the Orthogonal Channel Noise Simulator. In the AUTO setting, the OCNS level is such that the sum of all generator levels and the OCNS level equals the nominal base station power. The query returns the OCNS level in units relative to the CDMA power (see `SOURce:RFGenerator:LEVel` command).				V2.50

SOURce:RFGenerator:IMPairments *<AWGN_Lev>,<Freq_Offset>*				Impairments
Parameters	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | OFF, –50.0 kHz to +50.0 kHz | OFF	AWGN level AWGN generator off BS frequency offset no frequency offset	OFF OFF	dB Hz	
Description of command				FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the RF generator signal.				V2.50

SOURce:RFGenerator:FREQuency *<Number>*				RF Frequency
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0.200 000 MHz to 2 700 . 000 000 MHz	Input frequency Default Input Frequency for following standards: US Cell IS95 Japan Cell IS95 Japan Cell T53 China Cell IS95 US PCS UB-IS-95 US PCS J-STD08 Korea PCS UB-IS-95 Korea PCS J-STD08	 878.490 000 860.950 000 860.950 000 936.962 000 1931.250 1931.250 1843.750 1843.750	MHz	
Description of command				FW vers.
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 CDMA 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 mobile under test).				V2.50

SOURce:RFGenerator:FREQuency:UNIT<*Unit or Number*>				Frequency Unit or Channel
<Unit or Number>	Description of parameters	Def. value	Def. unit	Unit ring
Hz | KHZ | MHZ | GHZ | CH	Frequency unit or Channel Number Default Channel number for following standards: USCellIS95 JapanCellIS95 JapanCellT53 ChinaCellIS95 USPCSUB-IS-95 USPCSJ-STD08 KoreaPCSUB-IS-95 Korea PCSJ-STD08	 283 76 76 79 25 25 75 75	CH	
Description of command				FW vers.
This command defines whether the frequency of the RF signal generated is specified in frequency units or as an CDMA channel number. Frequency units must be used to select input signals that are outside the designated CDMA channel range.				V2.50

SOURce:RFGenerator:TCH <*Channel*>				Traffic Channel
<Channel>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 31, 33 to 63	Traffic channel number (CDMA 800) Traffic channel number (CDMA 1900)	8	– –	
Description of command				FW vers.
This command determines the number of the traffic channel generated by the CMU.				V2.50

SOURce:RFGenerator:PNOFfset <*PNOffset*>				PN Offset
<PNOffset>>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +511	PN offset	0	–	
Description of command				FW vers.
Describes an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel.				V2.50

SOURce:RFGenerator:FOFFset <*FrameOffset*>				Frame Offset
<FrameOffset>>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +15	Frame offset	0	–	
Description of command				FW vers.
This command defines an offset for the traffic channel timing in CDMA frames.				V2.50

SOURce:RFGenerator:RATE <*Rate*>				Rate Set
<Rate>>	Description of parameters	Def. value	Def. unit	Unit ring
R08K | R13K	8 kbps rate 13 kbps rate	R08K	–	
Description of command				FW vers.
This command sets the data rate.				V2.50

SOURce:RFGenerator:FRATe <*DataRate*>				Data Rate
<DataRate>>	Description of parameters	Def. value	Def. unit	Unit ring
EIGHth | QUARter | HALF | FULL	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	
Description of command				FW vers.
This command sets the frame rate for a traffic channel.				V2.50

SOURce:RFGenerator:PCBits <*PCBits*>				Power Control Bits
<PCBits>	Description of parameters	Def. value	Def. unit	Unit ring
HOLD | ADOW | AUP | RTES | OFF	Alternating up/down control bits All power control bits down All power control bits up Range test mode Disable power control bits	HOLD	–	
Description of command				FW vers.
This command defines the power control bits in the RF generator signal.				V2.50

Test Object MODulation

The subsystem *MODulation* measures general scalar modulation parameters. The subsystem corresponds to the output fields in the *Analyzer/Generator* menu and the popup menu *Modulation Quality Configuration.*

Control of Measurement – Subsystem MODulation

The subsystem *MODulation* controls the modulation measurement. It corresponds to the softkey *Modulat. Quality* in the measurement menu *Analyzer/Generator.*

INITiate:MODulation	Start new measurement	*RUN*
ABORt:MODulation	Abort running measurement and switch off	*OFF*
STOP:MODulation	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:MODulation:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
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).	V2.50

FETCh:MODulation:STATus? Measurement Status

Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
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		
NONE	Statistic count set to off		–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the *Modulation Quality Configuration* menu.

Subsystem MODulation:CONTrol

The subsystem *MODulation:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration*.

CONFigure:MODulation:CONTrol <*Statistics*>, <*Repetition*>, <*StopCond*>, <*Stepmode*>				Scope of Measurement
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	No. of bursts within a statistics cycle Statistics off	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
This command sets all measurement control parameters. It combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands.				V2.50

CONFigure:MODulation:CONTrol:STATistics <*Statistics*>				Statistic Count
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	No. of bursts within a statistics cycle Statistics off	100	–	
Description of command				FW vers.
This command selects the type of measured values and determines the number of bursts forming one statistics cycle.				V2.50

CONFigure:MODulation:CONTrol:REPetition
<Repetition> ,<StopCond>,<Stepmode> Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
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.*	V2.50

DEFault:MODulation:CONTrol *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation: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)*.	V2.50

Tolerance values – Subsystem MODulation:LIMit

The subsystem *MODulation:LIMit* defines tolerance values for the modulation measurement. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Quality Configuration.*

CONFigure:MODulation:LIMit[:SCALar][:SYMMetric][:COMBined]:VALue Limits ***<Wavef_Quality>, <CarrFreqErr>, <TransmitTimeErr>,<CarrFeedthr>, <IQImbalance>***				
Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 to +1.0, –10.0 Hz to 0.0 Hz, 0.0 µs to 10.0 µs, –120.0 dB to -20.0 dB, –120.0 dB to -20.0 dB	Waveform Quality Carrier Frequency Error Tansmit Time Error Carrier Feedthrough I/Q Imbalance	0.944 300.0 1.0 -25.0 -30.0	– Hz µs dB dB	
Description of command				FW vers.
This command defines upper limits for all quantities describing the modulation quality.				V2.50

DEFault:MODulation:LIMit *<Enable>* Default Settings				
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the MODulation:LIMit 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)*.				V2.50

Measured Values – Subsystem MODulation

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 *MODulation,* application *Overview.*

READ[:SCALar]:MODulation?	Start single shot measurement and return results
FETCh[:SCALar]:MODulation?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Waveform Quality,	0.0 to +1.0,	NAN	–	
Carrier Frequency Error,	–10.0 Hz to 0.0 Hz,	NAN	Hz	
Tansmit Time Error,	0.0 µs to 10.0 µs,	NAN	µs	
Carrier Feedthrough,	–120.0 dB to -20.0 dB,	NAN	dB	
I/Q Imbalance,	–120.0 dB to -20.0 dB	NAN	dB	
Meas. out of Tolerance	0% to 100 %	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a modulation measurement and output all scalar measurement results (see Chapter 4).	V2.50

CALCulate[:SCALar]:MODulation:MATChing:LIMit?	Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
Waveform Quality,		INV	–	
Carrier Frequency Error,	For all measured values:	INV	–	
Tansmit Time Error,		INV	–	
Carrier Feedthrough,	NMAU | NMAL | INV | OK	INV	–	
I/Q Imbalance		INV	–	

Description of command — FW vers.

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. — V2.50

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	

CDMA Mobile Tests (Signalling Mode)

In the *Signalling* mode, the CMU is able to generate control and traffic channel signals and to set up a call to the mobile. A broad range of signalling parameters can be configured and measurements may be performed with a call connection established.

Group Configuration

The remote-control commands in this section are used to configure the measurements in the function group *CDMA1900-MS Signalling* globally, i.e., they provide settings that are valid for all measurements within the function group. They correspond to the settings in the popup menu of the softkey *Group Config.* located to the left of the headline of each main menu.

Network Standards – Subsystem NSTandard

The *NSTandards* system switches over between the different CDMA network standards. It corresponds to the *Network* tab in the popup menu *Group Configuration*.

CONFigure:NSTandard *<Standard>*			Network Standard	
<Standard> ***For CDMA Cellular MS***	Description of parameters	Def. value	Def. unit	Unit ring
U95 | J95 | JT53 | C95	US Cell IS95 Japan Cell IS95 Japan Cell T53 China Cell IS95	U95	–	
For CDMA PCS MS				
UP95 | UP08 | KP95 | KP08	US PCS UBIS95 US PCS JSTD008 Korea PCS UBIS95 Korea PCS JSTD008	UP95	–	
Description of command			Sig. State	FW vers.
This command activates the test mode according to one of the provided CDMA network standards.			all	V2.50

Group Configuration

The remote-control commands in this section are used to configure the measurements in the function group *CDMA800/1900-MS Non Signalling* globally, i.e., they provide settings that are valid for all measurements within the function group. They correspond to the settings in the popup menu of the softkey *Group Config.* located to the left of the headline of each main menu.

Subsystem INTernal (AWGN Generator)

The subsystem *INTernal* determines the bandwidth of the internal Additive White Gaussian Noise generator. It corresponds to the tab *Internal* in the popup menu *Group Configuration*.

SOURce:INTernal:AWGN:BANDwidth <*Bwidth*>			AWGN Bandwidth	
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
B123 | B180	1.23 MHz bandwidth 1.80 MHz bandwidth	B123	–	
Description of command				FW vers.
This command determines the bandwidth of the calibrated wideband signal simulating white noise.				V2.50

DEFault:INTernal <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem INTernal 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)*.				V2.50

Connection Control

The remote-control commands presented in this section control the signalling (call setup and release, services, signalling parameters), determine the inputs and outputs as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect. Control* located to the right of the headline of each main menu.

Note: *Some parameters of the CMU assume several independent values: The default value is used to set up a call; most default values can be modified in the signalling states Signal Off, Signal On and MS Registered. The current value during the call (signalling states Call Established) can still be changed, however, modifying this current value does not alter the default value. The handoff value comes into effect after a handoff from another to the current network; most handoff values can be set in all signalling states.*
Many of the default and current parameters in CDMA 800/1900-MS occur in the SIGNalling and in the BSSignal subsystems. Default values are set with a `CONFigure ...` *command, current values are set with the corresponding* `PROCedure ...` *command.*

Signalling – Subsystem SIGNalling (Call Setup and Cleardown)

The subsystem *SIGNalling* controls the call setup and cleardown from the CMU to the mobile and determines the signalling parameters. It corresponds to the different tabs *Signalling* (for different signalling states, see command `PROCedure:SIGNalling:ACTion`) in the popup menu *Connect. Control*.

PROCedure:SIGNalling:ACTion <*Action*>			Signalling Control	
<Action>	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | SON | CTM | CRELease | UNRegister | HANDoff	Switch off RF signal *(signal off)* Switch on RF signal *(signal on)* Call to mobile Call release Unregister Handoff	–	–	–
Description of command			Sig. State	FW vers.
This command has no query form and no default value. It changes between the different signalling states of the CMU.			See below	V2.50

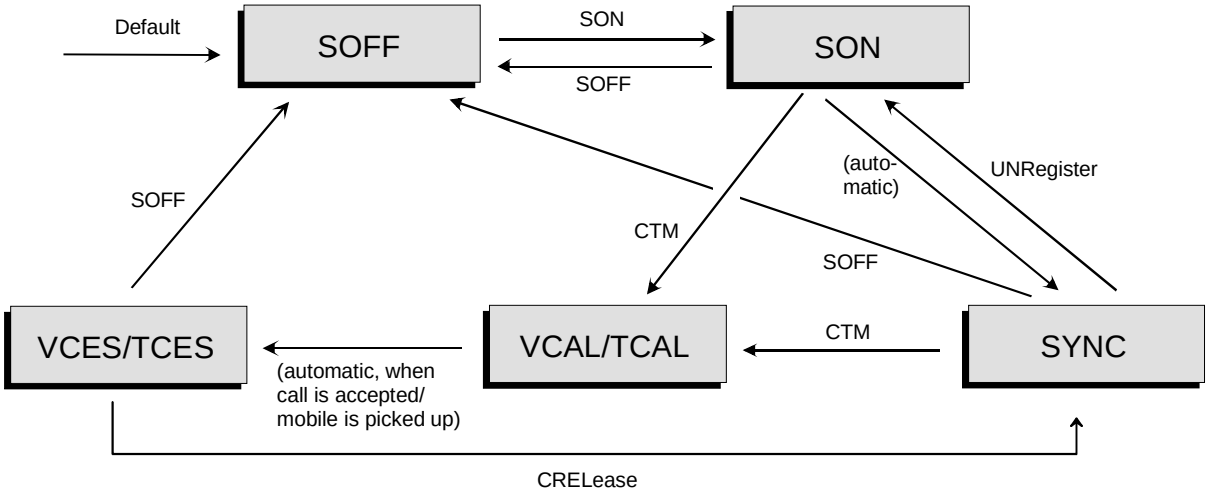

Fig. 6-1: Signalling states of the CMU and transitions

Signalling states:

See next command, `[SENSe:]SIGNalling:STATe?`

Actions (initiated from the CMU):

See description of command `[PROCedure:]SIGNalling:ACTion`

Further transitions between the signalling states (not shown in Fig. 6-1) may occur, e.g. in case of errors. For the transitions and signalling states related to handoff procedures (CDMA to AMPS) refer to the AMPS-MS operating manual.

[SENSe:]SIGNalling:STATe?				Signalling State
Return	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | SON | SYNC | VCAL | TCAL | VCES | TCES | CPEN | RPEN	RF signal switched off *(Signal Off)* RF signal switched on *(Signal On)* MS registration performed *(Synchronized)* Mobile is ringing *(Voice Call Alerting)* Mobile is ringing *(Test Call Alerting)* Voice call to mobile set up *(Voice Call Established)* Test call to mobile set up *(Test Call Established)* Call pending *(Handoff* procedures) Registration pending *(Handoff* procedures)		–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the current signalling state.			all	V2.50

Subsystem BSSignal... (Signal of Base Station/CMU)

The subsystem *BSSignal...* configures the RF and traffic channels for the signals transmitted by the CMU to the mobile phone. It corresponds to the tab *BS Signal* in the popup menu *Connect. Control*.

CONFigure:BSSignal:SIGNalling:TCH *<Number>*			Traffic Channel	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 31, 33 to 63	Number of traffic channel, CDMA800 Number of traffic channel, CDMA1900	8	– –	
Description of command			Sig. State	FW vers.
This command determines the traffic channel number. The command is valid in the Signal Off, Signal On, Registered states.These commands are not valid in the call established states.			all	V2.50

PROCedure:BSSignal:SIGNalling:TCH *<Number>*			Traffic Channel	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
2 to 31, 33 to 63	Number of traffic channel, CDMA800 Number of traffic channel, CDMA1900	8	– –	
Description of command			Sig. State	FW vers.
This command determines the traffic channel number. These commands are only valid when in the call establish states (voice or test).			VCES TCES	V2.50

CONFigure:BSSignal:SIGNalling:RFCHannel *<Number>*			RF Channel	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 and 990 to 1023	Number of RF channel, US Cellular IS 95	283	– –	
0 to 1199	Number of RF channel, Japan Cellular IS 95	76		
0 to 1199	Number of RF channel, Japan Cellular T 53	76		
0 to 1000 and 1329 to 2047	Number of RF channel, China Cellular IS 95	79		
0 to 1199	Number of RF channel, US PCS UB-IS-95	25		
0 to 1199	Number of RF channel, US PCS J-STD08	25		
0 to 699	Number of RF channel, Korean PCS UB-IS-95	75		
0 to 699	Number of RF channel, Korean PCS J-STD08	75		
Description of command			Sig. State	FW vers.
This command determines the RF channel number. These commands are valid in the Signal Off state and call established states.			SOFF TCES VCES Q: all	V2.50

PROCedure:BSSignal:SIGNalling:RFCHannel <*Number*>			RF Channel	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 and 990 to 1023	Number of RF channel, US Cellular	283	–	
0 to 1199	Number of RF channel, Japan Cellular	76	–	
0 to 1000 and 1329 to 2047	Number of RF channel, China Cellular	79		
0 to 1199	Number of RF channel, US PCS	25		
0 to 699	Number of RF channel, Korean PCS	75		
Description of command			Sig. State	FW vers.
This command determines the RF channel number. This command is only valid in the call establish states (voice or test).			VCES TCES	V2.50

CONFigure:BSSignal:SIGNalling:PNOFfset <*Number*>			PN Offset	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +511	PN offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel.			SOFF TCES VCES Q: all	V2.50

PROCedure:BSSignal:SIGNalling:PNOFfset <*Number*>			PN Offset	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +511	PN offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the timing of the pilot channel, the sync channel message, and the long code mask of the paging channel. These commands are only valid in the call establish states (voice or test).			VCES TCES	V2.50

CONFigure:BSSignal:SIGNalling:FOFFset <*Number*>			Frame Offset	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +15	Frame offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the traffic channel timing in CDMA frames. The command valid in the Signal Off, Signal On, Registered states.This command is not valid in the call established states.			all	V2.50

PROCedure:BSSignal:SIGNalling:FOFFset <*Number*>			Frame Offset	
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
0 to +15	Frame offset	0	–	
Description of command			Sig. State	FW vers.
This command determines an offset for the traffic channel timing in CDMA frames. This command is only valid in the call establish states (voice or test).			VCES TCES	V2.50

CONFigure:BSSignal:SIGNalling:CMODe <*Mode*>
PROCedure:BSSignal:SIGNalling:CMODe <*Mode*>
Call Mode

<Number>	Description of parameters	Def. value	Def. unit	Unit ring
DL8 | DL13 VL8 | VL8E | VL13	Test loopback 8 kbps Test loopback 13 kbps Voice loopback 8 kbps basic Voice loopback 8 kbps enhanced Voice loopback 13 kbps	VL8E	–	
Description of command			Sig. State	FW vers.
This command determines the preferred call mode.			all	V2.50

CONFigure:BSSignal:SIGNalling:FRATe <*Rate*>
Frame Rate

<Rate>	Description of parameters	Def. value	Def. unit	Unit ring
EIGHth | QUARter HALF FULL	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	
Description of command			Sig. State	FW vers.
This command sets the frame rate for a traffic channel for test calls only.			all	V2.50

[SENSe:]BSSignal:SIGNalling:RFRequency*?*
Mobile Frequency

Returned Values	Description of parameters	Def. value	Def. unit	Unit ring
Default TX Frequency, Default RX Frequency, Current TX Frequency, Current RX Frequency	Default BS Transmitter Frequency Default BS Receiver Frequency Current BS Transmitter Frequency Current BS Receiver Frequency	870.06 925.75 870.06 925.75	MHZ	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the four values (read only): Default TX Frequency, Default RX Frequency, Current TX Frequency, Current RX Frequency.			all	V2.50

DEFault:BSSignal:SIGNalling <*Enable* >
Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem BSSignal 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)*.			SOFF SON SYNC Q: all	V2.50

Subsystem BSSignal:LEVel (Level of Base Station/CMU Signals)

The subsystem *BSSignal:LEVel* determines the level of the different components of the signals transmitted by the CMU to the mobile phone. It corresponds to the *CDMA Levels* table section in the *BS Signal* tab in the popup menu *Connect. Control*.

CONFigure:BSSignal:LEVel
<CDMA_Power>,<Traffic_Lev>,<Paging_Lev>,<Sync_Lev>,<Pilot_Lev> RF Level

Values	Description of parameters	Def. value	Def. unit	Unit ring
–144.0 dBm to –33.0 dBm | –144.0 dBm to –18.0 dBm | –97.0 dBm to 7.0 dBm	CDMA Power RF1 OUT, 0 dB ext. atten. RF2 OUT, 0 dB ext. atten. RF3 OUT, 0 dB ext. atten	–70.0	dBm	
–20.0 dB to –7.0 dB	Traffic Level	–14.0	dB	
–20.0 dB to –7.0 dB	Paging Level	–12.0	dB	
–20.0 dB to –7.0 dB	Sync Level	–16.0	dB	
–20.0 dB to –7.0 dB	Pilot Level	–7.0	dB	

Description of command	Sig. State	FW vers.
This command determines all RF levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel, the forward paging channel, the forward sync channel, and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.	SOFF SON SYNC Q: all	V2.50

SOURce:BSSignal:LEVel:OCNS? OCNS Settings

<Level> for query	Description of parameters	Def. value	Def. unit	Unit ring
OCNS Level	OCNS Level relative to CDMA power	–	dB	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the level of the Orthogonal Channel Noise Simulator in units relative to the CDMA power (see `CONFigure:BSSignal:LEVel` command).	SOFF SON SYNC Q: all	V2.50

SOURce:BSSignal:LEVel:OUTPut? Output Level

<Level> for query	Description of parameters	Def. value	Def. unit	Unit ring
Output Power	Total output power		dB	

Description of command	Sig. State	FW vers.
This command is always a query. It returns the total output power of the CMU, i.e. the CDMA power plus the AWGN level.	SOFF SON SYNC Q: all	V2.50

DEFault:BSSignal:LEVel <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem BSSignal:LEVel 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)*.			SOFF SON SYNC Q: all	V2.50

DEFault:BSSignal <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem BSSignal 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)*.			SOFF SON SYNC Q: all	V2.50

Subsystem HANDoff:TARGet (Handoff Target)

The subsystem *HANDoff:TARGet* sets the target for a forced handoff of the mobile phone. The corresponding softkeys are located in the tab *Handoff* in the popup menu *Connect. Control*.

STATus:HANDoff:TARGet:LIST?			Destination List	
Response	Description of parameters	Def. value	Def. unit	Unit ring
"AMPSMS"| "AMPSMSFallback"	Target list for CDMA 800/1900	–	–	–
Description of command			Sig. State	FW vers.
This command is always a query and returns a list of all networks that are available for a handoff. On registration, the complete (default) target list is replaced by the actual target list depending on the capabilities of the mobile station.			all	V2.50

CONFigure:HANDoff:TARGet <*Target*>			Destination Selection	
<Target>	Description of parameters	Def. value	Def. unit	Unit ring
"AMPSMS" | "AMPSMSFallback" | NONE	Possible target for CDMA 800/1900 No handoff	NONE	–	–
Description of command			Sig. State	FW vers.
This command selects a handoff target. The targets available depend on the current network and on the capabilities of the mobile station; see previous command. The query returns `NONE` unless a destination has been selected before. Handoff is initiated via the `PROCedure:SIGNalling:ACTion HANDoff` command.			TCES Q: all	V2.50

DEFault:HANDoff <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem Handoff 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)*.			SOFF SON SYNC Q: all	V2.50

DEFault:HANDoff:SIGNalling <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem BSSignal 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)*.			SOFF SON SYNC Q: all	V2.50

Subsystem NETWork

The subsystem *NETWork* determines the parameters of the radio network and the existing radio link. The subsystem corresponds to the popup menu *Network* in the menu group *Connect. Control*.

Subsystem NETWork:MSETtings (Mobile Settings)

The subsystem *NETWork:MSETtings* defines the mobile parameters. The subsystem corresponds to the table field *Mobile Settings* in the popup menu *Network*.

CONFigure:NETWork:MSETtings:IDTYpe *<Type>*			MSID Type	
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
MIN | IMSI	34-bit MIN (mobile identification number) 50-bit IMSI (international mobile subscriber identity)	IMSI	–	–
Description of command			Sig. State	FW vers.
This command determines which type of mobile station identity is to be used for call setup to the mobile phone.			SOFF SON SYNC Q: all	V2.50

CONFigure:NETWork:MSETtings:ID *<ID>*			MIN or IMSI	
<ID>	Description of parameters	Def. value	Def. unit	Unit ring
"0" to "2^{50} – 1"	Mobile ID (34-bit or 50-bit)	0	–	–
Description of command			Sig. State	FW vers.
This command determines themobile ID used to set up a call to the mobile phone. The ID type is set via `CONFigure:NETWork:MSETtings:IDTYpe`, see above.			SOFF SON SYNC Q: all	V2.50

[SENSe:]NETWork:MSETtings:PREVision*?*			Protocol Revision	
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
1 | 2 | 3	TIA/EIA/IS-95 TIA/EIA/IS-95-A TIA/EIA/TSB-74	–	–	
Description of command			Sig. State	FW vers.
This command is always a query. This command returns the version of the transmission protocol used by the mobile station.			SOFF SON SYNC Q: all	V2.50

Subsystem NETWork:SYSTem (System Parameters)

The subsystem *NETWork:System* determines system parameters for the radio connection. The subsystem corresponds to the table field *System Parameters* in the popup menu *Network*.

CONFigure:NETWork:SYSTem:PREVision *<Revision>*			Protocol Revision	
<Revision>	Description of parameters	Def. value	Def. unit	Unit ring
1 | 2 | 3	TIA/EIA/IS-95 TIA/EIA/IS-95-A TIA/EIA/TSB-74	3	–	
Description of command			Sig. State	FW vers.
This command defines the version of the transmission protocol for the CMU to use.			SOFF SON SYNC Q: all	V2.50

CONFigure:NETWork:SYSTem:TBReg *<Time>*			Time Based Registration	
<Time>	Description of parameters	Def. value	Def. unit	Unit ring
R012sec | R014sec | R017sec | R020sec | R024sec | R029sec | R034sec | R041sec | R049sec | R058sec | R069sec | R082sec | R089sec | R097sec | R116sec | OFF	Registration interval in seconds no periodic registration	R012sec	–	
Description of command			Sig. State	FW vers.
This command sets the periodic registration interval.			SOFF SON SYNC Q: all	V2.50

CONFigure:NETWork:SYSTem:BSID *<ID>*			Base Station ID	
<Revision>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 65534	16-bit BTS ID	1	–	
Description of command			Sig. State	FW vers.
This command defines the base station identification for the CMU.			SOFF SON SYNC Q: all	V2.50

Subsystem NETWork:PCHannel (Paging Channel)

The subsystem *NETWork:PCHannel* determines the paging channel parameters. The subsystem corresponds to the table field *Paging Channel* in the popup menu *Network*.

CONFigure:NETWork:PCHannel:SCINdex <*Index*>			Slot Cycle Index	
<Index>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 1023	10-bit Slot Cycle index	0	–	
Description of command			Sig. State	FW vers.
This command defines which slot cycle the paging channel uses.			SOFF SON SYNC Q: all	V2.50

Subsystem NETWork:IDENTity

The subsystem *NETWork:IDENTity* defines the identity of the mobile radio network. The subsystem corresponds to the table field *Network Identity* in the popup menu *Network*.

CONFigure:NETWork:IDENTity:MCC <*Code*>			MCC	
<Code>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 999	Mobile country code	0	–	–
Description of command			Sig. State	FW vers.
This command defines the mobile country code.			SON, SOFF, SYNC Q: all	V2.50

CONFigure:NETWork:IDENTity:SID <*Code*>			SID	
<Code>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 32767	15-bit system identity code	1	–	–
Description of command			Sig. State	FW vers.
This command defines the system identity code.			SON, SOFF, SYNC Q: all	V2.50

CONFigure:NETWork:IDENTity:NID <*Code*>			NID	
<Code>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 65534	16-bit network identity code	1	–	–
Description of command			Sig. State	FW vers.
This command defines the network identity code.			SON, SOFF, SYNC Q: all	V2.50

DEFault:NETWork <*Enable*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem NETWork 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)*.			SOFF SON SYNC Q: all	V2.50

Subsystem IOConnector (External Attenuation at the Connectors)

The subsystem *IOConnector* contains the commands for configuration of the input and output connectors. The subsystem corresponds to the tab RF in the popup menu *Connect. Control*.

INPut[:STATe] <*State*>			RF Input	
<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 RF2 RF4	Connector RF1 used as input Connector RF2 used as input Connector RF4 IN used as input	RF2	–	–
Description of command			Sig. State	FW vers.
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.			all	V2.50

OUTPut[:STATe] <*State*>			RF Output	
<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 RF2 RF3	Connector RF1 used as output Connector RF2 used as output Connector RF3 OUT used as output	RF2	–	–
Description of command			Sig. State	FW vers.
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.			all	V2.50

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*> **SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*>**				Ext. Att. Input
<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB –90 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1,2 Value for external attenuation at output <nr>, where <nr> = 4	0.0	dB	Ratio
Description of command			Sig. State	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.			all	V2.50

[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude] <*Attenuation*> **SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude] <*Attenuation*>**				Ext. Att. Output
<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB –90 dB to +90 dB	Value for external attenuation at output <nr>, where <nr> = 1,2 Value for external attenuation at output <nr>, where <nr> = 3	0.0	dB	Ratio
Description of command			Sig. State	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.			all	V2.50

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 <*Mode*>				REF OUT 2 on/off
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	–
Description of command			Sig. State	FW vers.
This command switches the system clock at output *REF OUT 2* on or off.			all	V2.50

SOURce:DM:CLOCk:FREQuency <Frequency>				REF OUT 2
<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
NCD1 | NCD2 | NCD3 | NCD4	39.3216 MHz System Clock Frequency 19.6608 MHz System Clock Frequency 13.1072 MHz System Clock Frequency 9.8304 MHz System Clock Frequency	NCD1		
Description of command				FW vers.
This command determines the system clock frequency applied to *REF OUT 2* .				V2.50

Pseudo Test Object MSSinfo
(Signalling information of mobile phone)

The subsystem *MSSinfo* contains the commands for querying the properties of the mobile phone. The subsystem corresponds to the *Mobile Info* output table in the *Signalling* tabs of the *Connect. Control* menu. The mobile phone properties do not actually represent measured values, they are provided by the mobile phone during registration.

Note:*If no mobile is connected, or if the mobile under test is not synchronized (signalling states SOFF, SON), the queries in this section will return the default values INV. The Mobile ID and serial number are available in the SYNC and TCES states, the remaining information in the TCES state only. They are overwritten by INV as soon as registration is lost (transition from SYNC or TCES to SON or SOFF).*

[SENSe:]MSSinfo?			Mobile Info	
<Returned Value>	Description of parameters	Def. val.	Def. unit	Unit ring
IDType, IDNumber, SerNumber, PowerClass, DialedNumber, ProtocolRev, ActualCallMode	MS identification type (TMSI, MIN, or IMSI) Actual TMSI or MIN or IMSI Serial number of the mobile station Power class of the mobile station Number dialed at the mobile station Protocol revision of the mobile station Actual call mode of the mobile station	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query and retrieves information on the mobile station that is being called.			all	V2.50

Test Object SAPPower (Standby and Access Probe Power)

The subsystem *SAPPower* contains the commands for measuring the standby and access probe power. It corresponds to the softkey *Power* of the tab *Signalling* in the menu group *Connect. Control*.

Note:*In contrast to the measurement groups reported below, the* `SAPPower` *measurement can be performed in the signalling states SON, and SYNC only. Configurations are always possible*.

INITiate:SAPPower	Start new measurement	*RUN*
ABORt:SAPPower	Abort running measurement and switch off	*OFF*
STOP:SAPPower	Stop measurement after current stat. cycle	*STOP*
CONTinue:SAPPower	Next measurement step (only *stepping mode*)	*RUN*

Description of command	Sig. State	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.	SON SYNC	V2.50

CONFigure:SAPPower:EREPorting <*Mode*> — Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5).	all	V2.50

FETCh:SAPPower:STATus? — Measurement Status

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
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		–	–

Description of command	Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	all	V2.50

Scalar Results:

READ[:SCALar]:SAPPower? Start single shot measurement and return results
FETCh[:SCALar]:SAPPower? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:SAPPower? Read out measurement results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–30.0 dBm to +30.0 dBm, –30.0 dBm to +30.0 dBm	Standby power Access probe power	NAN NAN	dBm dBm	

Description of command	Sig. State	FW vers.
These commands are always queries. They start the measurement of the standby and access probe power and output the result.	SON SYNC	V2.50

Test Object OVERview

Note:*In order to perform any kind of measurement and obtain a meaningful result, an appropriate test setup is required (see application examples in Chapter 2 of this manual). Consequently, for the measurements reported in this and the following sections, the Test Call Established (TCES) signalling state must be reached before any of the commands retrieving test results (`READ...?`, `FETCh...?`, `SAMPle...?`, or `CALCulate...LIMit?`) can be used. Test configurations, however, can be defined any time.*

The subsystem *OVERview* measures the most important power, modulation, and receiver quality parameters using a set of configuration settings that is independent of the other measurement groups *(POWer, MODulation, RXQuality)*. The subsystem corresponds to the *Overview* menu and the associated popup menu *Overview Meas. Configuration.*

General Configurations – Subsystem OVERview:MCQuality

The subsystem *OVERview:MCQuality* configures the generated RF signal. It corresponds to the *Overview Meas. & Channel Qual. Settings* panel in the *Overview* menu and the associated softkeys.

CONFigure:OVERview:MCQuality:LEVel
<CDMA_Power>,<Traffic_Lev>,<Pilot_Lev> CDMA Levels

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
	CDMA Power	-70.0	dBm	
–144.0 dBm to –33 dBm |	RF1 OUT , 0 dB ext. atten |			
–144.0 dBm to –16 dBm |	RF2 OUT , 0 dB ext. atten |			
–97.0 dBm to +7 dBm,	RF4 OUT , 0 dB ext. atten			
–20.0 dB to –7.0 dB,	Traffic Level	–14.0	dB	
–20.0 dB to –7.0 dB	Pilot Level	–7.0	dB	

Description of command	FW vers.
This command determines the most important output signal levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.	V2.50

CONFigure:OVERview:MCQuality:IMPairments *<AWGN_Lev>,<Freq_Offset>* Impairments

<Impairments>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | OFF	AWGN level	OFF	dB	
–50.0 kHz to +50.0 kHz | OFF	BS frequency offset	OFF	kHz	

Description of command	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.	V2.50

CONFigure:OVERview:MCQuality:PCBits <*PCBits*>				Power Control Bits
<PCBits>	Description of parameters	Def. value	Def. unit	Unit ring
AUTO | HOLD | ADOW | AUP | RTES | OFF	Auto mode, closed-loop operation Alternating up/down control bits All power control bits down All power control bits up Range test mode Disable power control bits	AUTO	–	
Description of command				FW vers.
This command defines the power control bits in the RF generator signal.				V2.50

General Configurations – Subsystem OVERview:PPOWer

The subsystem *OVERview:PPOWer* controls the pilot power measurement. It corresponds to the *Pilot Power* softkey in the *Overview* menu.

CONFigure:OVERview:PPOWer:ENABle <*Enable*>				Pilot Power Enable
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Activate/disable the pilot power report	ON	–	
Description of command				FW vers.
This command activates or disables the transmission of the pilot power measured by the mobile station.				V2.50

[SENSe:]OVERview:PPOWer?				Pilot Power
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Reported PPower Actual PPower	Reported pilot power Actual pilot power		–	
Description of command				FW vers.
This command is always a query. It returns the pilot power reported by the mobile station and the actual pilot power transmitted by the CMU.				V2.50

Overview Measurement Control – Subsystem OVERview:MODulation

The subsystem *OVERview:MODulation* controls the measurement of general power and modulation parameters. It corresponds to the *Overview Meas.* softkey in the *Overview* menu and the associated output fields and to the *Overview Meas. Configuration* menu.

INITiate:OVERview:MODulation	Start new measurement	*RUN*
ABORt:OVERview:MODulation	Abort running measurement and switch off	*OFF*
STOP:OVERview:MODulation	Stop measurement after current stat. cycle	*STOP*
CONTinue:OVERview:MODulation	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the overview measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:OVERview:MODulation:EREPorting *<Mode>* Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped (see Chapter 5 of the CMU200 Operating manual for event reporting).	V2.50

FETCh:OVERview:MODulation:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
NONE	Statistic count set to off			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

Subsystem OVERview:MODulation:CONTrol

The subsystem *OVERview:MODulation:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs of the popup menu *Overview Meas. Configuration.*

CONFigure:OVERview:MODulation:CONTrol:REPetition
<Repetition>,<StopCond>,<Stepmode> Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
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.	V2.50

DEFault:OVERview:MODulation:CONTrol Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:MODulation 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)*.	V2.50

Test Configuration

The commands of the following subsystem determine the parameters of the overview measurement.

Subsystem OVERview:MODulation:LIMit

The subsystem *OVERview:MODulation:...LIMit* defines the tolerance values for the overview measurement. The subsystem corresponds to the *Overview Meas.* section in the *Limits* tab in the popup menu *Power Configuration.*

CONFigure:OVERview:MODulation:CAMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue <*Carr_Freq*>,<*Transmit_Time*>,<*Wavef_Qual*>			Overview Limits	
Limits	Description of parameters	Def. value	Def. unit	Unit ring
0.0 Hz to +1000.0 Hz, 0.0 µs to 10.0 µs, 0.0000 to 1.000	Upper limit for carrier frequency error Upper limit for transmit time error Lower limit for waveform quality	+300 1.0 0.944	Hz µs –	
Description of command				FW vers.
This commands defines the upper limits for the overview measurement.				V2.50

DEFault:OVERview:MODulation:LIMit			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	the parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:MODulation: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)*.				V2.50

Measured Values – Subsystem OVERview:MODulation

The subsystem *OVERview:MODulation* determines and outputs the results of the overview measurement. In the *Overview* menu, it corresponds to the output fields associated to the *Overview Meas.* softkey.

READ[:SCALar]:OVERview:MODulation? Scalar results:
Start single shot measurement and return results

FETCh[:SCALar]:OVERview:MODulation?
Read out measurement results (unsynchronized)

SAMPle[:SCALar]:OVERview:MODulation?
Read out measurement results (synchronized)

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
Expected MS Power,	Expected MS Power,	NAN	dBm	
Measured MS Power,	Measured MS Power,	NAN	dBm	
Expected Carrier Frequency,	Expected Carrier Frequency,	NAN	Hz	
Carrier Frequency Error,	Carrier Frequency Error,	NAN	Hz	
Transmit Time Error,	Transmit Time Error,	NAN	µs	
Waveform Quality	Waveform Quality	NAN	–	

Description of command	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results (see Chapter 5).	V2.50

CALCulate[:SCALar]:OVERview:MODulation:MATChing:LIMit? Limit Matching

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
For all values: NMAT | NMAL | INV | OK	Carrier Frequency Error, Transmit Time, Waveform Quality	INV INV INV	– – –	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the tolerances for the overview measurement have been exceeded. The following messages may be output for the values *LeakPowRMS and BurstPwCurrRMS:* NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched	V2.50

Overview Measurement Control – Subsystem OVERview:CQUality

The subsystem *OVERview:CQUality* controls the measurement of general channel quality parameters. It corresponds to the *Channel Quality* softkey in the *Overview* menu and the associated output fields and to the *Channel Quality* sections of the *Overview Meas. Configuration* menu.

INITiate:OVERview:CQUality	Start new measurement	*RUN*
ABORt:OVERview:CQUality	Abort running measurement and switch off	*OFF*
STOP:OVERview:CQUality	Stop measurement after current stat. cycle	*STOP*
CONTinue:OVERview:CQUality	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the overview measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:OVERview:CQUality:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).	V2.50

FETCh:OVERview:CQUality:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
NONE	Statistic count set to off			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

Subsystem OVERview:CQUality:CONTrol

The subsystem *OVERview:CQUality:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs of the popup menu *Overview Meas. Configuration.*

CONFigure:OVERview:CQUality:CONTrol <*Statistics*>, <*Repetition*>, <*StopCond*>, <*Stepmode*> Scope of Measurement				
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				V2.50

CONFigure:OVERview:CQUality:CONTrol:STATistics <*Statistics*> Statistic Count				
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:OVERview:CQUality:CONTrol:REPetition <*Repetition*>,<*StopCond*>,<*Stepmode*> Test Cycles				
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	

<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
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.*				V2.50

DEFault:OVERview:CQUality:CONTrol				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:CQUality: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)*.				V2.50

Test Configuration

The commands of the following subsystem determine the parameters of the channel quality measurement.

Subsystem OVERview:CQUality:LIMit

The subsystem *OVERview:CQUality:...LIMit* defines the tolerance values for the overview measurement. The subsystem corresponds to the *Channel Quality* section in the *Limits* tab in the popup menu *Power Configuration.*

CONFigure:OVERview:CQUality:CAMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue ***<Max_FER>***				Channel Quality Limits
<Limit>	Description of parameters	Def. value	Def. unit	Unit ring
0.1% to +5.0%	Upper limit for frame error rate	0.5	%	
Description of command				FW vers.
This commands defines the upper limits for the channel quality measurement.				V2.50

DEFault:OVERview:CQUality:LIMit				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	the parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem OVERview:CQUality: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)*.				V2.50

Measured Values – Subsystem OVERview:CQUality

The subsystem *OVERview:CQUality* determines and outputs the results of the channel quality measurement. In the *Overview* menu, it corresponds to the output fields associated to the *Channel Quality* softkey.

				Scalar results:
READ[:SCALar]:OVERview:CQUality?				Start single shot measurement and return results
FETCh[:SCALar]:OVERview:CQUality?				Read out measurement results (unsynchronized)
SAMPle[:SCALar]:OVERview:CQUality?				Read out measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	Unit ring
Frames transmitted, Frame Error Rate	1 to 1000 0% to 100%	NAN NAN	– %	
Description of command				FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results (see Chapter 5).				V2.50

CALCulate[:SCALar]:OVERview:CQUality:MATChing:LIMit?				Limit Matching
Returned values	Value range	Def. value	Def. unit	Unit ring
FER Limit	NMAU | NMAL | INV | OK	INV	–	
Description of command				FW vers.
This command is always a query. It indicates whether and in which way the tolerances for the overview measurement have been exceeded. The following messages may be output for the values *LeakPowRMS and BurstPwCurrRMS:* NMAU – Tolerance value underflow – *not matching, underflow* NMAL – Tolerance value exceeded – *not matching, overflow* INV – Measurement invalid – *invalid* OK – Tolerance value matched				V2.50

Test Object POWer:OLTResponse

The subsystem *POWer:OLTResponse* measures the MS open loop time response. The subsystem corresponds to the measurement menu *Power,* application *Open Loop Time Response,* and the sections related to this application in the associated popup menu *Power Configuration.*

Control of measurement – Subsystem POWer:OLTResponse

The subsystem *POWer:OLTResponse* controls the open loop time response measurement.

INITiate:POWer:OLTResponse	Start new measurement	*RUN*
ABORt:POWer:OLTResponse	Abort running measurement and switch off	*OFF*
STOP:POWer:OLTResponse	Stop measurement after current stat. cycle	*STOP*
CONTinue:POWer:OLTResponse	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:POWer:OLTResponse:EREPorting *<Mode>* Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).	V2.50

FETCh:POWer:OLTResponse:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
NONE	Statistic count set to off			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the different softkey/hotkey combinations in the graphical measurement menu and to the *Power Configuration* popup menu.

CONFigure:POWer:OLTResponse:IBSPower <*Power*>				Initial BS Power
<Power>	Description of parameters	Def. value	Def. unit	Unit ring
–108.0 dBm to -34.0 dBm –94.0 dBm to –17.0 dBm –55.0 dBm to 6.0 dBm	Initial BS power RF1 OUT , 0 dB ext. atten. RF2 OUT , 0 dB ext. atten RF3 OUT , 0 dB ext. atten	–60	dBm	
Description of command				FW vers.
This command sets the initial power the CMU uses to set up a call to the mobile station. The range depends on the selected RF Connector.				V2.50

CONFigure:POWer:OLTResponse:PSTep <*Power*>				Power Step
<Power>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 dB to +100.0 dB	BS power step	+20	dB	
Description of command				FW vers.
This command sets the power step of the CMU.				V2.50

CONFigure:POWer:OLTResponse:PSDirection <*Power*>				Power Step Direction
<Power Direction>	Description of parameters	Def. value	Def. unit	Unit ring
UP | DOWN	BS power step direction	UP	–	
Description of command				FW vers.
This command sets the power step direction of the CMU.				V2.50

CONFigure:POWer:OLTResponse:LEVel <*Traffic_Lev*>,<*Pilot_Lev*>				Levels
Power Levels	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to –7.0 dB, **–20.0 dB to –7.0 dB**	Traffic Level Pilot Level	–7.4 –7.0	dB dB	
Description of command				FW vers.
This command determines the output signal levels the CMU uses in the Open Loop Time Response measurement. This includes the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power.				V2.50

DEFault:POWer:OLTResponse				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the POWer:OLTResponse 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)*.				V2.50

Measured Values – Subsystem POWer

The subsystem *POWer:OLTResponse* determines and outputs the results of the Open Loop Time Response measurement. They correspond to the graphical measurement menu *Power*, application *Open Loop Time Response,* with its various display elements.

READ[:SCALar]:POWer:OLTResponse?				Scalar results: Start single shot measurement and return results
FETCh[:SCALar]:POWer:OLTResponse?				Read out meas. results (unsynchronized)
SAMPle[:SCALar]:POWer:OLTResponse?				Read out measurement results (synchronized)
Returned values	Value range	Def. value	Def. unit	Unit ring
Initial MS Power, Initial BS Power, Current BS Power, Limit Lines Matching	–100.0 dBm to +20.0 dBm –100.0 dBm to +20.0 dBm –100.0 dBm to +20.0 dBm NMAT | NMAU | INV | OK	NAN NAN NAN INV	dBm dBm dBm –	
Description of command				FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results. The calculation of results in an *average* or *peak* measurement is described in Chapter 3 (see *display modes*).The following messages may be output for *Limit Lines Matching:* NMAU Tolerance value underflow *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK Tolerance value matched				V2.50

Burst Power

READ:ARRay:POWer:OLTResponse? Start single shot measurement and return results — RUN

FETCh:ARRay:POWer:OLTResponse? Read meas. results (unsynchronized) — RUN

SAMPle:ARRay:POWer:OLTResponse? Read results (synchronized) — RUN

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dB... + 10.0 dB, ... –100.0 dB... + 10.0 dB	BurstPower[1], 1st value for burst power ... BurstPower[x], xth value for burst power	NAN ... NAN	dB ... dB	

Description of command	FW vers.
These commands are always queries. They output the burst power versus time at fixed, equidistant test points. The number of measured values is 320. This corresponds to a time interval of 100 milliseconds.	V2.50

Test Object POWer:MIOutput

The subsystem *POWer:MIOutput* measures the MS minimum output. The subsystem corresponds to the measurement menu *Power,* application *Minimum Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

Control of measurement – Subsystem POWer:MIOutput

The subsystem *POWer:MIOutput* controls the minimum output measurement.

INITiate:POWer:MIOutput	Start new measurement	*RUN*
ABORt:POWer:MIOutput	Abort running measurement and switch off	*OFF*
STOP:POWer:MIOutput	Stop measurement after current stat. cycle	*STOP*
CONTinue:POWer:MIOutput	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:POWer:MIOutput:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).	V2.50

FETCh:POWer:MIOutput:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
NONE	Statistic count set to off			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

Subsystem POWer:MIOutput:CONTrol

The subsystem *POWer:MIOutput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

CONFigure:POWer:MIOutput:CONTrol *<Statistics>, <Repetition>, <StopCond>, <Stepmode>* Scope of Measurement				
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				V2.50

CONFigure:POWer:MIOutput:CONTrol:STATistics *<Statistics>* Statistic Count				
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:POWer:MIOutput:CONTrol:REPetition *<Repetition>,<StopCond>,<Stepmode>* Test Cycles				
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	

<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
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.	V2.50

DEFault:POWer:MIOutput:CONTrol Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:MIOutput: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)*.	V2.50

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the different softkey/hotkey combinations in the graphical measurement menu and to the *Power Configuration* popup menu.

CONFigure:POWer:MIOutput:LEVel *<CDMA_Power>,<Traffic_Lev>,<Pilot_Lev>* Levels

Values	Description of parameters	Def. value	Def. unit	Unit ring
	CDMA Power			
–144.0 dBm to –33 dBm |	RF1 OUT , 0 dB ext. atten |	–25.0	dBm	
–144.0 dBm to –16 dBm |	RF2 OUT , 0 dB ext. atten |	–25.0	dBm	
–97.0 dBm to 7 dBm,	RF4 OUT , 0 dB ext. atten	–25.0	dBm	
–20.0 dB to –7.0 dB,	Traffic Level	–7.4	dB	
–20.0 dB to –7.0 dB	Pilot Level	–7.0	dB	

Description of command	FW vers.
This command determines the output signal levels the CMU uses in the Minimum Output measurement. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.	V2.50

Subsystem POWer:MIOutput:LIMit

The subsystem *POWer:MIOutput:LIMit* defines the tolerance values for the minimum output measurement. The subsystem corresponds to the *Minimum Output.* section in the *Limits* tab of the *Power Configuration* popup menu.

CONFigure:POWer:MIOutput:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue
<Abs_Min_Pow>,<Wavef_Qual> Minimum Output Limits

Limits	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dBm to 0.0 dBm, 0.0 to 1.0	Upper limit for absolute min. power Lower limit for waveform quality	–50 0.944	dBm –	

Description of command	FW vers.
This commands defines the tolerance limits for the minimum output measurement. The limits are apply to all measurement curves *(Current, Average, Minimum, Maximum)*.	V2.50

DEFault:POWer:MIOutput:LIMit Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:MIOutput: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)*.	V2.50

Measured Values – Subsystem POWer

The subsystem *POWer:MIOutput* determines and outputs the results of the *Minimum Output* measurement. They correspond to the measurement menu *Power*, application *Minimum Output,* with its various display elements.

READ[:SCALar]:POWer:MIOutput? Scalar results:
Start single shot measurement and return results
FETCh[:SCALar]:POWer:MIOutput? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MIOutput? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,	–100.0 dBm to –50.0 dBm		dBm	
Total Power Average,	–100.0 dBm to –50.0 dBm		dBm	
Total Power Minimum,	–100.0 dBm to –50.0 dBm		dBm	
Total Power Maximum,	–100.0 dBm to –50.0 dBm		dBm	
Waveform Quality Current,	0.0 to 1.0		–	
Waveform Quality Average,	0.0 to 1.0		–	
Waveform Quality Minimum,	0.0 to 1.0		–	
Waveform Quality Maximum,	0.0 to 1.0		–	
Measurements out of Tolerance	0.0% to 100.0%		%	

Description of command	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.	V2.50

CALCulate[:SCALar]:POWer:MIOutput:MATChing:LIMit? Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,	For all values		–	
Total Power Average,			–	
Total Power Minimum,			–	
Total Power Maximum,			–	
Waveform Quality Current,	NMAU | NMAL | INV | OK		–	
Waveform Quality Average,			–	
Waveform Quality Minimum,			–	
Waveform Quality Maximum			–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded.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	V2.50

Test Object POWer:MAOutput

The subsystem *POWer:MAOutput* measures the MS maximum output. The subsystem corresponds to the measurement menu *Power,* application *Maximum Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

Control of measurement – Subsystem POWer:MAOutput

The subsystem *POWer:MAOutput* controls the maximum output measurement.

INITiate:POWer:MAOutput	Start new measurement	*RUN*
ABORt:POWer:MAOutput	Abort running measurement and switch off	*OFF*
STOP:POWer:MAOutput	Stop measurement after current stat. cycle	*STOP*
CONTinue:POWer:MAOutput	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:POWer:MAOutput:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).	V2.50

FETCh:POWer:MAOutput:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
NONE	Statistic count set to off			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

Subsystem POWer:MAOutput:CONTrol

The subsystem *POWer:MAOutput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

CONFigure:POWer:MAOutput:CONTrol <*Statistics*>, <*Repetition*>, <*StopCond*>, <*Stepmode*> Scope of Measurement				
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				V2.50

CONFigure:POWer:MAOutput:CONTrol:STATistics <*Statistics*> Scope of Measurement				
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:POWer:MAOutput:CONTrol:REPetition <*Repetition*>,<*StopCond*>,<*Stepmode*> Test Cycles				
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	

<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
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.*	V2.50

DEFault:POWer:MAOutput:CONTrol Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:MAOutput: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)*.	V2.50

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the different softkey/hotkey combinations in the graphical measurement menu and to the *Power Configuration* popup menu.

CONFigure:POWer:MAOutput:LEVel *<CDMA_Power>,<Traffic_Lev>,<Pilot_Lev>* Levels

Values	Description of parameters	Def. value	Def. unit	Unit ring
	CDMA Power			
–144.0 dBm to –33 dBm |	RF1 OUT , 0 dB ext. atten.	–105.0	dBm	
–144.0 dBm to –16 dBm |	RF2 OUT , 0 dB ext. atten.		dBm	
–97.0 dBm to 7 dBm,	RF4 OUT , 0 dB ext. atten.		dBm	
–20.0 dB to –7.0 dB,	Traffic Level	–7.4	dB	
–20.0 dB to –7.0 dB	Pilot Level	–7.0	dB	

Description of command	FW vers.
This command determines the output signal levels the CMU uses in the Minimum Output measurement. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.	V2.50

Subsystem POWer:MAOutput:LIMit

The subsystem *POWer:MAOutput:LIMit* defines the tolerance values for the maximum output measurement. The subsystem corresponds to the *Maximum Output.* section in the *Limits* tab of the *Power Configuration* popup menu.

CONFigure:POWer:MAOutput:CAMMax:LIMit[:SCALar]:ASYMmetric[:COMBined]:VALue
<Abs_Max_Pow>,<Upper_Limit>,<Lower_Limit>,<Wavef_Qual> Maximum Output Limits

Limits	Description of parameters	Def. value	Def. unit	Unit ring
0.0 dBm to +100.0 dBm, 0.0 dB to +50.0 dB, –50.0 dB to +0.0 dB, 0.0 to 1.0	Absolute max. power Upper limit, relative Lower limit, relative Lower limit for waveform quality	+50.0 +7.0 0.0 0.944	dBm dB dB –	

Description of command	FW vers.
This commands defines the tolerance limits for the maximum output measurement. The limits are apply to all measurement curves *(Current, Average, Minimum, Maximum)*.	V2.50

DEFault:POWer:MAOutput:LIMit Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	the parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:MAOutput: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)*.	V2.50

Measured Values – Subsystem POWer

The subsystem *POWer:MAOutput* determines and outputs the results of the *Maximum Output* measurement. They correspond to the measurement menu *Power*, application *Maximum Output,* with its various display elements.

Scalar results:

READ[:SCALar]:POWer:MAOutput? Start single shot measurement and return results
FETCh[:SCALar]:POWer:MAOutput? Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:MAOutput? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,	–100.0 dBm to –50.0 dBm		dBm	
Total Power Average,	–100.0 dBm to –50.0 dBm		dBm	
Total Power Minimum,	–100.0 dBm to –50.0 dBm		dBm	
Total Power Maximum,	–100.0 dBm to –50.0 dBm		dBm	
Waveform Quality Current,	0.0 to 1.0		–	
Waveform Quality Average,	0.0 to 1.0		–	
Waveform Quality Minimum,	0.0 to 1.0		–	
Waveform Quality Maximum,	0.0 to 1.0		–	
Meas. out of Tolerance	0.0% to 100.0%		%	

Description of command	FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.	V2.50

CALCulate[:SCALar]:POWer:MAOutput:MATChing:LIMit? Limit Matching

Returned values	Value range	Def. value	Def. unit	Unit ring
Total Power Current,	For all values		–	
Total Power Average,			–	
Total Power Minimum,			–	
Total Power Maximum,			–	
Waveform Quality Current,	NMAU | NMAL | INV | OK		–	
Waveform Quality Average,			–	
Waveform Quality Minimum,			–	
Waveform Quality Maximum			–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the (fixed) limit lines have been exceeded.The following messages may be generated*:*	V2.50

NMAU	Tolerance value underflow	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	Tolerance value matched	

Test Object POWer:GOUTput

The subsystem *POWer:GOUTput* measures the MS gated output. The subsystem corresponds to the measurement menu *Power,* application *Maximum Output,* and the sections related to this application in the associated popup menu *Power Configuration.*

Control of measurement – Subsystem POWer:GOUTput

The subsystem *POWer:GOUTput* controls the gated output measurement.

INITiate:POWer:GOUTput	Start new measurement	*RUN*
ABORt:POWer:GOUTput	Abort running measurement and switch off	*OFF*
STOP:POWer:GOUTput	Stop measurement after current stat. cycle	*STOP*
CONTinue:POWer:GOUTput	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the power measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:POWer:GOUTput:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).	V2.50

FETCh:POWer:GOUTput:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
NONE	Statistic count set to off			

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

CONFigure:POWer:GOUTput:PCGCount < Pcgcount >				Statistics Count
<Pcgcount>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 200	Number of PCG (Power Control Group) Count	100	–	
Description of command				FW-Vers.
This command specifies the PCG (Power Control Group) Count for Gated Output Power.				V2.50

Subsystem POWer:GOUTput:CONTrol

The subsystem *POWer:GOUTput:CONTrol* defines the repetition mode, statistic count, and stop condition of the measurement. These settings are provided in the *Control* and *Statistics* tabs in the popup menu *Power Configuration.*

CONFigure:POWer:GOUTput:CONTrol *<Mode>, <Statistics>, <Repetition>, <StopCond>, <Stepmode>*				Scope of Measurement
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the ...CONTrol:RMODe, ...CONTrol:STATistics and ...CONTrol:REPetition commands, see below.				V2.50

CONFigure:POWer:GOUTput:CONTrol:RMODe *<Mode>*				Result mode
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
Description of command				FW-Vers.
This command specifies the type of measured values.				≥1.15

CONFigure:POWer:GOUTput:CONTrol:STATistics <*Statistics*>				Statistics Count
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:POWer:GOUTput:CONTrol:REPetition <*Repetition*>,<*StopCond*>,<*Stepmode*>				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
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.*				V2.50

DEFault:POWer:GOUTput:CONTrol				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:GOUTput: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)*.				V2.50

Test Configuration

The commands of the following subsystems determine the parameters of the signal power measurement. They correspond to the different softkey/hotkey combinations in the graphical measurement menu and to the *Power Configuration* popup menu.

CONFigure:POWer:GOUTput:LEVel <*CDMA_Power*>,<*Traffic_Lev*>,<*Pilot_Lev*>				Levels
<Levels>	Description of parameters	Def. value	Def. unit	Unit ring
–144.0 dBm to –33 dBm | –144.0 dBm to –16 dBm | –97.0 dBm to 7 dBm,	CDMA Power RF1 OUT , 0 dB ext. atten | RF2 OUT , 0 dB ext. atten | RF4 OUT , 0 dB ext. atten	–50.0	dBm	
–20.0 dB to –7.0 dB,	Traffic Level	–7.4	dB	
–20.0 dB to –7.0 dB	Pilot Level	–7.0	dB	
Description of command				FW vers.
This command determines the output signal levels the CMU uses in the Minimum Output measurement. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.				V2.50

Subsystem POWer:GOUTput:LIMit:LINE

The subsystem *POWer:GOUTput:...LIMit:LINE* defines the tolerance values for the gated output measurement. The subsystem corresponds to the *Limit Lines* tab of the *Power Configuration* popup menu.

CONFigure:POWer:GOUTput:CAMMax:LIMit:LINE:SYMMetric[:COMBined]:VALue <*A_Limit*>,<*B_Limit*>,<*C_Limit*>,<*D_Limit_Rel*>,<*D_Limit_Abs*>,<*E_Limit*>				Limit Lines
Limits	Description of parameters	Def. value	Def. unit	Unit ring
1.0 µs to +10.0 µs, 1.0 µs to +10.0 µs, –25.0 dB to +0.0 dB, –25.0 dB to +0.0 dB, –70.0 dBm to 0.0 dBm, 1240.0 µs to +1260.0 µs	A limit (rise time) B limit (fall time) C limit D limit (relative) D limit (absolute) E limit (burst length)	7 7 -3 -20 -54 1247	µs µs dB dB dBm µs	
Description of command				FW vers.
This commands defines the tolerance limits for the gated output measurement.				V2.50

DEFault:POWer:GOUTput:LIMit				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values The parameters differ from the default values (partially or totally)	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem POWer:GOUTput: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)*.				V2.50

Subsystem SUBarrays:POWer:GOUTput

The subsystem *SUBarrays:POWer:GOUTput* defines the measurement range and the type of output values.

CONFigure:SUBarrays:POWer:GOUTput <Mode>,<Start>,<Samples>{,<Start>,<Samples>}				Definition of Subarrays
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
–100 µs to 1400 µs	Start time in current range	-52.08	µs	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 3328	No. of samples in range,	3328	–	
Description of command				FW vers.
This command configures the `READ:SUBarrays:POWer:GOUTput...`, `FETCh:SUBarrays:POWer:GOUTput...`, `SAMPle:SUBarrays:POWer:GOUTput...` 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 a start time and the number of test points which are located on a fixed, equidistant grid. The subranges may overlap but must be within the total range of the *POWer:GOUTput* 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.				V2.50

Measured Values – Subsystem POWer

The subsystem *POWer:GOUTput* determines and outputs the results of the *Gated Output* measurement. They correspond to the graphical measurement menu *Power*, application *Gated Output,* with its various display elements.

				Scalar results:
READ[:SCALar]:POWer:GOUTput?				Start single shot measurement and return results
FETCh[:SCALar]:POWer:GOUTput?				Read out measurement results (unsynchronized)
SAMPle[:SCALar]:POWer:GOUTput?				Read out measurement results (synchronized)
Returned values	Value range		Def. value	Def. unit / Unit ring
Mean Output, Limit Lines Matching	0.0 dBm to +100.0 dBm MATC | NMAT | INV | OUT			dBm –
Description of command				FW vers.
These commands are always queries. They start a measurement and output all scalar measurement results.				V2.50

				Burst Power
READ:ARRay:POWer:GOUTput?	Start single shot measurement and return results			RUN
FETCh:ARRay:POWer:GOUTput?	Read meas. results (unsynchronized)			RUN
SAMPle:ARRay:POWer:GOUTput?	Read results (synchronized)			RUN
Returned values	Description of parameters		Def. value	Def. unit / Unit ring
–100.0 dB... + 10.0 dB, ... –100.0 dB... + 10.0 dB	BurstPower[1], 1st value for burst power ... BurstPower[x], xth value for burst power		NAN ... NAN	dB ... dB
Description of command				FW vers.
These commands are always queries. They output the burst power versus time at fixed, equidistant test points. The number of measured values is 3328.				V2.50

Subarray Results

READ:SUBarrays:POWer:GOUTput?	Start single shot measurement and return results	RUN
FETCh:SUBarrays:POWer:GOUTput?	Read meas. results (unsynchronized)	RUN
SAMPle:SUBarrays:POWer:GOUTput?	Read results (synchronized)	RUN

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 dB... + 10.0 dB	BurstPower[1], 1st value for burst power	NAN	dB	
...	...	...	...	
–100.0 dB... + 10.0 dB	BurstPower[x], xth value for burst power	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the burst power versus time in the subranges defined by means of the `CONFigure:SUBarrays:POWer:GOUTput` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:POWer:GOUTput` 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*).	V2.50

Test Object Modulation

DEFault:MODulation:CONTrol <*Mode*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem MODulation: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)*.				V2.50

Test Object MODulation:OVERview

The subsystem *MODulation:OVERview* measures general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Overview,* and the associated popup menu *Modulation Configuration.*

Control of Measurement – Subsystem MODulation:OVERview

The subsystem *MODulation:OVERview* controls the modulation measurement. It corresponds to the softkey *Overview O-QPSK* in the measurement menu *Modulation*.

INITiate:MODulation:OVERview	Start new measurement	*RUN*
ABORt:MODulation:OVERview	Abort running measurement and switch off	*OFF*
STOP:MODulation:OVERview	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation:OVERview	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V2.50

CONFigure:MODulation:OVERview:EREPorting <*Mode*>			Event Reporting	
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	–
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped (see Chapter 5 of the CMU200 Operating manual about event reporting).				V2.50

FETCh:MODulation:OVERview:STATus?			Measurement Status	
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
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,	No counting mode set	NONE	–	
1 to 1000 |	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				V2.50

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Overview* application.

Subsystem MODulation:OVERview:CONTrol

The subsystem *MODulation:OVERview:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration*.

CONFigure:MODulation:OVERview:CONTrol ***<Statistics>, <Repetition>, <StopCond>, <Stepmode>***			Scope of Measurement	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 |	Number of bursts per statistics cycle	100	–	
NONE	Statistics off (equivalent to 1)			
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)	SING	–	
SINGleshot |	Single shot measurement (until `Status = RDY`)			
1 to 10000,	Multiple measurement (*counting*, until `Status = STEP | RDY`)			
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror |	Stop measurement in case of error *(stop on error)*	SON	–	
NONE,	Continue measurement even in case of error			
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE	Continue measurement according to its rep. mode			
Description of command				FW-Vers.
This command combines the `...CONTrol:STATistics` and the `...CONTrol:REPetition` commands, see below.				V2.50

CONFigure:MODulation:OVERview:CONTrol:STATistics <*Statistics*>				Statistic Count
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:MODulation:OVERview:CONTrol:REPetition <*Repetition*> ,<*StopCond*>,<*Stepmode*>				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
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.*				V2.50

DEFault:MODulation:OVERview:CONTrol <*Mode*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
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)*.				V2.50

Tolerance values – Subsystem MODulation:OEMP:LIMit

The subsystem *MODulation:OEMP:LIMit* determines the output RF signal of the CMU and defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Modulation* section in the *Control* tab and to the *Limits* tab in the popup menu *Modulation Configuration.*

CONFigure:MODulation:OEMP:LEVel <*CDMA_Power*>,<*Traffic_Lev*>,<*Pilot_Lev*> CDMA Levels

Values	Description of parameters	Def. value	Def. unit	Unit ring
–144.0 dBm to –33 dBm, –144.0 dBm to –16 dBm, –97.0 dBm to 7 dBm,	CDMA Power RF1 OUT , 0 dB ext. atten RF2 OUT , 0 dB ext. atten RF4 OUT , 0 dB ext. atten	–50.0	dBm	
–20.0 dB to –7.0 dB,	Traffic Level	–14.0	dB	
–20.0 dB to –7.0 dB	Pilot Level	–7.0	dB	

Description of command	FW vers.
This command determines the most important output signal levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.	V2.50

CONFigure:MODulation:OEMP:IMPairments <*AWGN_Lev*>,<*Freq_Offset*> Impairments

Values	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | OFF,	AWGN level AWGN generator off	OFF	dB	
–50.0 kHz to +50.0 kHz | OFF	BS frequency offset no frequency offset	OFF	Hz	

Description of command	FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.	V2.50

CONFigure:MODulation:OEMP:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined] Limits
CONFigure:MODulation:OEMP:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]
<EVMErrorPeak>, <Enable>, <EVMErrorRMS>, <Enable>, <MagnErrorPeak>, <Enable>, <MagnErrorRMS>, <Enable>, <PhaseErrorPeak>, <Enable>, <PhaseErrorRMS>, <Enable>, <CarrFeedthr>, <Enable>, <IQImbalance>, <Enable>, <CarrierFreqError>, <Enable>, <TransmitTimeError>, <Enable>, <WavefQuality>, <Enable>

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for parameter preceding <*Enable*> on or off	ON	–	Angle

Parameters	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to +100.0 %,	EVM Error Peak	+33.4	%	Angle
0.0 % to +100.0 %,	EVM Error RMS	+23.6	%	
0.0 % to +100.0 %,	Magn Error Peak	+33.4	%	
0.0 % to +100.0 %,	Magn Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	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	µs	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords CMMax and AVERage refer to the *Current* and *Max./Min*. traces and for the *Average* trace, respectively. 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, see the following two command tables.	V2.50

Limit values

CONFigure:MODulation:OEMP:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue
CONFigure:MODulation:OEMP:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue
<EVMErrorPeak>,<EVMErrorRMS>,<MagnErrorPeak>, <MagnErrorRMS>, <PhaseErrorPeak>, <PhaseErrorRMS>, <CarrFeedthr>, <IQImbalance>, <CarrierFreqError>, <TransmitTimeError>, <WavefQuality>

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to +100.0 %,	EVM Error Peak	+33.4	%	Angle
0.0 % to +100.0 %,	EVM Error RMS	+23.6	%	
0.0 % to +100.0 %,	Magn Error Peak	+33.4	%	
0.0 % to +100.0 %,	Magn Error RMS	+23.6	%	
0.0 deg to +45.0 deg,	Phase Error Peak	+19.6	deg	
0.0 deg to +45.0 deg,	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	µs	
0.0 to 1.0	Waveform Quality	0.944	–	

Description of command	FW vers.
This command defines upper limits for the different traces and for the scalar modulation parameters derived from them. The keywords CMMax and AVERage refer to the *Current* and *Max./Min*. traces and for the *Average* trace, respectively.	V2.50

Limit Enable

CONFigure:MODulation:OEMP:CMMax:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle
CONFigure:MODulation:OEMP:AVERage:LIMit[:SCALar]:SYMMetric[:COMBined]:ENABle
<EVMErrorPeakEnable>, <EVMErrorRMSEnable>, <MagnErrorPeak>, <MagnErrorRMSEnable>, <PhaseErrorPeakEnable>, <PhaseErrorRMSEnable>, <CarrFeedthrEnable>, <IQImbalanceEnable>, <CarrierFreqErrorEnable>, <TransmitTimeErrorEnable>, <WavefQualityEnable>

<...Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch limit check for corresponding parameter on or off.	ON	–	Angle

Description of command	FW vers.
This command enables or disables the limit check for the different traces and for the scalar modulation parameters derived from them. The keywords CMMax and AVERage refer to the *Current* and *Max./Min*. traces and for the *Average* trace, respectively.	V2.50

DEFault:MODulation:OEMP:LIMit *<Mode>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
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)*.	V2.50

Measured Values – Subsystem MODulation:OVERview

The subsystem *MODulation:OVERview* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Overview.*

READ[:SCALar]:MODulation:OVERview? Scalar Results:
Start single shot measurement and return results
FETCh[:SCALar]:MODulation:OVERview?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:OVERview?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
EVMPeakCurr,	0.0 % to 100.0 %	NAN	%	
EVMPeakAvg,	0.0 % to 100.0 %	NAN	%	
EVMPeakMMax,	0.0 % to 100.0 %	NAN	%	
EVMRMS (x3),	0.0 % to 100.0 %	NAN	%	
MagnErrorPeak (x3),	0.0 % to 100.0 %	NAN	%	
MagnErrorRMS (x3),	0.0 % to 100.0 %	NAN	%	
PhErrorPeakCurr (x3),	0.0 deg to +45.0 deg	NAN	deg	
PhErrorRMS (x3),	0.0 deg to +45.0 deg	NAN	deg	
CarrierFeedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/QImbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
TransmitTimeError (x3),	0 µs to 10 µs	NAN	µs	
WaveformQuality (x3),	0 to 1	NAN	–	
MSPowerCurr (x3),	–133.0 dBm to +19.0 dBm	NAN	dB	
MeasCount	1 to 1000	NAN	–	
MeasOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a modulation 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.	V2.50

CALCulate[:SCALar]:MODulation:OVERview:MATChing:LIMit?				Bursts out of Tol.
Returned values	Value range	Def. value	Def. unit	Unit ring
EVMPeak (x3), EVMRMS (x3), MagnErrorPeak (x3), MagnErrorRMS (x3), PhErrorPeakCurr (x3), PhErrorRMS (x3), CarrierFeedthrough (x3), I/QImbalance (x3), TransmitTimeError (x3), WaveformQuality (x3), MSPowerCurr (x3)	For all measured values: NMAU | NMAL | INV | OK	INV INV INV INV INV INV INV INV INV INV INV	– – – – – – – – – – –	
Description of command				FW vers.
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				V2.50

Test Object MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures the error vector magnitude as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *EVM DQPSK,* and the associated popup menu *Modulation Error Config.*

Control of Measurement – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* controls the modulation measurement. It corresponds to the softkey *EVM DQPSK* in the measurement menu *Modulation*.

INITiate:MODulation:EVMagnitude	Start new measurement	*RUN*
ABORt:MODulation:EVMagnitude	Abort running measurement and switch off	*OFF*
STOP:MODulation:EVMagnitude	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation:EVMagnitude	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.		V2.50

CONFigure:MODulation:EVMagnitude:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).				V2.50

FETCh:MODulation:EVMagnitude:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
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	–	
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				FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).				V2.50

DISPlay:MODulation:EVMagnitude:GRID <*Enable*>				Grid on/off
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on grid lines Switch off grid lines	ON	–	
Description of command				FW vers.
This command switches the grid lines in the test diagrams on or off.				V2.50

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Error Vector Magnitude* application.

Subsystem MODulation:EVMagnitude:CONTrol

The subsystem *MODulation:EVMagnitude:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Error Config*.

CONFigure:MODulation:EVMagnitude:CONTrol ***<Mode>, <Statistics>, <Repetition>, <StopCond>, <Stepmode>***			Scope of Measurement	
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the ...CONTrol:RMODe, ...CONTrol:STATistics and ...CONTrol:REPetition commands, see below.				V2.50

CONFigure:MODulation:EVMagnitude:CONTrol:RMODe ***<Mode>***			Result mode	
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
Description of command				FW-Vers.
This command specifies the type of measured values.				≥1.15

CONFigure:MODulation:EVMagnitude:CONTrol:STATistics <*Statistics*>				Statistics Count
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:MODulation:EVMagnitude:CONTrol:REPetition <*Repetition*> ,<*StopCond*>,<*Stepmode*>				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
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.*				V2.50

DEFault:MODulation:EVMagnitude:CONTrol <*Mode*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
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)*.				V2.50

Tolerance values – Subsystem MODulation:OEMP:LIMit

The subsystem *MODulation:OEMP:LIMit* (refer to page 6.69) defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:EVMagnitude
<Mode>,<Start>,<Samples>{,<Start>,<Samples>} Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
0 µs to 406 µs	Start time in current range	0	µs	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 500	Number of samples in current range	500	–	

Description of command	FW vers.
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.	V2.50

Measured Values – Subsystem MODulation:EVMagnitude

The subsystem *MODulation:EVMagnitude* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Error Vector Magnitude.*

Scalar Results:

READ[:SCALar]:MODulation:EVMagnitude? Start single shot measurement and return results
FETCh[:SCALar]:MODulation:EVMagnitude? Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:EVMagnitude? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
EVMPeakCurr,	0.0 % to 100.0 %	NAN	%	
EVMPeakAvg,	0.0 % to 100.0 %	NAN	%	
EVMPeakMMax,	0.0 % to 100.0 %	NAN	%	
EVMRMS (x3),	0.0 % to 100.0 %	NAN	%	
CarrierFeedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/QImbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
TransmitTimeError (x3),	0 µs to 10 µs	NAN	µs	
WaveformQuality (x3),	0 to 1	NAN	–	
MSPowerCurr (x3),	–133.0 dBm to +–19.0 dBm	NAN	dB	
MeasCount	1 to 1000	NAN	–	
MeasOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
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 *MMax* value.	V2.50

CALCulate[:SCALar]:MODulation:EVMagnitude:MATChing:LIMit? Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
EVMPeak (x3),		INV	–	
EVMRMS (x3),		INV	–	
	For all measured values:			
CarrierFeedthrough (x3),		INV	–	
I/QImbalance (x3),		INV	–	
TransmitTimeError (x3),		INV	–	
WaveformQuality (x3),	NMAU | NMAL | INV | OK	INV	–	
MSPowerCurr (x3)		INV	–	

Description of command — FW vers.

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. — V2.50

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	

READ:ARRay:MODulation:EVMagnitude:CURRent? Phase Error in Burst
READ:ARRay:MODulation:EVMagnitude:AVERage?
READ:ARRay:MODulation:EVMagnitude:MMAX?
Start single shot measurement and return results *RUN*
FETCh:ARRay:MODulation:EVMagnitude:CURRent?
FETCh:ARRay:MODulation:EVMagnitude:AVERage?
FETCh:ARRay:MODulation:EVMagnitude:MMAX?
Read measurement results (unsynchronized) *RUN*
SAMPle:ARRay:MODulation:EVMagnitude:CURRent?
SAMPle:ARRay:MODulation:EVMagnitude:AVERage?
SAMPle:ARRay:MODulation:EVMagnitude:MMAX?
Read measurement results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %,	1st value for error vector magnitude	NAN	%	
... ,	...	...	...	
0.0 % to+ 100.0 %	xth value for error vector magnitude	NAN	%	

Description of command — FW vers.

These commands are always queries. They return the error vector magnitude vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. — V2.50

The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).

READ:SUBarrays:MODulation:EVMagnitude:CURRent? Subarray Results
READ:SUBarrays:MODulation:EVMagnitude:AVERage?
READ:SUBarrays:MODulation:EVMagnitude:MMAX?
Start single shot measurement and return results RUN
FETCh:SUBarrays:MODulation:EVMagnitude:CURRent?
FETCh:SUBarrays:MODulation:EVMagnitude:AVERage?
FETCh:SUBarrays:MODulation:EVMagnitude:MMAX?
Read meas. results (unsynchronized) RUN
SAMPle:SUBarrays:MODulation:EVMagnitude:CURRent?
SAMPle:SUBarrays:MODulation:EVMagnitude:AVERage?
SAMPle:SUBarrays:MODulation:EVMagnitude:MMAX?
Read results (synchronized) RUN

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %, ... , 0.0 % to+ 100.0 %	1st value for error vector magnitude ... xth value for error vector magnitude	NAN ... NAN	% ... %	

Description of command — FW vers.

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. In the default setting of the configuration command the `READ:SUBarrays..., FETCh:SUBarrays..., and SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay..., FETCh:ARRay..., and SAMPle:ARRay...` command group described above. — V2.50

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*).

Test Object MODulation:PERRor

The subsystem *MODulation:PERRor* measures the phase error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Phase Error,* and the associated popup menu *Modulation Configuration.*

Control of Measurement – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* controls the modulation measurement. It corresponds to the soft-key *Phase Error* in the measurement menu *Modulation*.

INITiate:MODulation:PERRor	Start new measurement	*RUN*
ABORt:MODulation:PERRor	Abort running measurement and switch off	*OFF*
STOP:MODulation:PERRor	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation:PERRor	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:MODulation:PERRor:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).	V2.50

FETCh:MODulation:PERRor:STATus? Measurement Status

Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
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,	No counting mode set	NONE	–	
1 to 1000 |	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

DISPlay:MODulation:PERRor:GRID <*Enable*>				Grid on/off
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on grid lines Switch off grid lines	ON	–	
Description of command				FW vers.
This command switches the grid lines in the test diagrams on or off.				V2.50

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *Modulation Configuration* menu that are related to the *Phase Error* application.

Subsystem MODulation:PERRor:CONTrol

The subsystem *MODulation:PERRor:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration*.

CONFigure:MODulation:PERRor:CONTrol ***<Mode>, <Statistics>, <Repetition>, <StopCond>, <Stepmode>***				Scope of Measurement
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the ...CONTrol:RMODe, ...CONTrol:STATistics and ...CONTrol:REPetition commands, see below.				V2.50

CONFigure:MODulation:PERRor:CONTrol:RMODe <*Mode*>				Result mode
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
Description of command				FW-Vers.
This command specifies the type of measured values.				≥1.15

CONFigure:MODulation:PERRor:CONTrol:STATistics <*Statistics*>				Statistics Count
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:MODulation:PERRor:CONTrol:REPetition <Repetition> ,<StopCond>,<Stepmode>				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
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.*				V2.50

DEFault:MODulation:PERRor:CONTrol <*Mode*>			Default Settings	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
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)*.				V2.50

Tolerance values – Subsystem MODulation:OEMP:LIMit

The subsystem *MODulation:OEMP:LIMit* (refer to page 6.69) defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation:PERRor

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:PERRor <Mode>,<Start>,<Samples>{,<Start>,<Samples>}			Definition of Subarrays	
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
0 µs to 406 µs	Start time in current range	0	µs	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 500	Number of samples in current range	500	–	
Description of command				FW vers.
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.				V2.50

Measured Values – Subsystem MODulation:PERRor

The subsystem *MODulation:PERRor* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Phase Error.*

READ[:SCALar]:MODulation:PERRor? Scalar Results:
Start single shot measurement and return results
FETCh[:SCALar]:MODulation:PERRor?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:PERRor?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
PhErrorPeakCurr (x3),	0.0 deg to +45.0 deg	NAN	deg	
PhErrorRMS (x3),	0.0 deg to +45.0 deg	NAN	deg	
CarrierFeedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/QImbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
TransmitTimeError (x3),	0µs to 10 µs	NAN	µs	
WaveformQuality (x3),	0 to 1	NAN	–	
MSPowerCurr (x3),	–133.0 dBm to +–19.0 dBm	NAN	dB	
MeasCount	1 to 1000	NAN	–	
MeasOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
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 *MMax* value.	V2.50

CALCulate[:SCALar]:MODulation:PERRor:MATChing:LIMit? Bursts out of Tol.

Returned values	Value range	Def. value	Def. unit	Unit ring
PhErrorPeakCurr (x3),		INV	–	
PhErrorRMS (x3),		INV	–	
	For all measured values:			
CarrierFeedthrough (x3),		INV	–	
I/QImbalance (x3),		INV	–	
TransmitTimeError (x3),		INV	–	
WaveformQuality (x3),	NMAU | NMAL | INV | OK	INV	–	
MSPowerCurr (x3)		INV	–	

Description of command — FW vers.

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. — V2.50

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	

READ:ARRay:MODulation:PERRor:CURRent? Phase Error in Burst
READ:ARRay:MODulation:PERRor:AVERage?
READ:ARRay:MODulation:PERRor:MMAX?
Start single shot measurement and return results *RUN*
FETCh:ARRay:MODulation:PERRor:CURRent?
FETCh:ARRay:MODulation:PERRor:AVERage?
FETCh:ARRay:MODulation:PERRor:MMAX?
Read measurement results (unsynchronized) *RUN*
SAMPle:ARRay:MODulation:PERRor:CURRent?
SAMPle:ARRay:MODulation:PERRor:AVERage?
SAMPle:ARRay:MODulation:PERRor:MMAX?
Read measurement results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–100.0 deg to+ 100.0 deg,	1st value for phase error	NAN	deg	
... ,	...	...	...	
–100.0 deg to+ 100.0 deg	xth value for phase error	NAN	deg	

Description of command — FW vers.

These commands are always queries. They return the phase error vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. — V2.50

The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).

READ:SUBarrays:MODulation:PERRor:CURRent? Subarray Results
READ:SUBarrays:MODulation:PERRor:AVERage?
READ:SUBarrays:MODulation:PERRor:MMAX?
Start single shot measurement and return results RUN
FETCh:SUBarrays:MODulation:PERRor:CURRent?
FETCh:SUBarrays:MODulation:PERRor:AVERage?
FETCh:SUBarrays:MODulation:PERRor:MMAX?
Read meas. results (unsynchronized) RUN
SAMPle:SUBarrays:MODulation:PERRor:CURRent?
SAMPle:SUBarrays:MODulation:PERRor:AVERage?
SAMPle:SUBarrays:MODulation:PERRor:MMAX?
Read results (synchronized) RUN

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
100.0 deg to+ 100.0 deg, ... , –100.0 deg to+ 100.0 deg	1st value for phase error ... xth value for phase error	NAN ... NAN	deg ... deg	

Description of command — FW vers.

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. In the default setting of the configuration command the `READ:SUBarrays..., FETCh:SUBarrays..., and SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay..., FETCh:ARRay..., and SAMPle:ARRay...` command group described above. — V2.50

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*).

Test Object MODulation:MERRor

The subsystem *MODulation:MERRor* measures the magnitude error as well as general scalar modulation parameters. The subsystem corresponds to the measurement menu *Modulation,* application *Magnitude Error,* and the associated popup menu *Modulation Configuration.*

Control of Measurement – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* controls the modulation measurement. It corresponds to the softkey *Magn. Error* in the measurement menu *Modulation*.

INITiate:MODulation:MERRor	Start new measurement	*RUN*
ABORt:MODulation:MERRor	Abort running measurement and switch off	*OFF*
STOP:MODulation:MERRor	Stop measurement after current stat. cycle	*STOP*
CONTinue:MODulation:MERRor	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the modulation measurement, setting it to the status indicated in the top right column.	V2.50

CONFigure:MODulation:MERRor:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5 of CMU200 manual).	V2.50

FETCh:MODulation:MERRor:STATus? Measurement Status

Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
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,	No counting mode set	NONE	–	
1 to 1000 |	Counter for current evaluation period within a cycle			
NONE	Statistic count set to off	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see Chapters 3 and 5).	V2.50

DISPlay:MODulation:MERRor:GRID <*Enable*>				Grid on/off
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on grid lines Switch off grid lines	ON	–	
Description of command				FW vers.
This command switches the grid lines in the test diagrams on or off.				V2.50

Subsystem MODulation:MERRor:CONTrol

The subsystem *MODulation:MERRor:CONTrol* configures the modulation measurement. It corresponds to the tabs *Control* and *Statistics* in the popup menu *Modulation Configuration*.

CONFigure:MODulation:MERRor:CONTrol ***<Mode>, <Statistics>, <Repetition>, <StopCond>, <Stepmode>***				Scope of Measurement
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay,	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000,	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE,	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW-Vers.
This command combines the ...CONTrol:RMODe, ...CONTrol:STATistics and ...CONTrol:REPetition commands, see below.				V2.50

CONFigure:MODulation:MERRor:CONTrol:RMODe <*Mode*>				Result mode
<Mode>	Desciption of parameters	Def. value	Def. unit	Unit ring
SCALar | ARRay	Scalar values only (incl. ramp matching) Scalar measured values and arrays	ARRay	–	
Description of command				FW-Vers.
This command specifies the type of measured values.				≥1.15

CONFigure:MODulation:MERRor:CONTrol:STATistics <*Statistics*>				Statistics Count
<Statistics>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 1000 | NONE	Number of bursts per statistics cycle Statistics off (equivalent to 1)	100	–	
Description of command				FW-Vers.
This command specifies the type of measured values and defines the number of bursts forming a statistics cycle.				V2.50

CONFigure:MODulation:MERRor:CONTrol:REPetition <Repetition> ,<StopCond>,<Stepmode>				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | NONE	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	SON	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
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.*				V2.50

DEFault:MODulation:MERRor:CONTrol <*Mode*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
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)*.				V2.50

Tolerance values – Subsystem MODulation:OEMP:LIMit

The subsystem *MODulation:OEMP:LIMit* (refer to page 6.69) defines tolerance values for the modulation measurement in all four applications. The subsystem corresponds to the *Limits* tab in the popup menu *Modulation Configuration.*

Subsystem SUBarrays:MODulation

The subsystem *SUBarrays:MODulation* defines the measurement range and the type of output values.

CONFigure:SUBarrays:MODulation:MERRor
<Mode>,<Start>,<Samples>{,<Start>,<Samples>} Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | ARIThmetical | MINimum | MAXimum,	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
0 µs to 406 µs	Start time in current range	0	µs	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 500	Number of samples in current range	500	–	

Description of command	FW vers.
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.	V2.50

Measured Values – Subsystem MODulation:MERRor

The subsystem *MODulation:MERRor* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *MODulation,* application *Magnitude. Error.*

READ[:SCALar]:MODulation:MERRor? Scalar Results:
Start single shot measurement and return results
FETCh[:SCALar]:MODulation:MERRor?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:MODulation:MERRor?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
MagnErrorPeak (x3),	0.0 % to 100.0 %	NAN	%	
MagnErrorRMS (x3),	0.0 % to 100.0 %	NAN	%	
CarrierFeedthrough (x3),	–120.0 dB to -20.0 dB	NAN	dB	
I/QImbalance (x3),	–120.0 dB to -20.0 dB	NAN	dB	
TransmitTimeError (x3),	0 µs to 10 µs	NAN	µs	
WaveformQuality (x3),	0 to 1	NAN	–	
MSPowerCurr (x3),	–133.0 dBm to +–19.0 dBm	NAN	dB	
MeasCount	1 to 1000	NAN	–	
MeasOutOfTol	0.0 % to 100.0 %	NAN	%	

Description of command	FW vers.
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 *MMax* value.	V2.50

CALCulate[:SCALar]:MODulation:MERRor:MATChing:LIMit? Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
MagnErrorPeak (x3),		INV	–	
MagnErrorRMS (x3),		INV	–	
	For all measured values:			
CarrierFeedthrough (x3),		INV	–	
I/QImbalance (x3),		INV	–	
TransmitTimeError (x3),		INV	–	
WaveformQuality (x3),	NMAU | NMAL | INV | OK	INV	–	
MSPowerCurr (x3)		INV	–	

Description of command — FW vers.

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. — V2.50

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	

READ:ARRay:MODulation:MERRor:CURRent? Phase Error in Burst
READ:ARRay:MODulation:MERRor:AVERage?
READ:ARRay:MODulation:MERRor:MMAX?
Start single shot measurement and return results *RUN*
FETCh:ARRay:MODulation:MERRor:CURRent?
FETCh:ARRay:MODulation:MERRor:AVERage?
FETCh:ARRay:MODulation:MERRor:MMAX?
Read measurement results (unsynchronized) *RUN*
SAMPle:ARRay:MODulation:MERRor:CURRent?
SAMPle:ARRay:MODulation:MERRor:AVERage?
SAMPle:ARRay:MODulation:MERRor:MMAX?
Read measurement results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %,	1st value for magnitude error	NAN	%	
... ,	...	...	...	
0.0 % to+ 100.0 %	xth value for magnitude error	NAN	%	

Description of command — FW vers.

These commands are always queries. They return the magnitude error vs. time at fixed, equidistant test points. The number of measured values is 500, corresponding to a time range of 0 symbols to 406 microseconds. — V2.50

The calculation of *current, average, and mmax* (Min./Max.) results is explained in Chapter 3 (see *display mode*).

READ:SUBarrays:MODulation:MERRor:CURRent? Subarray Results
READ:SUBarrays:MODulation:MERRor:AVERage?
READ:SUBarrays:MODulation:MERRor:MMAX?
Start single shot measurement and return results RUN
FETCh:SUBarrays:MODulation:MERRor:CURRent?
FETCh:SUBarrays:MODulation:MERRor:AVERage?
FETCh:SUBarrays:MODulation:MERRor:MMAX?
Read meas. results (unsynchronized) RUN
SAMPle:SUBarrays:MODulation:MERRor:CURRent?
SAMPle:SUBarrays:MODulation:MERRor:AVERage?
SAMPle:SUBarrays:MODulation:MERRor:MMAX?
Read results (synchronized) RUN

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to+ 100.0 %, ... , 0.0 % to+ 100.0 %	1st value for magnitude error ... xth value for magnitude error	NAN ... NAN	% ... %	

Description of command — FW vers.

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. In the default setting of the configuration command the `READ:SUBarrays..., FETCh:SUBarrays..., and SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay..., FETCh:ARRay..., and SAMPle:ARRay...` command group described above. — V2.50

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*).

Test Object Receiver Quality

The subsystem *Receiver Quality* measures the receiver quality of the CDMA mobile phone. The settings are used to assess the quality of transmission between the CMU and the device under test. The subsystem corresponds to the main menu *Receiver Quality* and the associated popup menu *Receiver Quality Configuration.*

Test Object RXQuality:FER (Frame Erasure Rate)

The subsystem *RXQuality:FER* contains the commands for receiver quality measurements. The subsystem corresponds to the main menu *Receiver Quality* and the corresponding sections of the associated popup menu *Receiver Quality Configuration.*

Control of Measurement – Subsystem RXQuality:FER

The subsystem *RXQuality:FER* controls the single shot receiver quality measurements.

CONFigure:RXQuality:FER:TSETup <TestSetup>			Test Setup	
<Test Setup>	Description of parameters	Def. value	Def. unit	Unit ring
T1 | T2 | T3 | T4 | T5	Test Setup 1: Sensitivity Test Setup 2: Dynamic range Test Setup 3: Traffic channel demodulation Test Setup 4: User 1 Test Setup 5: User 2	T3	–	–
Description of command			Status	FW vers.
This command selects one out of 5 test setups, i.e. one data set parametrizing a particular receiver quality measurement. When a test setup is switched over, the running measurement is stopped and all measured values are set invalid.			TCES	V2.50

INITiate:RXQuality:FER	Start new measurement	*RUN*
ABORt:RXQuality:FER	Abort running measurement and switch off	*OFF*
STOP:RXQuality:FER	Stop measurement	*STOP*
CONTinue:RXQuality:FER	Next measurement step (only *stepping mode*)	*RUN*

Description of command	Status	FW vers.
These commands do not exist as queries. They start or stop the current single shot measurement, setting it to the status indicated in the top right column.	all	V2.50

CONFigure:RXQuality:FER:EREPorting <*Mode*>			Event Reporting	
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | SOPC | SRSQ | OFF	Service request Single operation complete SRQ and SRSQ No reporting	OFF	–	–
Description of command			Status	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see Chapter 5).			all	V2.50

FETCh:RXQuality:FER:STATus?			Measurement Status	
Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF | RUN | STOP | ERR | STEP | RDY, 1 to 20000 | NONE	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 Counter for current evaluation period (frame) Statistic count set to off (only 1 frame)	OFF NONE	– –	– –
Description of command			Status	FW vers.
This command is always a query. It returns the status of the measurement (see Chapter 5).			all	V2.50

Subsystem RXQuality:FER:CONTrol

The subsystem *RXQuality:FER:CONTrol* sets the control parameters for the single shot receiver quality measurements. The subsystem corresponds to the tab *Control* in the popup menu *Receiver Quality Configuration.*

CONFigure:RXQuality:FER:TSETup<nr>:CONTrol <*Max_Frames*> ,<*Repetition*>, <*StopCondition*>, <Stepmode>			Scope of Measurement	
<Max_Frames>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 20000	No. of frames to be sent	1000	–	
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCondition>	Description of parameters	Def. value	Def. unit	Unit ring
ALEXceeded | CLEXceeded | FLEXceeded | NONE	Measurement aborted if any limit is exceeded Aborted when confidence limit is exceeded Aborted when frame limit is exceeded Not aborted, measurement over all frames	See below	–	–
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	–
Description of command			Status	FW vers.
This command defines the measured value and the number of frames to be sent, the repetition mode, the stop condition and the stepping mode for the measurement. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default value is the same for all test setups.			all	V2.50

CONFigure:RXQuality:FER:TSETup<nr>:CONTrol:STATistics <*Max_Frames*>				Frames
<Max_Frames>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 20000	No. of frames to be sent	1000	–	
Description of command			Status	FW vers.
This command defines the measured value and the numFER of frames to be sent in a single shot measurement, constituting a statistics cycle. The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default value is the same for all test setups.			all	V2.50

CONFigure:RXQuality:FER:TSETup<nr>:CONTrol:REPetition <Repetition>, <StopCondition>, <Stepmode>				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | SINGleshot | 1 to 10000	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCondition>	Description of parameters	Def. value	Def. unit	Unit ring
ALEXceeded | CLEXceeded | FLEXceeded | NONE	Measurement aborted if any limit is exceeded Aborted when confidence limit is exceeded Aborted when frame limit is exceeded Not aborted, measurement over all frames	See below	–	–
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | NONE	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	–
Description of command			Status	FW vers.
This command determines the repetition mode, 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.*			all	V2.50

DEFault:RXQuality:FER:TSETup<nr>:CONTrol <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to default values The parameters partly or completely differ from the default values	ON	–	–
Description of command			Status	FW vers.
As a *setting command* with the setting *ON* this command sets all parameters of the subsystem RXQuality:FER:TSETup<nr>:CONTrol to default values (the setting OFF results in an error message).The suffix <nr> refers to the selected test setup (<nr> = 1 to 5); the range and the default value is the same for all test setups. As a query, this command reads out whether all parameters are set to default values *(ON)* or not *(OFF)*.			all	V2.50

DEFault:RXQuality:FER:CONTrol <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem RXQuality:FER:TSETup<nr>:CONTrol to their default for all test setups. If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.50

General Configurations – Subsystem RXQuality:FER:TSETup<nr>

The subsystem *RXQuality:FER:TSETup<nr>* configures the generated RF signal. It corresponds to the *CDMA Levels* and the *Impairments* section in the *Control* tab of the *Receiver Quality Configuration* menu.

CONFigure:RXQuality:FER:TSETup<nr>:LEVel ***<CDMA_Power>,<Traffic_Lev>,<Pilot_Lev>***				CDMA Levels
<Levels>	Description of parameters	Def. value	Def. unit	Unit ring
–144.0 dBm to –33.0 dBm | –144.0 dBm to –16.0 dBm | –97.0 dBm to 7.0 dBm –20.0 dB to –7.0 dB, –20.0 dB to –7.0 dB	Default CDMA Power for test setup 1 Default CDMA Power for test setup 2 Default CDMA Power for test setup 3 Default CDMA Power for test setup 4 Default CDMA Power for test setup 5 RF1 OUT , 0 dB ext. atten | RF2 OUT , 0 dB ext. atten | RF4 OUT , 0 dB ext. atten Traffic Level Pilot Level	-104.0 -25.0 –70.0 –70.0 –70.0 –14.0 –7.0	dBm dB dB	
Description of command				FW vers.
This command determines the most important output signal levels of the CMU. This includes the total CDMA output power (absolute value, in dBm) and the levels in the forward traffic channel and the forward pilot channel. The individual channel powers are in units relative to the total CDMA power. CDMA Power value range depends on the RF input used and the external attenuation set.				V2.50

CONFigure:RXQuality:FER:TSETup<nr>:IMPairments <*AWGN_Lev*>,<*Freq_Offset*> Impairments				
<Levels>	Description of parameters	Def. value	Def. unit	Unit ring
–20.0 dB to +4.0 dB | OFF, –50.0 kHz to +50.0 kHz | OFF	AWGN level AWGN generator off BS frequency offset no frequency offset	Off 0.0	dB Hz	
Description of command				FW vers.
This command determines an Additional White Gaussian Noise level and a frequency offset to impair the CMU output signal.				V2.50

CONFigure:RXQuality:FER:TSETup<nr>:FRATe *<Rate>*				Frame Rate
<Rate>	Description of parameters	Def. value	Def. unit	Unit ring
EIGHth | QUARter HALF FULL	Frames at 1/8 of the rate set Frames at 1/4 of the rate set Frames at 1/2 of the rate set Frames at the full rate set	FULL	–	
Description of command			Sig. State	FW vers.
This command sets the frame rate for a variable rate traffic channel.			all	V2.50

Subsystem RXQuality:FER:TSETup<nr>:LIMit

The subsystem *RXQuality:FER:TSETup<nr>:LIMit* defines tolerance values for the single shot receiver quality measurements. The subsystem corresponds to the tab *Limits* in the popup menu *Receiver Quality Configuration.*

CONFigure:RXQuality:FER:TSETup<nr>:LIMit[:SCALar]:SYMMetric[:COMBined]:VALue *<Max_FER>, <Min_Conf_Lev>*				Limits
Parameters	Description of parameters	Def. value	Def. unit	Unit ring
0.0 % to +100.0 %, 85.0 % to +99.9 %	Maximum FER Minimum Confidence Level	+0.5 +95.0	% %	Angle
Description of command			Status	FW vers.
This command defines the tolerances for the receiver quality measurement and for test setup <nr>. The ranges and default values are the same for all test setups.				V2.50

DEFault:RXQuality:FER:TSETup<nr>:LIMit <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem RXQuality:FER:TSETup<nr>:LIMIT to their default values (the setting OFF results in an error message) for test setup <nr>. If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.50

DEFault:RXQuality:FER:LIMit <Enable>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON,* this command sets all parameters of the subsystem RXQuality:FER:TSETup<nr>:LIMIT to their default for all test setups. If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.50

Measured Values – Subsystem RXQuality:FER

The subsystem *RXQuality:FER* measures and outputs the bit error rate and compares it with the tolerance values. The subsystem corresponds to the output fields in the *Receiver Quality* menu.

				Scalar Results:
READ[:SCALar]:RXQuality:FER?				Start single shot measurement and return results
FETCh[:SCALar]:RXQuality:FER?				Read out meas. results (unsynchronized)
SAMPle[:SCALar]:RXQuality:FER?				Read out measurement results (synchronized)
Returned Values	Value range	Def. value	Def. unit	Unit ring
Frame Error Rate (FER), Frame Errors, Frames Received, Confidence Level	0.0% to 100.0% 0 to 20000 0 to 20000 0.000% to 100.000%	NAN NAN NAN NAN	% – – %	
Description of command			Status	FW vers.
These commands are always queries. They start a receiver quality measurement and output the measurement results (see also detailed explanation of measured values in Chapter 4).			all	V2.50

CALCulate:RXQuality:FER:MATChing:LIMit?				Limit Matching
Returned Values	Meaning	Def. value	Def. unit	Unit ring
NMAT | NMAU | INV | OK, **NMAT | NMAU | INV | OK**	Maximum FER Minimum Confidence Level	INV INV	– –	
Description of command			Status	FW vers.
This command is always a query. It indicates whether and in which way the permissible error limits for the measured values of the bit error rate test (see command above) have been exceeded. The following messages can be output for the measured quantities: NMAU – Underflow of tolerance value – *not matching, underflow* NMAL – Tolerance value exceeded – *not matching, overflow* INV – Measurement invalid – *invalid* OK – all tolerances matched			all	V2.50

List of Commands

In the following, all remote-control commands of the function groups CDMA 800/1900-MS are listed in alphabetical order.

Table 6-1 Remote-control commands: *Non Signalling* mode

Table 6-2 Remote-control commands: *Signalling* mode

Command (Signalling, alphabetical) **Page**

Command (Signalling, alphabetical) **Page**

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7 Remote Control – Program Example

The following example illustrates primary and secondary addressing by setting up a call and performing a simple measurement with the CMU. In the example, remote control via GPIB bus and the programming language WinBatch is used.

```
ECHO ON

FPRINT ------------------------------------------------------------------------
FPRINT CMU Setup
FPRINT ------------------------------------------------------------------------
CMUBASE: *RST
CMUBASE: *CLS;*OPC?

WAITKEY Turn on Report
CMUBASE: *IDN?

CMUBASE: SYST:ERR?

; 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 1,"RF_NSig"
CMUBASE: SYST:REM:ADDR:SEC 17,"CDMA_Cell_MS_Sig"
CMUBASE: SYST:REM:ADDR:SEC 16,"CDMA_Cell_MS_NSig"

; SWITCH OFF Signaling mode
CMUBASE: SYST:ERR?
CDMA-S8: PROC:SIGN:ACT SOFF
;*STB?

; Make sure signaling is off
REPORT OFF
WHILE CDMA-S8: SENSe:SIGNalling:STATe? <> SOFF
REPORT ON

; Do a check on state and standard
CDMA-S8: SIGN:STAT?
CDMA-S8: CONFigure:NSTandard?

CDMA-S8: CONFigure:BSSignal:SIGNalling:CMODe DL8
CDMA-S8: CONFigure:BSSignal:SIGNalling:CMODe?

FPRINT ------------------------------------------------------------------------
FPRINT BS Configuration
FPRINT ------------------------------------------------------------------------

; Set the connectors
CDMA-S8: INPut:STATe RF2
CDMA-S8: OUTPut:STATe RF2

; Set the power levels
CDMA-S8: CONF:BSS:LEV -50,-14,-12,-16,-7
CDMA-S8: CONF:BSS:LEV?

; Set and get all the current settings for signaling
CDMA-S8: CONFigure:BSSignal:SIGNalling:TCH 8
CDMA-S8: CONFigure:BSSignal:SIGNalling:TCH?
CDMA-S8: CONFigure:BSSignal:SIGNalling:RFCHannel 283
CDMA-S8: CONFigure:BSSignal:SIGNalling:RFCHannel?
CDMA-S8: CONFigure:BSSignal:SIGNalling:PNOFfset?
CDMA-S8: CONFigure:BSSignal:SIGNalling:FOFFset 0
```

```
CDMA-S8: CONFigure:BSSignal:SIGNalling:FOFFset?
CDMA-S8: CONFigure:BSSignal:SIGNalling:FRATe FULL
CDMA-S8: CONFigure:BSSignal:SIGNalling:FRATe?
CDMA-S8: CONFigure:BSSignal:SIGNalling:CMODe DL8
CDMA-S8: CONFigure:BSSignal:SIGNalling:CMODe?

FPRINT ------------------------------------------------------------------------
FPRINT Network Configuration
FPRINT ------------------------------------------------------------------------

CDMA-S8: CONFigure:NETWork:MSETtings:IDTYpe?
CDMA-S8: CONFigure:NETWork:MSETtings:ID?
CDMA-S8: CONFigure:NETWork:SYSTem:PREVision?
CDMA-S8: CONFigure:NETWork:SYSTem:TBReg?
CDMA-S8: CONFigure:NETWork:SYSTem:BSID?
CDMA-S8: CONFigure:NETWork:PCHannel:SCINdex?
CDMA-S8: CONFigure:NETWork:IDENtity:MCC?
CDMA-S8: CONFigure:NETWork:IDENtity:SID?
CDMA-S8: CONFigure:NETWork:IDENtity:NID?

FPRINT ------------------------------------------------------------------------
FPRINT RXQ parameter tests
FPRINT Check commands before call is established; index to Dynamic Range
measurement
FPRINT ------------------------------------------------------------------------

; Check reset values for limits
CDMA-S8:
CONFigure:RXQuality:FER:TSETup3:LIMit:SCALar:SYMMetric:COMBined:VALue?

; Check reset values for controls
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:REPetition?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:IMPairments?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:LEV?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:FRATe?

;Check reset value for statistics
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:STATistics?

;Check reset state value
CDMA-S8: DEFault:RXQuality:FER:TSETup3:CONTrol?

; Set and check reset limit values
CDMA-S8:
CONFigure:RXQuality:FER:TSETup3:LIMit:SCALar:SYMMetric:COMBined:VALue 0.2,
87
CDMA-S8:
CONFigure:RXQuality:FER:TSETup3:LIMit:SCALar:SYMMetric:COMBined:VALue?

;Check state
CDMA-S8: DEFault:RXQuality:FER:TSETup3:CONTrol?

FLEXceeded, NONE
;CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol?

;CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:REPetition SINGleshot,
FLEXceeded, NONE
;CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:REPetition?

CDMA-S8: CONFigure:RXQuality:FER:TSETup3:IMPairments -3.0, -21.2
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:IMPairments?

CDMA-S8: CONFigure:RXQuality:FER:TSETup3:LEV -50.0, -14.4, -8.1
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:LEV?

CDMA-S8: CONFigure:RXQuality:FER:TSETup3:FRATe HALF
```

```
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:FRATe?

;Check state
CDMA-S8: DEFault:RXQuality:FER:TSETup3:CONTrol?

; Set and check limit values
CDMA-S8:
CONFigure:RXQuality:FER:TSETup3:LIMit:SCALar:SYMMetric:COMBined:VALue 0.2,
87
CDMA-S8:
CONFigure:RXQuality:FER:TSETup3:LIMit:SCALar:SYMMetric:COMBined:VALue?

;Check state
CDMA-S8: DEFault:RXQuality:FER:TSETup3:CONTrol?

; Set configuration statistic values
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:STATistics 8111
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:STATistics?

;Check state
CDMA-S8: DEFault:RXQuality:FER:TSETup3:CONTrol?

FPRINT ------------------------------------------------------------------------
FPRINT Check to see whether (and how) default commands work
FPRINT ------------------------------------------------------------------------

;Set defaults switch
CDMA-S8: DEFault:RXQuality:FER:TSETup3:CONTrol ON

; Check reset values for controls
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:REPetition?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:IMPairments?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:LEV?
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:FRATe?

; Check reset values for limits
CDMA-S8:
CONFigure:RXQuality:FER:TSETup3:LIMit:SCALar:SYMMetric:COMBined:VALue?

; Check reset values for statistics
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:STATistics?

FPRINT ------------------------------------------------------------------------
FPRINT Turn signal on after selecting test 3 and setting event reporting
FPRINT ------------------------------------------------------------------------

CDMA-S8:  CONFigure:RXQuality:FER:TSETup T3
CDMA-S8:  CONFigure:RXQuality:FER:TSETup?

CDMA-S8:  CONFigure:RXQuality:FER:EREPorting OFF
CDMA-S8:  CONFigure:RXQuality:FER:EREPorting?

CDMA-S8:  PROCedure:SIGNalling:ACTion SON
CDMA-S8:  SENSe:SIGNalling:STATe?

FPRINT ------------------------------------------------------------------------
FPRINT Wait for registration
FPRINT ------------------------------------------------------------------------

REPORT OFF
WHILE CDMA-S8: SENSe:SIGNalling:STATe? <> SYNC
REPORT ON

FPRINT ------------------------------------------------------------------------
FPRINT Mobile is registered
FPRINT ------------------------------------------------------------------------
```

```
CDMA-S8: SENSe:MSSinfo?

FPRINT ------------------------------------------------------------------------
FPRINT Establish Test LB Call
FPRINT ------------------------------------------------------------------------

CDMA-S8: PROCedure:SIGNalling:ACTion CTM

; Wait for mobile to indicate a call is up

REPORT OFF
WHILE CDMA-S8: SENSe:SIGNalling:STATe? <> TCES
REPORT ON

FPRINT ------------------------------------------------------------------------
FPRINT RXQ singleshot measurement tests
FPRINT ------------------------------------------------------------------------

; Setup
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:CONTrol:STATistics 1011
CDMA-S8: CONFigure:RXQuality:FER:TSETup3:IMPairments 3.4, OFF

; Get unsynchronized results and check conditions
;CDMA-S8: FETCh:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER:STATus?
CDMA-S8: CALCulate:RXQuality:FER:MATChing:LIMit?

FPRINT ------------------------------------------------------------------------
FPRINT Do a simple read
FPRINT ------------------------------------------------------------------------

; Start measurement and return results
CDMA-S8: READ:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER:STATus?
CDMA-S8: CALCulate:RXQuality:FER:MATChing:LIMit?

FPRINT ------------------------------------------------------------------------
FPRINT Initiate a measurement
FPRINT ------------------------------------------------------------------------

; Start measurement and return results
CDMA-S8: INITiate:RXQuality:FER
CDMA-S8: FETCh:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER:STATus?
CDMA-S8: CALCulate:RXQuality:FER:MATChing:LIMit?

WAITKEY Halt the measurement

CDMA-S8: STOP:RXQuality:FER
CDMA-S8: FETCh:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER:STATus?
CDMA-S8: CALCulate:RXQuality:FER:MATChing:LIMit?

WAITKEY Restart the measurement

CDMA-S8: INITiate:RXQuality:FER
CDMA-S8: FETCh:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER:STATus?
CDMA-S8: CALCulate:RXQuality:FER:MATChing:LIMit?

WAITKEY Abort the measurement

CDMA-S8: ABORt:RXQuality:FER
CDMA-S8: FETCh:SCALar:RXQuality:FER:STATus?
CDMA-S8: CALCulate:RXQuality:FER:MATChing:LIMit?
```

```
JUMP RELEASE

FPRINT ------------------------------------------------------------------------
FPRINT Run in stepping mode
FPRINT ------------------------------------------------------------------------

CDMA-S8: SAMPle:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER?
CDMA-S8: FETCh:SCALar:RXQuality:FER:STATus?
CDMA-S8: CALCulate:RXQuality:FER:MATChing:LIMit?

[RELEASE]

FPRINT ------------------------------------------------------------------------
FPRINT Release the call
FPRINT ------------------------------------------------------------------------

; Release the call
CDMA-S8: PROCedure:SIGNalling:ACTion CREL

REPORT OFF
WHILE CDMA-S8: SENSe:SIGNalling:STATe? = CEST
REPORT ON

[END]

FPRINT ------------------------------------------------------------------------
FPRINT Done
FPRINT ------------------------------------------------------------------------
```

8 Maintenance

This chapter contains information on the maintenance of the CMU.

Please follow the instructions in the service manual when exchanging modules or ordering spares. The Order Nos. for spare parts can be found in the service manual.

The address of our support center and a list of all Rohde & Schwarz service centers can be found at the beginning of this manual.

The service manual includes further information particularly on troubleshooting, repair, exchange of modules and calibration.

Mechanical and Electrical 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.

Storing and Packing

The CMU can be stored at a temperature of –40°C to +70°C. When stored for an extended period of time the instrument should be protected against dust.

The original packing should be used, particularly the protective covers at the front and rear, when the instrument is to be transported or dispatched. If the original packing is no longer available, use a sturdy cardboard box of suitable size and carefully wrap the instrument to protect it against mechanical damage.

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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