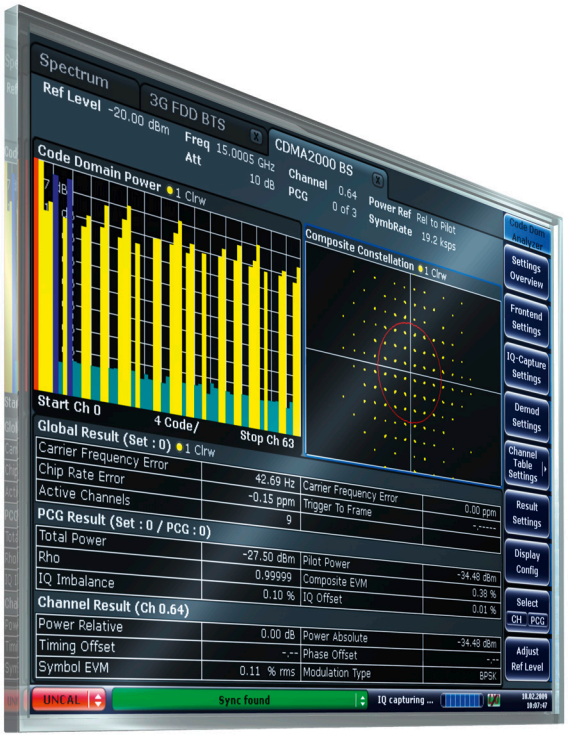
R&S® FSV-K82/-K83
Firmware Options CDMA2000 Analysis
Operating Manual



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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

This manual describes the following R&S®FSV options:

- R&S®FSV-K82 (1310.8703.02)
- R&S®FSV-K83 (1310.8755.02)

This manual is applicable for the following analyzer models with firmware version 1.55:

- R&S®FSV 3 (1307.9002K03)
- R&S®FSV 7 (1307.9002K07)
- R&S®FSV 13 (1307.9002K13)
- R&S®FSV 30 (1307.9002K30)
- R&S®FSV 40 (1307.9002K39)
- R&S®FSV 40 (1307.9002K40)
- R&S®FSVR 7 (1311.0006K7)
- R&S®FSVR 13 (1311.0006K13)
- R&S®FSVR 30 (1311.0006K30)

The firmware of the instrument makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" on the user documentation CD-ROM (included in delivery).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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

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1 Documentation Overview

The user documentation for the analyzer is divided as follows:

- Quick Start Guide
- Operating Manuals for base unit and options
- Service Manual
- Online Help
- Release Notes

Quick Start Guide

This manual is delivered with the instrument in printed form and in PDF format on the CD. It provides the information needed to set up and start working with the instrument. Basic operations and basic measurements are described. Also a brief introduction to remote control is given. The manual includes general information (e.g. Safety Instructions) and the following chapters:

Chapters 1-3	Introduction, General information
Chapter 4	Front and Rear Panel
Chapter 5	Preparing for Use
Chapter 6	Firmware Update and Installation of Firmware Options
Chapter 7	Basic Operations
Chapter 8	Basic Measurement Examples
Chapter 9	Brief Introduction to Remote Control
Appendix 1	Printer Interface
Appendix 2	LAN Interface

Operating Manuals

The Operating Manuals are a supplement to the Quick Start Guide. Operating Manuals are provided for the base unit and each additional (software) option.

The Operating Manual for the base unit provides basic information on operating the analyzer in general, and the "Spectrum" mode in particular. Furthermore, the software options that enhance the basic functionality for various measurement modes are described here. The set of measurement examples in the Quick Start Guide is expanded by more advanced measurement examples. In addition to the brief introduction to remote control in the Quick Start Guide, a description of the basic analyzer commands and programming examples is given. Information on maintenance, instrument interfaces and error messages is also provided.

In the individual option manuals, the specific instrument functions of the option are described in detail. For additional information on default settings and parameters, refer to the data sheets. Basic information on operating the analyzer is not included in the option manuals.

The following Operating Manuals are available for the analyzer:

- R&S FSV base unit; in addition:
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K7 Analog Demodulation and R&S FSV-K7S FM Stereo Measurements
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis
- R&S FSV-K72 3GPP FDD BTS Analysis
- R&S FSV-K73 3GPP FDD UE Analysis
- R&S FSV-K76/77 3GPP TD-SCDMA BTS/UE Measurement
- R&S FSV-K82/83 CDMA2000 BTS/MS Analysis
- R&S FSV-K84/85 1xEV-DO BTS/MS Analysis
- R&S FSV-K91 WLAN IEEE 802.11a/b/g/j/n
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application

These manuals are available in PDF format on the CD delivered with the instrument. The printed manual can be ordered from Rohde & Schwarz GmbH & Co. KG.

Service Manual

This manual is available in PDF format on the CD delivered with the instrument. It describes how to check compliance with rated specifications, instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the analyzer by replacing modules. The manual includes the following chapters:

Chapter 1	Performance Test
Chapter 2	Adjustment
Chapter 3	Repair
Chapter 4	Software Update / Installing Options
Chapter 5	Documents

Online Help

The online help contains context-specific help on operating the analyzer and all available options. It describes both manual and remote operation. The online help is installed on the analyzer by default, and is also available as an executable .chm file on the CD delivered with the instrument.

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding

firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

2 Conventions Used in the Documentation

2.1 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

2.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touch screen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the device or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen, a mouse pointer in the display, or a key on the device or on a keyboard.

3 How to Use the Help System

Calling context-sensitive and general help

► To display the general help dialog box, press the HELP key on the front panel.

The help dialog box "View" tab is displayed. A topic containing information about the current menu or the currently opened dialog box and its function is displayed.

For standard Windows dialog boxes (e.g. File Properties, Print dialog etc.), no context-sensitive help is available.

► If the help is already displayed, press the softkey for which you want to display help.

A topic containing information about the softkey and its function is displayed.

If a softkey opens a submenu and you press the softkey a second time, the submenu of the softkey is displayed.

Contents of the help dialog box

The help dialog box contains four tabs:

- "Contents" - contains a table of help contents
- "View" - contains a specific help topic
- "Index" - contains index entries to search for help topics
- "Zoom" - contains zoom functions for the help display

To change between these tabs, press the tab on the touchscreen.

Navigating in the table of contents

- To move through the displayed contents entries, use the UP ARROW and DOWN ARROW keys. Entries that contain further entries are marked with a plus sign.
- To display a help topic, press the ENTER key. The "View" tab with the corresponding help topic is displayed.
- To change to the next tab, press the tab on the touchscreen.

Navigating in the help topics

- To scroll through a page, use the rotary knob or the UP ARROW and DOWN ARROW keys.
- To jump to the linked topic, press the link text on the touchscreen.

Searching for a topic

1. Change to the "Index" tab.

2. Enter the first characters of the topic you are interested in. The entries starting with these characters are displayed.
3. Change the focus by pressing the ENTER key.
4. Select the suitable keyword by using the UP ARROW or DOWN ARROW keys or the rotary knob.
5. Press the ENTER key to display the help topic.

   The "View" tab with the corresponding help topic is displayed.

Changing the zoom

1. Change to the "Zoom" tab.
2. Set the zoom using the rotary knob. Four settings are available: 1-4. The smallest size is selected by number 1, the largest size is selected by number 4.

Closing the help window

► Press the ESC key or a function key on the front panel.

4 CDMA2000 BTS and UE Analysis Options R&S FSV-K82/-K83

Overview of Firmware Options R&S FSV-K82 and K83

This section contains all information required for operation of an analyzer equipped with Application Firmware R&S FSV-K82 or K83. It covers operation via menus and the remote control commands for the CDMA2000 base station (BTS) or mobile station (MS) analyzer.

This part of the documentation consists of the following chapters:

- chapter 4.1, "Test Setup for Base Station or Mobile Station Tests", on page 13
  Describes the measurement setup for base station or mobile station tests.
- chapter 4.2, "Measurement Examples for the CDMA2000 BTS Analysis (option K82)", on page 15
  Explains some basic 1xEV-DO base station tests.
- chapter 4.3, "Measurement Examples for the CDMA2000 MS Analysis (option K83)", on page 26
  Explains some basic 1xEV-DO mobile station tests.
- chapter 4.4, "Instrument Functions of the CDMA2000 Analysis", on page 36
  Describes the instrument functions of CDMA2000 Analysis.
- chapter 4.5, "Remote Commands of the CDMA2000 BTS Analysis", on page 169
  Describes all remote control commands defined for the code domain measurement. An alphabetic list of all remote control commands and a table of softkeys with the assignment of commands are provided at the end of this chapter.
- chapter 4.6, "Status Reporting System of the CDMA2000 BTS Analysis (option K82)", on page 298
  Contains device-specific error messages for R&S FSV-K82.
- chapter 4.7, "Glossary", on page 299
  Contains an explanation of terms and abbreviations related to the code domain analysis.
- chapter 4.8, "Appendix", on page 300

This part of the documentation includes only functions of the Application Firmware R&S FSV-K82 and K83. For all other descriptions, please refer to the description of the base unit.

4.1 Test Setup for Base Station or Mobile Station Tests

This section describes the default settings of the analyzer, if it is used as a CDMA2000 base or mobile station tester. Before starting the measurements, the analyzer has to be configured correctly and supplied with power as described in the Quick Start Guide, "Preparing For Use". Furthermore, the application firmware of the R&S FSV-K82 (base station) or -K83 (mobile station) must be enabled. Installation and enabling of the application firmware are described in the Quick Start Guide.

NOTICE

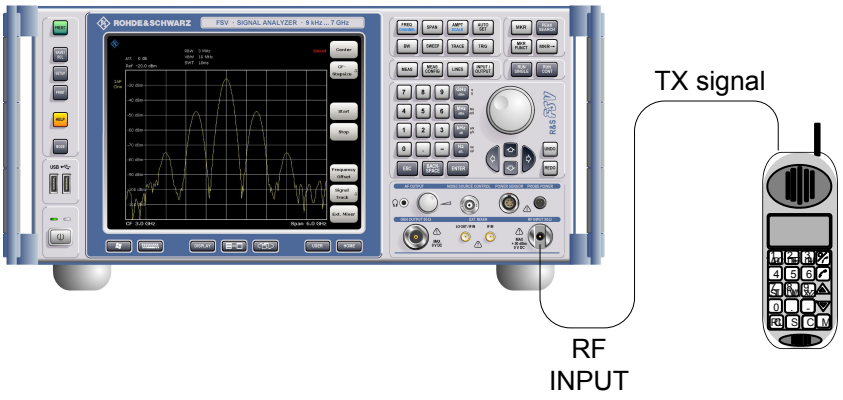
Risk of instrument damage

Before switching on the instrument, make sure that the following conditions are met:

- Instrument casing is closed and all fasteners are tightened.
- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
- The instrument is dry and shows no sign of condensation.
- The instrument is operated in the horizontal position on an even surface.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

Failure to meet these conditions may cause damage to the instrument or other devices in the test setup.

Connect the antenna output (or TX output) of the base station/mobile station to the RF input of the analyzer. Use a power attenuator exhibiting suitable attenuation.



The following values for external attenuation are recommended to ensure that the RF input of the analyzer is protected and the sensitivity of the unit is not reduced too much:

Maximum Power	Recommended external attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	0 to 10 dB

Maximum Power	Recommended external attenuation
≥ 20 to 25 dBm	0 to 5 dB
≤ 20 dBm	0 dB

- For signal measurements at the output of two-port networks, connect the reference frequency of the signal source to the rear reference input of the analyzer.
- The analyzer must be operated with an external frequency reference to ensure that the error limits of the CDMA2000 specification for frequency measurements on base stations/mobile stations are met. A rubidium frequency standard can be used as a reference source for example.
- If the base station/mobile station has a trigger output, connect the trigger output of the base station/mobile station to the rear trigger input of the analyzer (EXT TRIG GATE).

Presettings

- Enter the external attenuation.
- Enter the reference level.
- Enter the center frequency.
- Set the trigger.
- If used, enable the external reference.
- Select the standard and the desired measurement.
- Set the PN offset.

4.2 Measurement Examples for the CDMA2000 BTS Analysis (option K82)

This section explains basic CDMA2000 base station tests by means of a setup with a signal generator, e.g. an R&S SMU. It describes how operating and measurement errors can be avoided using correct settings. The measurements are performed with an analyzer equipped with the CDMA2000 BTS Analysis option (K82).

The following measurements are described:

- chapter 4.2.2, "Measuring the Signal Channel Power", on page 17
- chapter 4.2.3, "Measuring the Spectrum Emission Mask", on page 18
- chapter 4.2.4, "Measuring the Relative Code Domain Power and Frequency Error", on page 19
- chapter 4.2.5, "Measuring the Triggered Relative Code Domain Power", on page 21
- chapter 4.2.6, "Measuring the Composite EVM", on page 23
- chapter 4.2.7, "Measuring the Peak Code Domain Error and the RHO Factor", on page 24

As the CDMA2000 BTS Analysis option also supports the CDMA2000 Standard, the examples are performed on an CDMA2000 signal.

General Test Setup

The measurements are performed with the following units and accessories:

- An analyzer equipped with the CDMA2000 BTS Analysis option.
- R&S SMU signal generator equipped with option SMU-B9/B10/B11 baseband generator and SMUK46 CDMA2000 incl. 1xEVDV.
- 1 coaxial cable, 50 Ω, approximately 1 m, N connector
- 2 coaxial cables, 50 Ω, approximately 1 m, BNC connector

4.2.1 Test Setup for Base Station Tests

This section describes the default settings of the analyzer, if it is used as a CDMA2000 base station tester. Before starting the measurements, the analyzer has to be configured correctly and supplied with power as described in the Quick Start Guide, "Preparing For Use". Furthermore, the application firmware of the R&S FSV-K82 must be enabled. Installation and enabling of the application firmware are described in the Quick Start Guide, chapter 3.

NOTICE

Risk of damage to the instrument

Before taking the instrument into operation, make sure that

- the housing covers are in place and their screws have been tightened,
- the ventilation slits are free,
- no signal voltage levels above the permissible limits are applied to the inputs,
- the outputs of the unit are not overloaded or wrongly connected.

Failure to comply may result in damage to the instrument

Connect the antenna output (or TX output) of the base station to the RF input of the analyzer. Use a power attenuator exhibiting suitable attenuation.

The following values for external attenuation are recommended to ensure that the RF input of the analyzer is protected and the sensitivity of the unit is not reduced too much:

Maximum Power	Recommended external attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB

≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	0 to 10 dB
≥ 20 to 25 dBm	0 to 5 dB
20 dBm	0 dB

- For signal measurements at the output of two-port networks, connect the reference frequency of the signal source to the rear reference input of the analyzer.
- The analyzer must be operated with an external frequency reference to ensure that the error limits of the CDMA2000 specification for frequency measurements on base stations are met. A rubidium frequency standard can be used as a reference source for example.
- If the base station has a trigger output, connect the trigger output of the base station to the rear trigger input of the analyzer (EXT TRIG GATE).

Presettings

- Enter the external attenuation.
- Enter the reference level.
- Enter the center frequency.
- Set the trigger.
- If used, enable the external reference.
- Select the standard and the desired measurement.
- Set the PN offset.

4.2.2 Measuring the Signal Channel Power

In the Power measurement, the total channel power of the CDMA2000 signal is displayed. The measurement also displays spurious emissions like harmonics or intermodulation products that occur close to the carrier.

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer (coaxial cable with N connectors).

Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: CDMA2000

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.

2. Press the MODE key and activate the CDMA2000 BTS Analysis option.
3. Start the Power measurement
   a) Press the MEAS key.
   b) Press the "Power" softkey.
4. Set the center frequency to *878.49 MHz*.
5. Set the reference level.
   a) Press the AMPT key and enter *0 dBm*.

On the screen, the spectrum of the signal and the corresponding power levels within the 1.2288 MHz channel bandwidth are displayed. In the table below the diagram, the numeric values of the channel bandwidth of the TX Channel and power level of the analyzed signal are listed.

4.2.3 Measuring the Spectrum Emission Mask

To detect spurious emissions such as harmonics or intermodulation products, the analyzer offers a spectrum emission mask measurement. The measurement compares the power against the spectrum emission mask in the range from -4 MHz to 4 MHz around the carrier. The exact measurement settings like the filter that is used depend on the Band Class parameter. For a list of supported bandclasses refer to the Bandclass softkey in the "Spectrum Emission Mask" menu.

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer (coaxial cable with N connectors).

Signal generator settings:

- Frequency: 878.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Downlink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the CDMA2000 BTS Analysis mode.
   a) Press the MODE key and activate the CDMA2000 BTS Analysis option.
3. Start the measurement.
   a) Press the MEAS key.
   b) Press the "Spectrum Emission Mask" softkey.

4. Set the center frequency.
   a) Press the FREQ key and enter 878.*49 MHz*.
5. Set the reference level.
   a) Press the AMPT key and enter *0 dBm*.
6. Select a bandclass
   a) Press the "Bandclass" softkey and select "BandClass 0: 800 MHz Cellular Band" from the list.

On the screen, the spectrum of the signal is displayed, including the limit line defined in the standard. To understand where and about how much the measurement has failed, the "List Evaluation" table shows the frequencies where spurious emissions occur.

4.2.4 Measuring the Relative Code Domain Power and Frequency Error

A Code Domain Power measurement analyses the signal over a single Power Control Group (PCG). It also determines the power of all codes and channels.

The following examples show a Code Domain Power measurement on a test model with 9 channels. In this measurement, changing some parameters one after the other should demonstrate the resulting effects: values adapted to the measurement signal are changed to non-adapted values.

In the following examples, adjusting the settings of the code domain measurements is described using the dialog boxes. Alternatively, most of the settings can also be modified by using the corresponding hardkeys as in the base unit (e.g. the center frequency can be either set in the "Frontend Settings" dialog box, or via the FREQ key).

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer.
- Connect the reference input (EXT REF) on the rear panel of the analyzer to the reference output (REF) of the signal generator (coaxial cable with BNC connectors).

Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: CDMA2000

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the "CDMA2000 BS Analysis" Mode.

a) Press the MODE key and select "CDMA2000 BS Analysis".

3. Enter the Code Domain Analyzer.
   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement
   a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
   b) Select the "Code Domain Power" measurement.
5. Set the center frequency and the reference level.
   a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.
   b) In the "Center Frequency" field enter 878.49 MHz.
   c) In the "Ref Level" field enter 10 dBm.
   d) Close the "Frontend Settings" dialog box.

In the two screens, the following results are displayed: screen A shows the power of the code domain of the signal. The x-axis represents the individual channels (or codes), while the y-axis shows the power of each channel.

In screen B the result summary is displayed. It shows the numeric results of the code domain power measurement, including the frequency error.

By default, the R&S FSV-K82 displays two measurement screens. After a preset screen A is always the Code Domain Power result display. Screen B is always the Result Summary display.

For more information on the display concept refer to the Display Config softkey.

Synchronization of the reference frequencies

The frequency error can be reduced by synchronizing the transmitter and the receiver to the same reference frequency.

- Press the SETUP key.
  – Press the "Reference Int/Ext" softkey to switch to an external reference.

Screen A again shows the Code Domain Power measurement and screen B the result summary. After the synchronization of the reference frequencies of the devices, the frequency error should now be smaller than 10 Hz.

Behavior with deviating center frequency setting

A measurement can only be valid if the center frequency of the DUT and the analyzer are balanced.

1. On the signal generator, change the center frequency in steps of 0.1 kHz and observe the analyzer screen.
   Up to a frequency error of approximately 1.0 kHz, a Code Domain Power measurement on the analyzer is still possible. A frequency error within this range causes no apparent difference in the accuracy of the Code Domain Power measurement.

In case of a frequency error of more than 1.0 kHz, the probability of incorrect synchronization increases. This is indicated by the "SYNC FAILED" error message.
If the frequency error exceeds approximately 1.5 kHz, a Code Domain Power measurement cannot be performed. This is also indicated by the "SYNC FAILED" error message.

2. Reset the center frequency of the signal generator to *878.49 MHz*.

The center frequency of the DUT should not deviate by more than 1.0 kHz from that of the analyzer.

4.2.5 Measuring the Triggered Relative Code Domain Power

If the code domain power measurement is performed without external triggering, a section of the test signal is recorded at an arbitrary point of time and the firmware attempts to detect the start of a PCG. To detect this start, all possibilities of the PN sequence location have to be tested in Free Run trigger mode. This requires computing time. This computing time can be reduced by using an external (frame) trigger and entering the correct PN offset. If the search range for the start of the power control group and the PN offset are known then fewer possibilities have to be tested. This increases the measurement speed.

Test setup:

- Connect the RF output of the signal generator to the input of the analyzer.
- Connect the reference input (EXT REF) on the rear panel of the analyzer to the reference input of the signal generator (coaxial cable with BNC connectors).
- Connect the external trigger input on the rear panel of the analyzer (EXT TRIGGER/ GATE IN) to the external trigger output of the signal generator.

Signal generator settings:

- Frequency: 878.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Downlink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the CDMA2000 BTS Analysis Mode.
   a) Press the MODE key and select *CDMA2000 BS Analysis*.
3. Enter the Code Domain Analyzer.
   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.

4. Start the measurement.
   a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
   b) Select the tab for Screen A.
   c) Select the "Code Domain Power" measurement.
5. Set the center frequency and the reference level.
   a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.
   b) In the "Center Frequency" field enter *878.49 MHz*.
   c) In the "Ref Level" field enter *10 dBm*.
   d) Close the "Frontend Settings" dialog box.

In the two screens, the following results are displayed: by default, screen A shows the code domain power of the signal. Compared to the measurement without an external trigger (see previous example), the repetition rate of the measurement increases. In screen B the result summary is displayed. In the row Trigger to Frame, the offset between the trigger event and and the start of the PCG is shown.

4.2.5.1 Adjusting the Trigger Offset

The delay between the trigger event and the start of the PCG can be compensated for by adjusting the trigger offset.

Set an external trigger source and the trigger offset.

1. Open the "IQ Capture" dialog box.
2. Set the "Trigger Source" option to "External".
3. Set the "Trigger Offset" to *100µs* to compensate analog delays of the trigger event.

In the two screens, the following results are displayed: Screen A shows the the same as above. In screen B the result summary is displayed. In the "Trg to Frame" result, the offset between the trigger event and the start of the PCG has been adjusted.

4.2.5.2 Behaviour With the Wrong PN Offset

The last adjustment is setting the PN (Pseudo Noise) offset correctly. The measurement is only valid if the PN offset on the analyzer is the same as that of the transmit signal.

- Set a PN Offset.
  – Open the "Demodulation Settings" dialog box.
  – In the "PN Offset" field enter *200*.

Again, screen A shows the CDP measurement, screen B the result summary. In the result summary, the "Trigger to Frame" result is not correct. Also, the error message "SYNC FAILED" indicates that the synchronization has failed.

► In the "PN Offset" field enter *0:*

After adjusting it, the PN offset on the analyzer is the same as that of the signal. In the result summary the "Trg To Frame" value is now shown correctly.

4.2.6 Measuring the Composite EVM

The Error Vector Magnitude (EVM) describes the quality of the measured signal compared to an ideal reference signal generated by the analyzer. In the I-Q plane, the error vector represents the ratio of the measured signal to the ideal signal on symbol level. The error vector is equal to the square root of the ratio of the measured signal to the reference signal. The result is given in %.

In the Composite EVM measurement the error is averaged over all channels (by means of the root mean square) for a given PCG. The measurement covers the entire signal during the entire observation time. On screen the results are shown in a diagram, in which the x-axis represents the examined PCGs and the y-axis shows the EVM values.

Test Setup:

- Connect the RF output of the signal generator to the RF input of the analyzer. (coaxial cables with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer.L to the reference output (REF) on the signal generator (coaxial cable with BNC connectors).
- Connect external triggering of the analyzer (EXT TRIG GATE) to the signal generator’s trigger (TRIGOUT1 at PAR DATA).

Signal generator settings:

- Frequency: 878.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Downlink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the CDMA2000 BTS Analysis Mode.
   a) Press the MODE key and select CDMA2000 BTS Analysis.
3. Enter the Code Domain Analyzer.
   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement.
   a) Press the "Display Config" softkey.
   b) Select the tab for Screen A.

c) Select the "Composite EVM" measurement.

5. Set the center frequency and the reference level.
   a) Open the "Frontend Settings" dialog box.
   b) In the "Center Frequency" field enter 878.49 MHz.
   c) In the "Ref Level" field enter 10 dBm.
   d) Close the "Frontend Settings" dialog box.
6. Set an external trigger source.
   a) Open the "IQ Capture Settings" dialog box.
   b) Set the "Trigger Source" option to "External".

In the two screens, the following results are displayed: by default, Screen A shows the diagram of the Composite EVM measurement result. In screen B the result summary is displayed. It shows the numeric results of the Code Domain Power measurement, including the values for the Composite EVM.

4.2.7 Measuring the Peak Code Domain Error and the RHO Factor

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the analyzer. In the I-Q plane, the error vector represents the difference of the measured signal and the ideal signal. The Code Domain Error is the difference in power on symbol level of the measured and the reference signal projected to the class of of the base spreading factor. The unit of the result is dB.

In the Peak Code Domain Error (PCDE) measurement, the maximum error value over all channels is determined and displayed for a given PCG. The measurement covers the entire signal during the entire observation time. On screen the results are shown in a diagram, in which the x-axis represents the PCGs and the y-axis shows the PCDE values.

A measurement of the RHO factor is shown in the second part of the example. RHO is the normalized, correlated power between the measured and the ideal reference signal. The maximum value of RHO is 1. In that case the measured signal and the reference signal are identical. When measuring RHO, it is required that only the pilot channel is active.

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer (coaxial cable with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference output (REF) on the signal generator (coaxial cable with BNC connectors).
- Connect external triggering of the analyzer (EXT TRIG GATE) to the signal generator trigger (TRIGOUT1 at PAR DATA).

Signal generator settings:

- Frequency: 878.49 MHz
- Level: 0 dBm

- Standard: CDMA2000
- Link direction: Downlink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the CDMA2000 BTS Analysis Mode.
   a) Press the MODE key and activate the CDMA2000 BTS Analysis option.
3. Enter the Code Domain Analyzer.
   a) Press the MEAS key.
   b) Press the "Code Domain Analyzer" softkey.
4. Start the Peak Code Domain Error measurement.
   a) Press the "Display Config" softkey
   b) Select the tab for Screen A.
   c) Select the "Peak Code Domain Error" softkey and start the measurement.
5. Set the center frequency and the reference level.
   a) Open the "Frontend Settings" dialog box.
   b) In the "Center Frequency" field enter *878.49 MHz*.
   c) In the "Ref Level" field enter *0 dBm*.
   d) Close the "Frontend Settings" dialog box.
6. Set an external trigger source.
   a) Open the "IQ Capture Settings" dialog box.
   b) Set the "Trigger Source" option to "External".

In the two screens, the following results are displayed: by default, screen A shows the diagram of the Peak Code Domain Error. In screen B the result summary is displayed.

Displaying RHO

Make sure that all channels except the pilot channel (code 0.64) are OFF, so that only the pilot channel is available in the measurement.

No specific measurement is required to get the value for RHO. The analyzer always calculates this value automatically regardless of the code domain measurement performed. Besides the results of the code domain measurements, the numeric result of the RHO measurement is shown in the result summary, by default shown in screen B.

4.3 Measurement Examples for the CDMA2000 MS Analysis (option K83)

This section explains basic CDMA2000 mobile station tests using a setup with a signal generator, e.g. an R&S SMU. It describes how operating and measurement errors can be avoided using correct settings. The measurements are performed with an analyzer equipped with the CDMA2000 MS Analysis option (K83).

As the CDMA2000 MS Analysis option also supports the CDMA2000 Standard, the examples are performed on a CDMA2000 signal.

General Test Setup

The measurements are performed with the following units and accessories:

- An analyzer equipped with the CDMA2000 MS Analysis option.
- R&S SMU signal generator equipped with option SMU-B9/B10/B11 baseband generator and SMUK46 CDMA2000 incl. 1xEVDV.
- 1 coaxial cable, 50 Ω, approximately 1 m, N connector
- 2 coaxial cables, 50 Ω, approximately 1 m, BNC connector

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4.3.1 Test Setup for Base Station or Mobile Station Tests

This section describes the default settings of the analyzer, if it is used as a CDMA2000 base or mobile station tester. Before starting the measurements, the analyzer has to be configured correctly and supplied with power as described in the Quick Start Guide, "Preparing For Use". Furthermore, the application firmware of the R&S FSV-K82 (base station) or -K83 (mobile station) must be enabled. Installation and enabling of the application firmware are described in the Quick Start Guide.

NOTICE

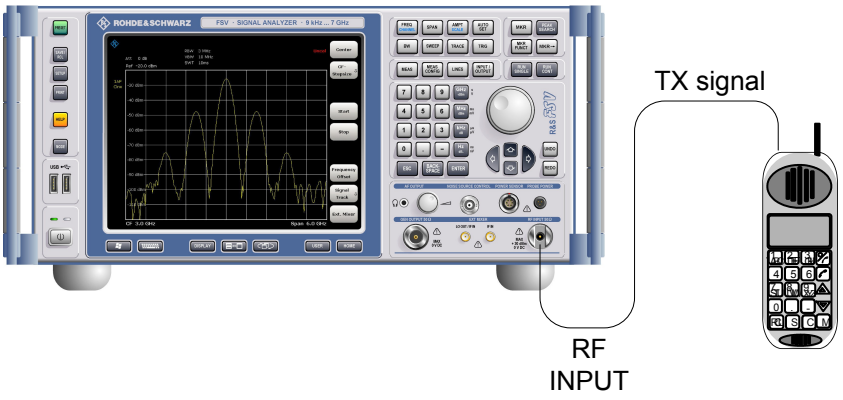
Risk of instrument damage

Before switching on the instrument, make sure that the following conditions are met:

- Instrument casing is closed and all fasteners are tightened.
- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
- The instrument is dry and shows no sign of condensation.
- The instrument is operated in the horizontal position on an even surface.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

Failure to meet these conditions may cause damage to the instrument or other devices in the test setup.

Connect the antenna output (or TX output) of the base station/mobile station to the RF input of the analyzer. Use a power attenuator exhibiting suitable attenuation.



The following values for external attenuation are recommended to ensure that the RF input of the analyzer is protected and the sensitivity of the unit is not reduced too much:

Maximum Power	Recommended external attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	0 to 10 dB

Maximum Power	Recommended external attenuation
≥ 20 to 25 dBm	0 to 5 dB
≤ 20 dBm	0 dB

- For signal measurements at the output of two-port networks, connect the reference frequency of the signal source to the rear reference input of the analyzer.
- The analyzer must be operated with an external frequency reference to ensure that the error limits of the CDMA2000 specification for frequency measurements on base stations/mobile stations are met. A rubidium frequency standard can be used as a reference source for example.
- If the base station/mobile station has a trigger output, connect the trigger output of the base station/mobile station to the rear trigger input of the analyzer (EXT TRIG GATE).

Presettings

- Enter the external attenuation.
- Enter the reference level.
- Enter the center frequency.
- Set the trigger.
- If used, enable the external reference.
- Select the standard and the desired measurement.
- Set the PN offset.

4.3.2 Measuring the Signal Channel Power

In the Power measurement, the total channel power of the CDMA2000 signal is displayed. The measurement also displays spurious emissions like harmonics or intermodulation products that occur close to the carrier.

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer (coaxial cable with N connectors).

Signal generator settings:

- Frequency: 833.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Uplink

Procedure:

1. Set the analyzer to its default state.

a) Press the PRESET key.

2. Press the MODE key and activate the CDMA2000 MS Analysis option.
3. Start the Power measurement
   a) Press the MEAS key.
   b) Press the "Power" softkey.
4. Set the center frequency to *833.49 MHz*.
5. Set the reference level.
   a) Press the AMPT key and enter *0 dBm*.

On the screen, the spectrum of the signal and the corresponding power levels within the 1.2288 MHz channel bandwidth are displayed. In the table below the diagram, the numeric values of the channel bandwidth of the TX Channel and power level of the analyzed signal are listed.

4.3.3 Measuring the Spectrum Emission Mask

To detect spurious emissions such as harmonics or intermodulation products, the analyzer offers a spectrum emission mask measurement. The measurement compares the power against the spectrum emission mask in the range from -4 MHz to 4 MHz around the carrier. The exact measurement settings like the filter that is used depend on the Band Class parameter. For a list of supported bandclasses refer to the Bandclass softkey in the "Spectrum Emission Mask" menu.

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer (coaxial cable with N connectors).

Signal generator settings:

- Frequency: 833.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Uplink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the "CDMA2000 MS Analysis" mode.
   a) Press the MODE key and activate the "CDMA2000 MS Analysis" option.
3. Start the measurement.
   a) Press the MEAS key.

b) Press the "Spectrum Emission Mask" softkey.

4. Set the center frequency.
   a) Press the FREQ key and enter *878.49 MHz*.
5. Set the reference level.
   a) Press the AMPT key and enter *0 dBm*.
6. Select a bandclass
   a) Press the "Bandclass" softkey and select *BandClass 0: 800 MHz Cellular Band* from the list.

On the screen, the spectrum of the signal is displayed, including the limit line defined in the standard. To understand where and about how much the measurement has failed, the "List Evaluation" table shows the frequencies where spurious emissions occur.

4.3.4 Measuring the Relative Code Domain Power and Frequency Error

A Code Domain Power measurement analyses the signal over a single Power Control Group (PCG). It also determines the power of all codes and channels.

The following examples show a Code Domain Power measurement on a test model with 9 channels. In this measurement, changing some parameters one after the other should demonstrate the resulting effects: values adapted to the measurement signal are changed to non-adapted values.

In the following examples, adjusting the settings of the code domain measurements is described using the dialog boxes. Alternatively, most of the settings can also be modified by using the corresponding hardkeys as in the base unit (e.g. the center frequency can be either set in the "Frontend Settings" dialog box, or via the FREQ key).

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer.
- Connect the reference input (EXT REF) on the rear panel of the analyzer to the reference output (REF) of the signal generator (coaxial cable with BNC connectors).

Signal generator settings:

Frequency: 833.49 MHz

Level: 0 dBm

Standard: CDMA2000

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.

2. Activate the "CDMA2000 BS Analysis" Mode.
   a) Press the MODE key and select "CDMA2000 BS Analysis".
3. Enter the Code Domain Analyzer.
   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement
   a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
   b) Select the "Code Domain Power" measurement.
5. Set the center frequency and the reference level.
   a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.
   b) In the "Center Frequency" field enter 833.49 MHz.
   c) In the "Ref Level" field enter 10 dBm.
   d) Close the "Frontend Settings" dialog box.

In the two screens, the following results are displayed: screen A shows the power of the code domain of the signal. The x-axis represents the individual channels (or codes), while the y-axis shows the power of each channel.

In screen B the result summary is displayed. It shows the numeric results of the code domain power measurement, including the frequency error.

By default, the R&S FSV-K83 displays two measurement screens. After a preset screen A is always the "Code Domain Power" result display. Screen B is always the "Result Summary" display.

For more information on the display concept refer to chapter 4.4.1.1, "Display Concept", on page 38.

Synchronization of the reference frequencies

The frequency error can be reduced by synchronizing the transmitter and the receiver to the same reference frequency.

- Press the SETUP key.
  – Press the "Reference Int/Ext" softkey to switch to an external reference.

Screen A again shows the Code Domain Power measurement and screen B the result summary. After the synchronization of the reference frequencies of the devices, the frequency error should now be smaller than 10 Hz.

Behavior with deviating center frequency setting

A measurement can only be valid if the center frequency of the DUT and the analyzer are balanced.

1. On the signal generator, change the center frequency in steps of 0.1 kHz and observe the analyzer screen.

Up to a frequency error of approximately 1.0 kHz, a Code Domain Power measurement on the analyzer is still possible. A frequency error within this range causes no apparent difference in the accuracy of the Code Domain Power measurement.
In case of a frequency error of more than 1.0 kHz, the probability of incorrect synchronization increases. This is indicated by the "SYNC FAILED" error message.
If the frequency error exceeds approximately 1.5 kHz, a Code Domain Power measurement cannot be performed. This is also indicated by the "SYNC FAILED" error message.

2. Reset the center frequency of the signal generator to *833.49 MHz*.

The center frequency of the DUT should not deviate by more than 1.0 kHz from that of the analyzer.

4.3.5 Measuring the Triggered Relative Code Domain Power

If the code domain power measurement is performed without external triggering, a section of the test signal is recorded at an arbitrary point of time and the firmware attempts to detect the start of a PCG. To detect this start, all possibilities of the PN sequence location have to be tested in Free Run trigger mode. This requires computing time. This computing time can be reduced by using an external (frame) trigger and entering the correct PN offset. If the search range for the start of the power control group and the PN offset are known then fewer possibilities have to be tested. This increases the measurement speed.

Test setup:

- Connect the RF output of the signal generator to the input of the analyzer.
- Connect the reference input (EXT REF) on the rear panel of the analyzer to the reference input of the signal generator (coaxial cable with BNC connectors).
- Connect the external trigger input on the rear panel of the analyzer (EXT TRIGGER/ GATE IN) to the external trigger output of the signal generator.

Signal generator settings:

- Frequency: 833.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Uplink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the "CDMA2000 MS Analysis" Mode.
   a) Press the MODE key and select *CDMA2000 BS Analysis*.

3. Enter the Code Domain Analyzer.
   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement.
   a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
   b) Select the tab for Screen A.
   c) Select the "Code Domain Power" measurement.
5. Set the center frequency and the reference level.
   a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.
   b) In the "Center Frequency" field enter *833.49 MHz*.
   c) In the "Ref Level" field enter *10 dBm*.
   d) Close the "Frontend Settings" dialog box.

In the two screens, the following results are displayed: by default, screen A shows the code domain power of the signal. Compared to the measurement without an external trigger (see previous example), the repetition rate of the measurement increases. In screen B the result summary is displayed. In the row Trigger to Frame, the offset between the trigger event and and the start of the PCG is shown.

4.3.5.1 Adjusting the Trigger Offset

The delay between the trigger event and the start of the PCG can be compensated for by adjusting the trigger offset.

Set an external trigger source and the trigger offset.

1. Open the "IQ Capture" dialog box.
2. Set the "Trigger Source" option to "External".
3. Set the "Trigger Offset" to *100µs* to compensate analog delays of the trigger event.

In the two screens, the following results are displayed: Screen A shows the the same as above. In screen B the result summary is displayed. In the "Trg to Frame" result, the offset between the trigger event and the start of the PCG has been adjusted.

4.3.6 Measuring the Composite EVM

The Error Vector Magnitude (EVM) describes the quality of the measured signal compared to an ideal reference signal generated by the analyzer. In the I-Q plane, the error vector represents the ratio of the measured signal to the ideal signal on symbol level. The error vector is equal to the square root of the ratio of the measured signal to the reference signal. The result is given in %.

In the Composite EVM measurement the error is averaged over all channels (by means of the root mean square) for a given PCG. The measurement covers the entire signal

during the entire observation time. On screen the results are shown in a diagram, in which the x-axis represents the examined PCGs and the y-axis shows the EVM values.

Test Setup:

- Connect the RF output of the signal generator to the RF input of the analyzer. (coaxial cables with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer.L to the reference output (REF) on the signal generator (coaxial cable with BNC connectors).
- Connect external triggering of the analyzer (EXT TRIG GATE) to the signal generator's trigger (TRIGOUT1 at PAR DATA).

Signal generator settings:

- Frequency: 833.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Uplink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the "CDMA2000 MS Analysis" Mode.
   a) Press the MODE key and select "CDMA2000 MS Analysis".
3. Enter the Code Domain Analyzer.
   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement.
   a) Press the "Display Config" softkey.
   b) Select the tab for Screen A.
   c) Select the "Composite EVM" measurement.
5. Set the center frequency and the reference level.
   a) Open the "Frontend Settings" dialog box.
   b) In the "Center Frequency" field enter 833.49 MHz.
   c) In the "Ref Level" field enter 10 dBm.
   d) Close the "Frontend Settings" dialog box.
6. Set an external trigger source.
   a) Open the "IQ Capture Settings" dialog box.
   b) Set the "Trigger Source" option to "External".

In the two screens, the following results are displayed: by default, Screen A shows the diagram of the Composite EVM measurement result. In screen B the result summary is

displayed. It shows the numeric results of the Code Domain Power measurement, including the values for the Composite EVM.

4.3.7 Measuring the Peak Code Domain Error and the RHO Factor

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the analyzer. In the I-Q plane, the error vector represents the difference of the measured signal and the ideal signal. The Code Domain Error is the difference in power on symbol level of the measured and the reference signal projected to the class of of the base spreading factor. The unit of the result is dB.

In the Peak Code Domain Error (PCDE) measurement, the maximum error value over all channels is determined and displayed for a given PCG. The measurement covers the entire signal during the entire observation time. On screen the results are shown in a diagram, in which the x-axis represents the PCGs and the y-axis shows the PCDE values.

A measurement of the RHO factor is shown in the second part of the example. RHO is the normalized, correlated power between the measured and the ideal reference signal. The maximum value of RHO is 1. In that case the measured signal and the reference signal are identical. When measuring RHO, it is required that only the pilot channel is active.

Test setup:

- Connect the RF output of the signal generator to the RF input of the analyzer (coaxial cable with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference output (REF) on the signal generator (coaxial cable with BNC connectors).
- Connect external triggering of the analyzer (EXT TRIG GATE) to the signal generator trigger (TRIGOUT1 at PAR DATA).

Signal generator settings:

- Frequency: 833.49 MHz
- Level: 0 dBm
- Standard: CDMA2000
- Link direction: Uplink

Procedure:

1. Set the analyzer to its default state.
   a) Press the PRESET key.
2. Activate the "CDMA2000 MS Analysis" Mode.
   a) Press the MODE key and activate the "CDMA2000 MS Analysis" option.
3. Enter the Code Domain Analyzer.
   a) Press the MEAS key.

b) Press the "Code Domain Analyzer" softkey.

4. Start the Peak Code Domain Error measurement.
   a) Press the "Display Config" softkey
   b) Select the tab for Screen A.
   c) Select the "Peak Code Domain Error" option and start the measurement.
5. Set the center frequency and the reference level.
   a) Open the "Frontend Settings" dialog box.
   b) In the "Center Frequency" field enter *833.49 MHz*.
   c) In the "Ref Level" field enter *0 dBm*.
   d) Close the "Frontend Settings" dialog box.
6. Set an external trigger source.
   a) Open the "IQ Capture Settings" dialog box.
   b) Set the "Trigger Source" option to "External".

In the two screens, the following results are displayed: by default, screen A shows the diagram of the Peak Code Domain Error. In screen B the result summary is displayed.

Displaying RHO

Make sure that all channels except the pilot channel (code 0.64) are OFF, so that only the pilot channel is available in the measurement.

No specific measurement is required to get the value for RHO. The analyzer always calculates this value automatically regardless of the code domain measurement performed. Besides the results of the code domain measurements, the numeric result of the RHO measurement is shown in the result summary, by default shown in screen B.

4.4 Instrument Functions of the CDMA2000 Analysis

The analyzer equipped with the CDMA2000 BTS Analysis option performs Code Domain measurements on forward link signals according to the 3GPP2 Standard (Third Generation Partnership Project 2). It is based on the "Recommended Minimum Performance Standard for CDMA2000 Spread Spectrum Base Stations", C.S0010-C version 2.0 dated March 2006. This Standard has been approved by the following authority with the specified designation:

- TIA: TIA-97-F-1
- TTA: TTAT.3G-C-S0010-C v2.0

When the CDMA2000 specification is mentioned in the document, these standards are meant.

The CDMA2000 BTS Analysis option supports the radio configurations 1 to 5, i.e. all radio configurations with a single carrier (1X) are supported. Accordingly, IS95A/B signals conforming to radio configurations 1&2 can be measured with the CDMA2000 BTS

Analysis option. In addition to the measurements called for by the CDMA2000 standard in the code domain, the CDMA2000 BTS Analysis option features measurements in the spectral range such as channel power, adjacent channel power, occupied bandwidth and spectrum emission mask with predefined settings.

To open the CDMA2000 settings menu

- Press the MODE key and select the required "CDMA2000" option.
- If the required "CDMA2000" Mode is already active, press the HOME key.

The CDMA2000 menu is displayed, which is identical to the "Measurement" menu.

For details on the measurement types, see chapter 4.4.1, "Measurements and Result Displays (BTS Mode)", on page 38.

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4.4.1 Measurements and Result Displays (BTS Mode)

The CDMA2000 Analysis options provide the following test measurement types and result displays. All measurements and result displays are accessed via the "CDMA2000" menu or the MEAS key.

4.4.1.1 Display Concept

Measurement results

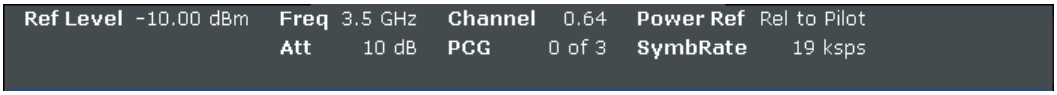
The code domain analyzer can show up to four result diagrams in four different screens (windows) at one time. For each screen, you can define which type of result diagram is to be displayed, or deactivate the screen temporarily. The current configuration of the display, i.e. which screens are displayed and which result diagram is displayed in which screen, can be stored and retrieved later. Thus, you can easily switch between predefined display configurations.

The available measurement results are described in the following sections.

All results are calculated from the same dataset of the recorded signal. Thus, it is not necessary to restart the measurement in order to switch the display mode.

Measurement settings

The most important measurement settings are displayed in the diagram header. For Code Domain Analyzer measurements, the following settings are shown:



Label	Description
Ref level	Reference level defined in "Ref Level" on page 60
Freq	Center frequency defined in "Center" on page 60
Att	Attenuation
Channel	Channel with spreading factor
PCG	Slot
Power Ref	Reference used for power results
SymbRate	Symbol rate of the current channel

Overview of all measurement settings

You can easily display an overview of all measurement settings using the Settings Overview softkey.

In addition to the information in the diagram header, each screen title contains diagram-specific trace information.

Screen focus

One of the screens has a blue frame indicating the focus. The screen focus can be changed just like in the base system. The settings for trace statistics and markers can only be changed for the focussed screen. Furthermore, the focussed screen can be set to full screen (for details see the analyzer Quick Start Guide).

4.4.1.2 Configuring the Display

1. Select the "Display Config" softkey in the "Code Domain Analyzer" menu.
2. Select the tab for the screen you want to configure (A-D).
3. Select the "Screen X active" option to display the selected screen.

   Tip: SCPI command: `DISPlay[:WINDow<n>]:STATe` on page 225
4. Select the required result diagram to be displayed in the selected screen.

   Tip: SCPI command: `CALCulate<n>:FEED` on page 173
5. Press "Close".

To select a predefined display configuration

You can retrieve previously stored display configurations, and thus easily switch between different displays of measurement results.

1. Select the "Predefined" tab in the "Display Configuration" dialog box.

   The previously stored and default configurations are listed. The current configuration is displayed at the top of the dialog box.

2. Select the required set of screen configurations.
3. Press "Apply".

To store the current display configuration

You can store the current display configuration in the list of predefined settings in order to switch back to it later.

1. Select the current display configuration at the top of the "Display Configuration" dialog box.
2. Click "Add".

   The current display configuration is added to the list of predefined settings.

To remove a predefined display configuration

You can remove one of the stored display configurations.

1. Select the display configuration to be removed from the "Predefined" tab of the "Display Configuration" dialog box.
2. Click "Remove".

   The selected display configuration is removed from the list of predefined settings.

To restore the default display configurations

You can restore the default set of predefined display configurations.

► In the "Predefined" tab of the "Display Configuration" dialog box, click "Restore".

4.4.1.3 Code Domain Analysis Results

The Code Domain Analyzer provides the following result display configurations for measurements in the code domain:

4.4.1.3.1 Code Domain Power....41
4.4.1.3.2 Channel Table....42
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4.4.1.3.6 Composite EVM (RMS)....48

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4.4.1.3.11 Power vs Symbol....51
4.4.1.3.12 Channel Bitstream....52

Code Domain Power

This result display determines the power of all channels and plots it in a diagram. The x-axis represents the channel (code) number, which corresponds to the base spreading factor. Each bar in the diagram represents one code. The order of the codes depends on the "Code Order" on page 73. The y-axis is a logarithmic level axis that shows the power of each channel.

The measurement evaluates the total signal over a single PCG. It supports both Hadamard and BitReverse code sorting order.

MS mode: the power is calculated only for the selected branch (I or Q).

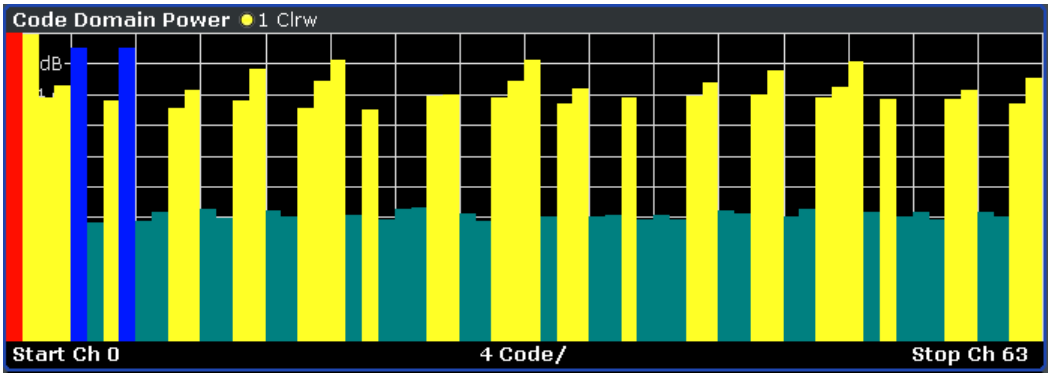


Fig. 4-1: Code Domain Power Result Display in Hadamard code sorting order

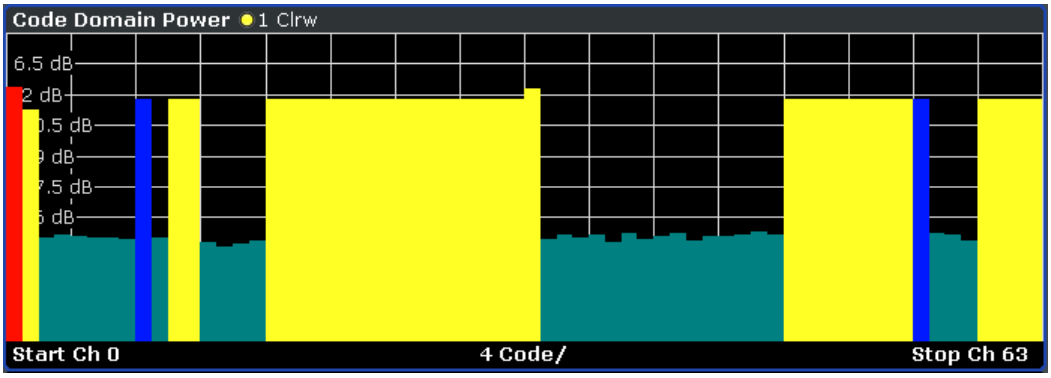


Fig. 4-2: Code Domain Power Result Display in Hadamard code sorting order

Active and inactive data channels are defined via the "Inactive Channel Threshold" on page 64. The power values of the active and unassigned channels are shown in different colors. In addition, codes with alias power can occur. These codes obtain power

components originating either from a spreading factor higher than the base spreading factor or from the own and/or another antenna as a result of transmit diversity.

The following colors are defined:

- Red: selected channel (Channel (Code) Number)
- Yellow: active channel
- Cyan: inactive channel
- Light blue: alias power of higher spreading factor
- Magenta: alias power as a result of transmit diversity

If codes with alias power are displayed, set the highest base spreading factor available in the Base Spreading Factor field.

It is not recommended to select more detailed result displays (such as "Channel Constell") for unassigned or inactive codes, since the results are not valid.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XPOW:CDP'`; see `CALCulate<n>:FEED` on page 173.

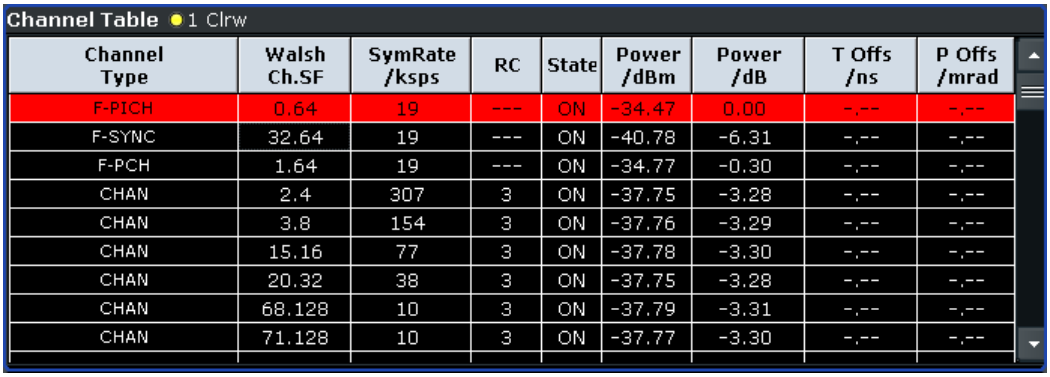
To query these results, use the command `CALC:MARK:FUNC:CDP:RES? CDP` or `CALC:MARK:FUNC:CDP:RES? CDPR`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Channel Table

This result display shows all channels of the signal. The sorting of the channels is according to channel type, i.e. special channels like F-PICH, F-SYNC etc. first, then data channels (CHAN) and last inactive channels (always shown as '---'). Within a group, channels are sorted according to the spreading factor and then according to code number, also in ascending order. Within the code number, first active, then inactive channels are listed. The selected channel is marked in red. Active and inactive data channels are defined via the "Inactive Channel Threshold" on page 64.

The Channel Table result display may contain up to 128 entries, corresponding to the highest base spreading factor of 128.

The measurement evaluates the total signal over a single PCG.



Channel Table ● 1 Clrw

Channel Type	Walsh Ch.SF	SymRate /ksps	RC	State	Power /dBm	Power /dB	T Offs /ns	P Offs /mrad
F-PICH	0.64	19	---	ON	-34.47	0.00	-.--	-.--
F-SYNC	32.64	19	---	ON	-40.78	-6.31	-.--	-.--
F-PCH	1.64	19	---	ON	-34.77	-0.30	-.--	-.--
CHAN	2.4	307	3	ON	-37.75	-3.28	-.--	-.--
CHAN	3.8	154	3	ON	-37.76	-3.29	-.--	-.--
CHAN	15.16	77	3	ON	-37.78	-3.30	-.--	-.--
CHAN	20.32	38	3	ON	-37.75	-3.28	-.--	-.--
CHAN	68.128	10	3	ON	-37.79	-3.31	-.--	-.--
CHAN	71.128	10	3	ON	-37.77	-3.30	-.--	-.--

Fig. 4-3: Channel Table result display

For the Code Domain Power measurement, the following parameters are determined for the channels:

Parameter	Description
Channel Type	Shows the channel type ('---' for inactive channels)
Walsh Chan.SF	Channel number including the spreading factor (in the form <Channel>.<SF>).
Symb Rate/ksps	Symbol rate with which the channel is transmitted (9.6 ksps to 307.2 ksps).
RC	Radio configuration.
State	Status display. Unassigned codes are identified as inactive channels.
Pwr dBm/Pwr dB	Specification of the absolute (dBm) and relative (dB) power of the channel. Relative powers are either referred to the pilot channel or the total power of the signal.
T Offs/ns and Ph Offs/mrad	Timing/phase offset between this channel and the pilot channel (enabled via the "Demod Settings (BTS mode)" on page 67 dialog box. If enabled, the maximum value of the timing/phase offset is displayed together with the associated channel in the last two lines. Since the timing/phase offset values of each active channel can be either negative or positive, the absolute values are compared and the maximum is displayed with the original sign.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:CTABle'`; see `CALCulate<n>:FEED` on page 173.

Power vs PCG

In this result display, the power of the selected channel is averaged for each measured PCG and referred to the pilot power of the PCG. Therefore the unit of the y-axis is dB (relative to the Pilot Channel). The result display consists of the number of the PCGs in the measurement and their respective power value.

MS mode: the power is calculated only for the selected branch (I or Q).

For signals with enabled power control, use the default reference power setting. For details refer to "Power Reference" on page 74.

The measurement evaluates one code channel over the entire period of observation. The selected PCG is displayed red.

You can set the number of PCGs by means of the "Capture Length" on page 61 field.

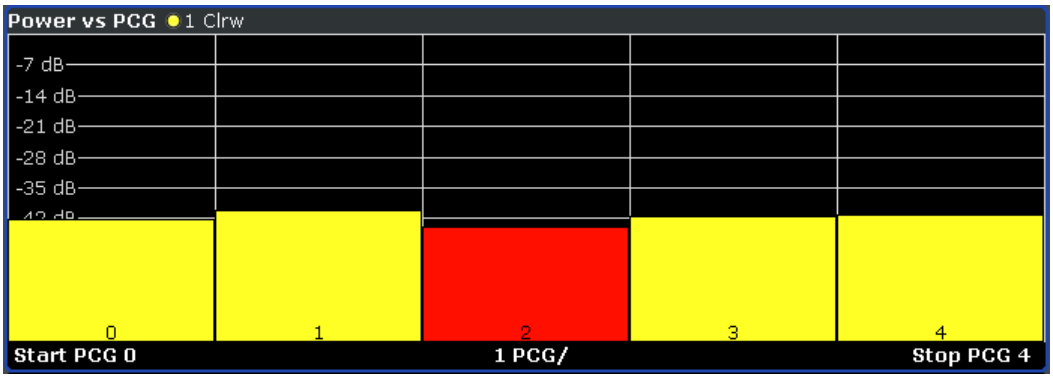


Fig. 4-4: Power vs PCG result display

For measurements in which Antenna Diversity is inactive (OFF) or set to 'Antenna 1', the F-PICH channel is used as reference, while the F-TDPICH channel is used for measurements in which Antenna Diversity is set to 'Antenna 2'.

To correctly detect the start of a power control group, the external trigger must be used for power-regulated signals.

Remote control

In remote control, this display configuration is selected using
`CALC:FEED 'XTIM:CDP:PVSLot'`; see `CALCulate<n>:FEED` on page 173.

Result Summary

The Result Summary shows the results of various code domain measurements in a table.

The table is divided as follows:

- Global results
- PCG results
- Channel results

Global Result 1 Clrw			
Carrier Frequency Error	42.50 Hz	Carrier Frequency Error	0.01 ppm
Chip Rate Error	-0.28 ppm	Trigger To Frame	9.000000 s
Active Channels	9		
PCG Result (PCG : 2)			
Total Power	-27.50 dBm	Pilot Power	0.00 dBm
Rho	1.00	Composite EVM	2.944870 %
IQ Imbalance	0.202920 %	IQ Offset	0.034036 %
Channel Results (Ch 0.64)			
Power Relative	-41 dB	Symbol EVM	67.42 % rms
Modulation Type	QPSK	Timing Offset	9.00 s
Phase Offset	9.00 s	Power Absolute	-75.53 dBm

Fig. 4-5: Result Summary result display

Remote control

In remote control, this display configuration is selected using
`CALC:FEED 'XTIM:CDP:ERR:SUMMary'`; see `CALCulate<n>:FEED` on page 173.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Global Results

Under Global Results, the measurement results that concern the total signal (that is, all channels) for the entire period of observation (that is, all PCGs) are displayed:

- Carrier Frequency Error
  Shows the frequency error referred to the center frequency of the analyzer. The absolute frequency error is the sum of the frequency error of the analyzer and that of the device under test. Frequency differences between the transmitter and receiver of more than 1.0 kHz impair synchronization of the Code Domain Power measurement. If at all possible, the transmitter and the receiver should be synchronized. For further information on correcting the frequency error refer to chapter 4.2.4, "Measuring the Relative Code Domain Power and Frequency Error", on page 19 .
  The frequency error is available in the units both Hz and ppm referred to the carrier frequency.
- Chip Rate Error
  Shows the chip rate error (1.2288 Mcps) in ppm. A large chip rate error results in symbol errors and, therefore, in possible synchronization errors for Code Domain Power measurements. This measurement result is also valid if the analyzer could not synchronize to the CDMA2000 signal.
- Trigger to Frame
  Reflects the time offset from the beginning of the recorded signal section to the start of the first PCG. In case of triggered data recording, this corresponds to the timing offset:
  frame trigger (+ trigger offset) – start of first PCG
  If it was not possible to synchronize the analyzer to the CDMA2000 signal, this measurement result is meaningless. For the Free Run trigger mode, dashes are displayed.
- Active Channels
  Specifies the number of active channels found in the signal. Detected data channels as well as special channels are regarded as active. With transmit diversity, the result applies to the selected "Antenna Diversity" on page 70. No value is displayed in both the Min and Max columns.

PCG Results

Under PCG, the measurement results that concern the total signal (that is, all channels) for the selected PCG are displayed:

- Total Power
  Shows the total power of the signal.
- Pilot Power

Shows the power of the pilot channel. If antenna 2 is selected, the power of the F-TDPICH is displayed, in all other cases that of the F-PICH. For details on antenna selection refer to "Antenna Diversity" on page 70.

- RHO
  Shows the quality parameter RHO. According to the CDMA2000 standard, RHO is the normalized, correlated power between the measured and the ideally generated reference signal. When RHO is measured, the CDMA2000 standard requires that only the pilot channel be supplied.
- Composite EVM
  The composite EVM is the difference between the test signal and the ideal reference signal. For further details refer to the "Composite EVM (RMS)", on page 48 result display.
- IQ Imbalance/Offset
  Shows the IQ imbalance and the DC offset of the signal in %.

Channel results

Under Channel, the measurement results of the selected channel and the selected PCG are displayed:

- Power Relative
  Shows the channel power of the selected channel and PCG. The result depends on the selected Code Power, the Power Reference and absolute channel power.
- Power Absolute
  Shows the absolute channel power of the selected channel and PCG
- Timing Offset
  Shows the timing offset between the selected channel and the pilot channel.
- Phase Offset
  Shows the phase offset between the selected channel and the pilot channel.
- Symbol EVM
  Shows the peak or mean value of the EVM measurement result. For further details refer to the "EVM vs Symbol", on page 50 result display.
- Modulation
  BTS mode only:
  Displays the modulation type of the channel and PCG: BPSK, QPSK, 8PSK, or 16QAM.
- Mapping
  Indicates the selected branch (I or Q)

Code Domain Error Power

This result display shows the difference in power of the test signal and an ideally generated reference signal and plots in a diagram. The unit is dB. The x-axis represents the channel (code) number, which corresponds to the base spreading factor. The y-axis is a logarithmic level axis that shows the error power of each channel. Since it is an error power, active and inactive channels can be rated jointly at a glance.

The measurement evaluates the total signal over a single PCG. It supports both Hadamard and BitReverse code sorting order.

MS mode: the error power is calculated only for the selected branch (I or Q).

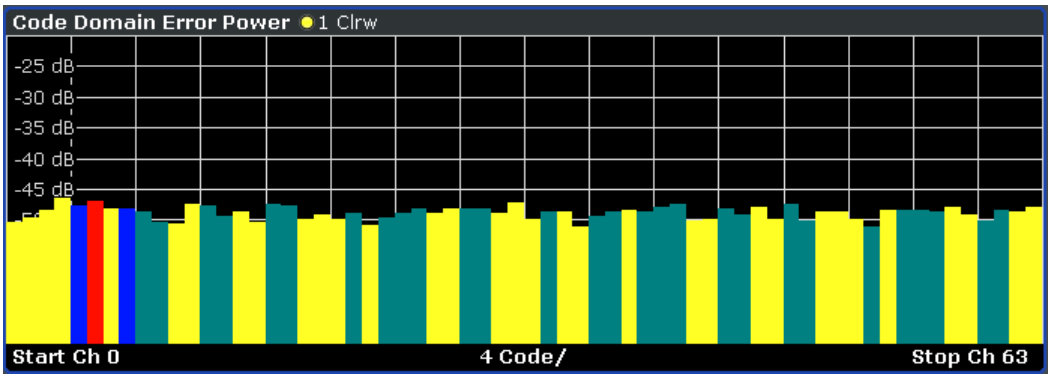


Fig. 4-6: Code Domain Error Power result display in Hadamard code sorting order

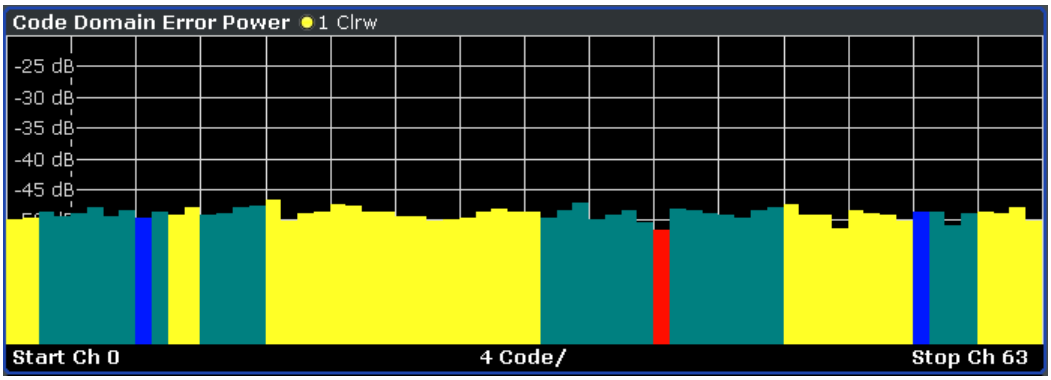


Fig. 4-7: Code Domain Error Power result display in BitReverse code sorting order

Active and inactive data channels are defined via the "Inactive Channel Threshold" on page 64. The power values of the active and inactive channels are shown in different colors. In addition, codes with alias power can occur. These codes obtain power components originating either from a spreading factor higher than the base spreading factor or from the own and/or another antenna as a result of transmit diversity.

The following colors are defined:

- Red: selected channel (Channel (Code) Number)
- Yellow: active channel
- Cyan: inactive
- Light blue: alias power of higher spreading factor
- Magenta: alias power as a result of transmit diversity

If codes with alias power are displayed, set the highest base spreading factor available in the "Base Spreading Factor" on page 68 field.

It is not recommended to select more detailed result displays (such as "Channel Constell") for unassigned or inactive codes, since the results are not valid.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XPOW:CDEP'`; see `CALCulate<n>:FEED` on page 173.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Composite EVM (RMS)

This result display is for measuring the modulation accuracy. It determines the error vector magnitude (EVM) over the total signal. The EVM is the root of the ratio of the mean error power (root mean square) to the power of an ideally generated reference signal. Thus, the EVM is shown in %. The diagram consists of a composite EVM for each PCG.

The measurement evaluates the total signal over the entire period of observation. The selected PCG is displayed red. You can set the number of PCGs in the "Capture Length" on page 61 field.

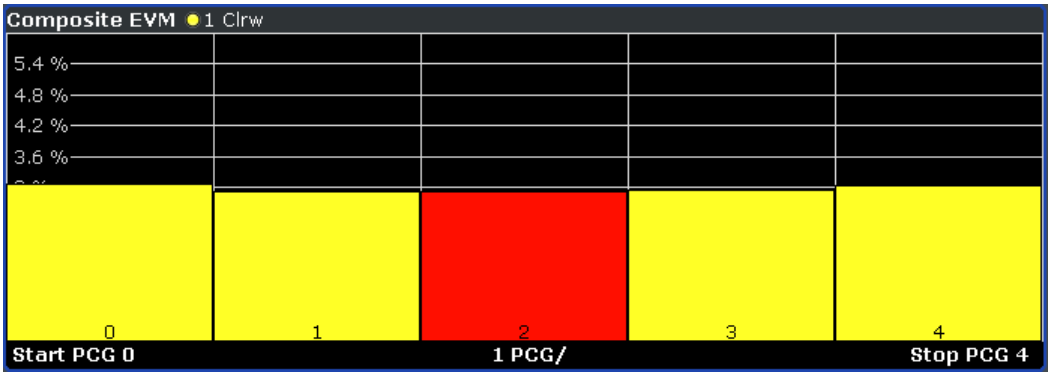


Fig. 4-8: Composite EVM result display

Only the channels detected as being active are used to generate the ideal reference signal. If a channel is not detected as being active, e.g. on account of low power, the difference between the test signal and the reference signal and therefore the composite EVM is very large. Distortions also occur if unassigned codes are wrongly given the status of "active channel". To obtain reliable measurement results, select an adequate channel threshold via the "Inactive Channel Threshold" on page 64 field.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:MACCuracy'`; see `CALCulate<n>:FEED` on page 173.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES? MACCuracy`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Peak Code Domain Error

The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. That means that in this result display the Code Domain Error Power

is projected onto the code domain at a specific base spreading factor. In the diagram, each bar of the x-axis represents one PCG. The y-axis represents the error power.

You can select the base spreading factor in the "Base Spreading Factor" on page 68 field and the number of evaluated PCGs in the "Capture Length" on page 61 field.

The measurement evaluates the total signal over the entire period of observation. The currently selected PCG is displayed red.

MS mode: the error is calculated only for the selected branch (I or Q).

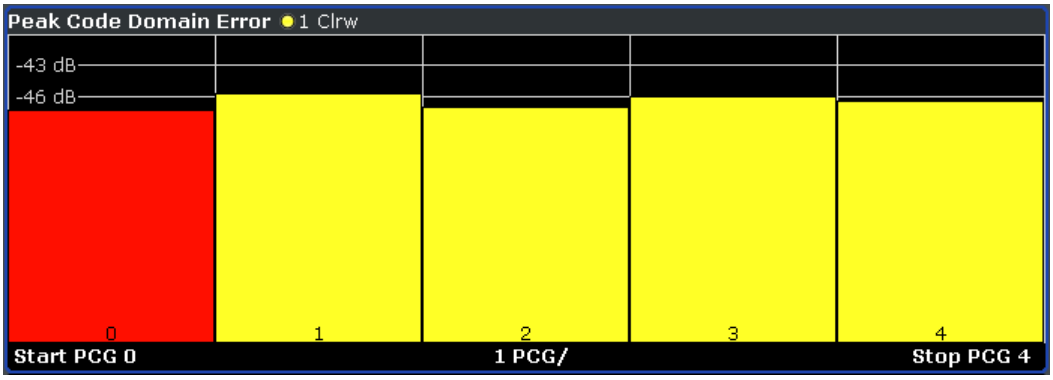


Fig. 4-9: Peak Code Domain Error result display

Only the channels detected as being active are used to generate the ideal reference signal. If a channel is not detected as being active, e.g. on account of low power, the difference between the test signal and the reference signal is very large. The result display therefore shows a peak code domain error that is too high. Distortions also occur if unassigned codes are wrongly given the status of "active channel". To obtain reliable measurement results, select an adequate channel threshold via the "Inactive Channel Threshold" on page 64 field.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:PCDomain'`; see `CALCulate<n>:FEED` on page 173.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES? PCDerror`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Channel Constellation

This result display shows the channel constellation of the modulated signal at symbol level.

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the Select softkey.

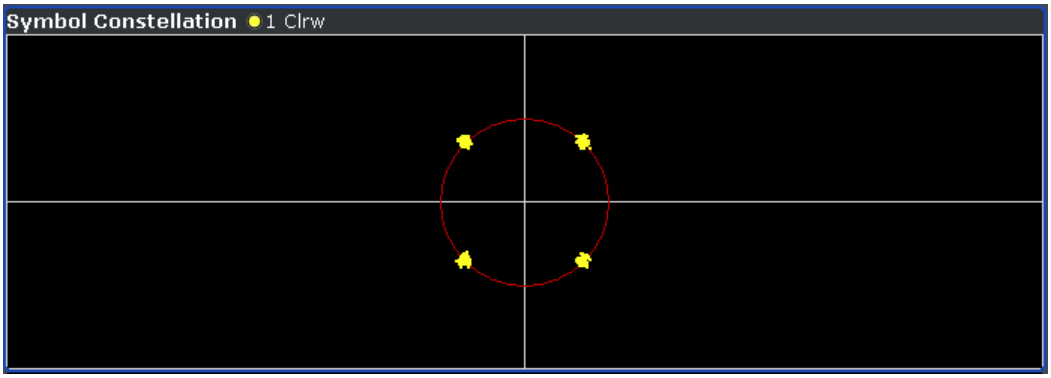


Fig. 4-10: Channel Constellation result display for QPSK-modulated signal

The R&S FSV-K82 supports BPSK, QPSK, 8PSK and 16QAM modulation schemes. The modulation scheme itself depends on the channel type. Refer to "Relationship Between Channel and Modulation Type", on page 148 for further information.

In case of BPSK the constellation points are located on the x-axis. For the QPSK and 16QAM schemes the constellation points are located on neither axis.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:SYMB:CONStellation'`; see `CALCulate<n>:FEED` on page 173.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

EVM vs Symbol

This result display shows the EVM on symbol level. The x-axis represents the symbols and the y-axis shows the EVM in %.

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the "Select" on page 76 softkey.

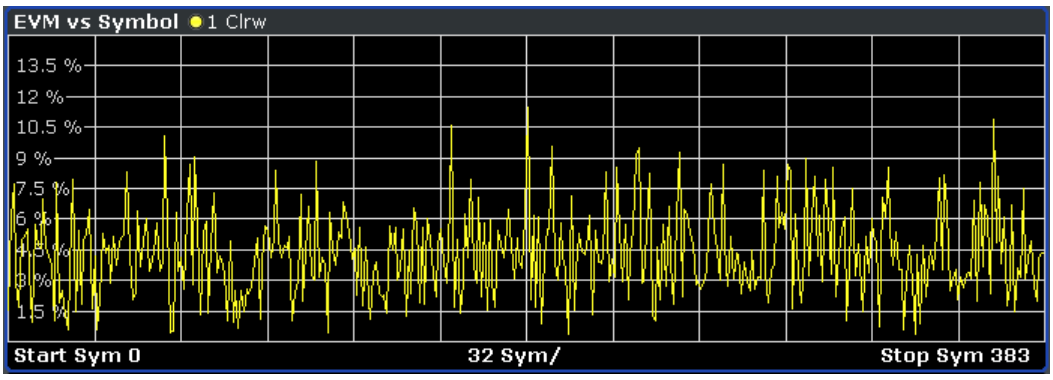


Fig. 4-11: EVM vs Symbol result display

The number of symbols is in the range from 6 to 384 and can be calculated like this:

Number of symbols = Number of chips in one PCG/ChannelSF/K, with

"Number of chips in one PCG = 1536"

"Channel SF = 4, 8, 16, 32, 64 or 128"

"K = 1 for Antenna Diversity = OFF"

"K = 2 for Antenna Diversity = OFF"

This calculation thus takes into account the results of a channel for a power control group.

Inactive channels can be measured, but the result is meaningless since these channels do not contain data.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:SYMB:EVM'`; see `CALCulate<n>:FEED` on page 173.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Composite Constellation

This result display shows the constellation of the modulated signal at chip level. For each of the 1536 chips, a constellation point is displayed in the diagram.

The measurement evaluates the total signal over a single PCG.

You can select a specific PCG with the "Select" on page 76 softkey.

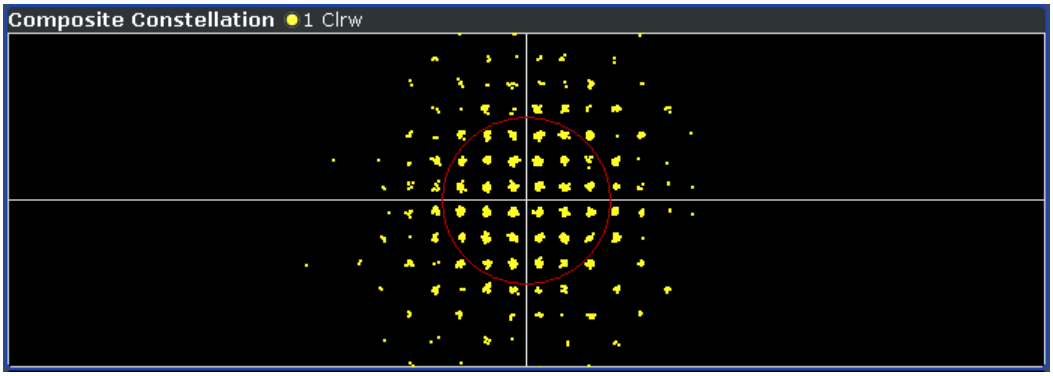


Fig. 4-12: Composite Constellation result display

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:COMP:CONStellation'`; see `CALCulate<n>:FEED` on page 173.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Power vs Symbol

This result display calculates the absolute power in dBm for every symbol number.

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the "Select" on page 76 softkey.

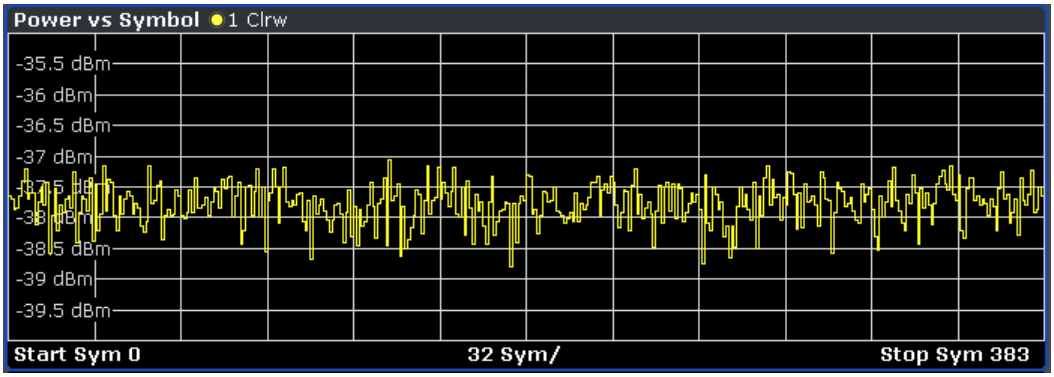


Fig. 4-13: Power vs Symbol result display

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:PVSYmbol'`; see `CALCulate<n>:FEED` on page 173.

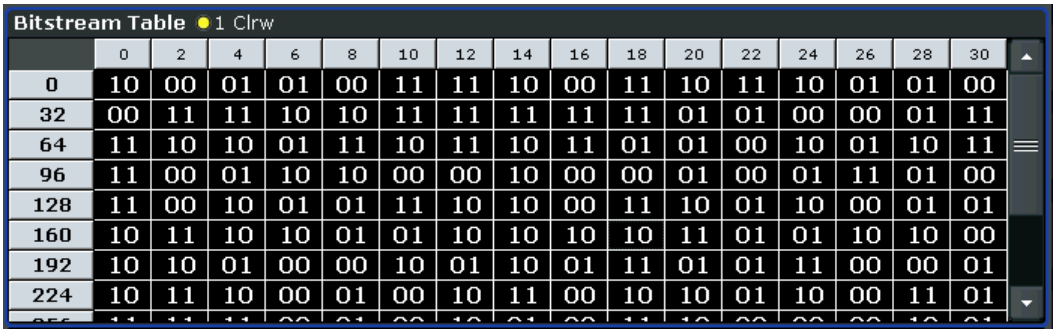
To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175.

Channel Bitstream

The result display provides information on the demodulated bits. All bits that are part of inactive channels are marked as being invalid by means of dashes. For 16QAM modulation '----' is displayed, for 8PSK modulation '---', for QPSK '--' and for BPSK '-'.

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the Select softkey.



	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
0	10	00	01	01	00	11	11	10	00	11	10	11	10	01	01	00
32	00	11	11	10	10	11	11	11	11	11	01	01	00	00	01	11
64	11	10	10	01	11	10	11	10	11	01	01	00	10	01	10	11
96	11	00	01	10	10	00	00	10	00	00	01	00	01	11	01	00
128	11	00	10	01	01	11	10	10	00	11	10	01	10	00	01	01
160	10	11	10	10	01	01	10	10	10	10	11	01	01	10	10	00
192	10	10	01	00	00	10	01	10	01	11	01	01	11	00	00	01
224	10	11	10	00	01	00	10	11	00	10	10	01	10	00	11	01

Fig. 4-14: Bitstream result display

Select a specific symbol using the MKR key. If you enter a number, the marker jumps to the selected symbol. If there are more symbols than the screen is capable of displaying, use the marker to scroll inside the list.

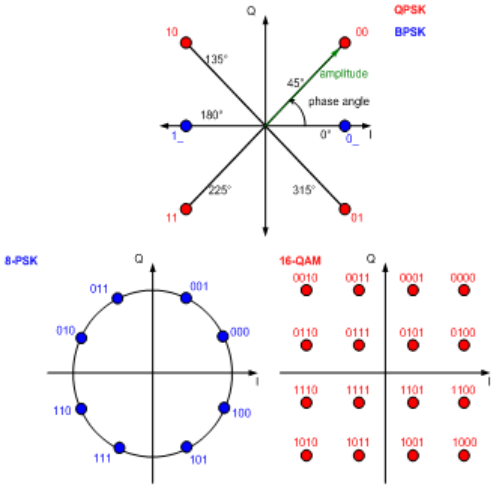
Depending on the spreading factor (symbol rate) of the channel, a power control group may contain a minimum of 12 and a maximum of 384 symbols. In case of an active

transmit diversity (Antenna Diversity) the values reduce to the half. Depending on the modulation type, a symbol consists of the following bits:

- BPSK: 1 bit (only the I-component is assigned)
- QPSK: 2 bits (I-component followed by the Q-component)
- 8PSK: 3 bits
- 16QAM: 4 bits

In accordance with the radio configuration and the channel type, there are BPSK and QPSK modulated channels in the CDMA2000 system. For details refer to "Relationship Between Channel and Modulation Type", on page 148.

In MS mode, only BPSK modulated channels are used, thus only the I-component is assigned.



4.4.1.4 RF Measurement Results

Signal Channel Power

The Signal Channel Power measurement analyses the RF signal power of a single channel with 1.2288 MHz bandwidth over a single trace. The displayed results are based on the root mean square. The configuration is according to the CDMA2000 requirements. Beneath the measurement screen the bandwidth and the associated channel power are displayed. The other screen elements match that of the screen of the Spectrum Analyzer mode. The default settings are in accordance with the 3GPP2 specifications.

Setting	Default Value
Frequency Span	2 MHz
ACP Standard	1xEV-DO0 MC1
Number of adjacent channels	0
Adjacent Channel Power	On

For details on the softkeys of the Signal Channel Power measurement refer to the Power softkey in the "Measurement" menu.

Adjacent Channel Power

The Adjacent Channel Power measurement analyses the power of the TX channel and the power of adjacent and alternate channels on the left and right side of the TX channel. The number of TX channels and adjacent channels can be modified as well as the band class. Beneath the measurement screens the bandwidth and power of the TX channel and the bandwidth, spacing and power of the adjacent and alternate channels are displayed.

The default settings are in accordance with the 3GPP2 specifications.

Setting	Default value
Adjacent Channel Power	On
ACP Standard	1xEV-DO0 MC1
Number of adjacent channels	2

For details on the softkeys of the Adjacent Channel Power measurement refer to the Ch Power ACLR softkey in the "Measurement" menu.

Spectrum Emission Mask

The Spectrum Emission Mask measurement shows the quality of the measured signal by comparing the power values in the frequency range near the carrier against a spectral mask that is defined by the 3GPP2 specifications. The limits depend on the selected bandclass. In this way, the performance of the DUT can be tested and the emissions and their distance to the limit be identified.

Note that the 3GPP2 standard does not distinguish between spurious and spectral emissions.

Beneath the measurement screen a table showing the peak list. In the peak list the values for the worst spectral emissions are displayed including their frequency and power.

The default settings of the Spectrum Emission Mask measurement are listed in the table below.

Setting	Default value
Frequency Span	8 MHz
Sweep Time	100 ms
Detector	RMS

For details on the softkeys of the Spectrum Emission Mask measurement refer to the Spectrum Emission Mask softkey in the "Measurement" menu.

Occupied Bandwidth

The Occupied Bandwidth measurement determines the bandwidth in which the signal power can be found. By default the bandwidth is displayed in which 99 % of the signal is found. The percentage of the signal power included in the measurement can be modified. In the top right corner of the screen, the bandwidth and frequency markers are displayed.

The default settings of the Occupied Bandwidth measurement are listed in the table below.

Setting	Default value
Occupied Bandwidth	ON
Frequency Span	4.2 MHz
Sweep Time	100 ms
RBW	30 kHz
VBW	300 kHz
Detector	RMS

For details on the softkeys of the Occupied Bandwidth measurement see Occupied Bandwidth in the "Measurement" menu.

Complementary Cumulative Distribution Function (CCDF)

The CCDF measurement displays the CCDF and the Crest factor. The CCDF shows distribution of the signal amplitudes. For the measurement, a signal section of settable length is recorded continuously in a zero span. The measurement is useful to determine errors of linear amplifiers. The Crest factor is defined as the ratio of the peak power and the mean power. Beneath the measurement screen a table containing the number of included samples, mean and peak power and the Crest factor is displayed.

The default settings of the CCDF measurement are listed in the table below.

Setting	Default value
CCDF	ON
RBW	10 MHz
Detector	Sample

For details on the softkeys of the CCDF measurement see CCDF in the "Measurement" menu.

4.4.2 Menu and Softkey Description for CDA Measurements

This chapter describes the menus and softkeys available in CDMA2000 BTS Analysis mode for CDA measurements. For RF measurements, the softkeys are described in chapter 4.4.3, "Softkeys and Menus for RF Measurements (K82)", on page 94.

The "Lines" menu is not available in the CDMA2000 BTS Analysis mode.

The "Span" menu is not available for code domain measurements and signal power measurements.

The "Bandwidth" menu is not available for code domain measurements measurements.

All menus not described here are the same as for the base unit, see the description there.

To display help to a softkey, press the HELP key and then the softkey for which you want to display help. To close the help window, press the ESC key. For further information refer to chapter 3, "How to Use the Help System", on page 11.

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4.4.2.1 Softkeys of the Code Domain Analyzer Menu

The following chapter describes all softkeys available in the "Code Domain Analyzer" menu of the CDMA2000 Analysis options.

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└ Channel (Code) Number....73
└ Code Order....73
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└ Pilot Power (MS mode only)....74
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Settings Overview

This softkey opens the "Settings Overview" dialog box that visualizes the data flow of the Code Domain Analyzer and summarizes all of the current settings. In addition, you can change the current settings via this dialog box.

To reset all values to their default state, press the "Set to Default" button.

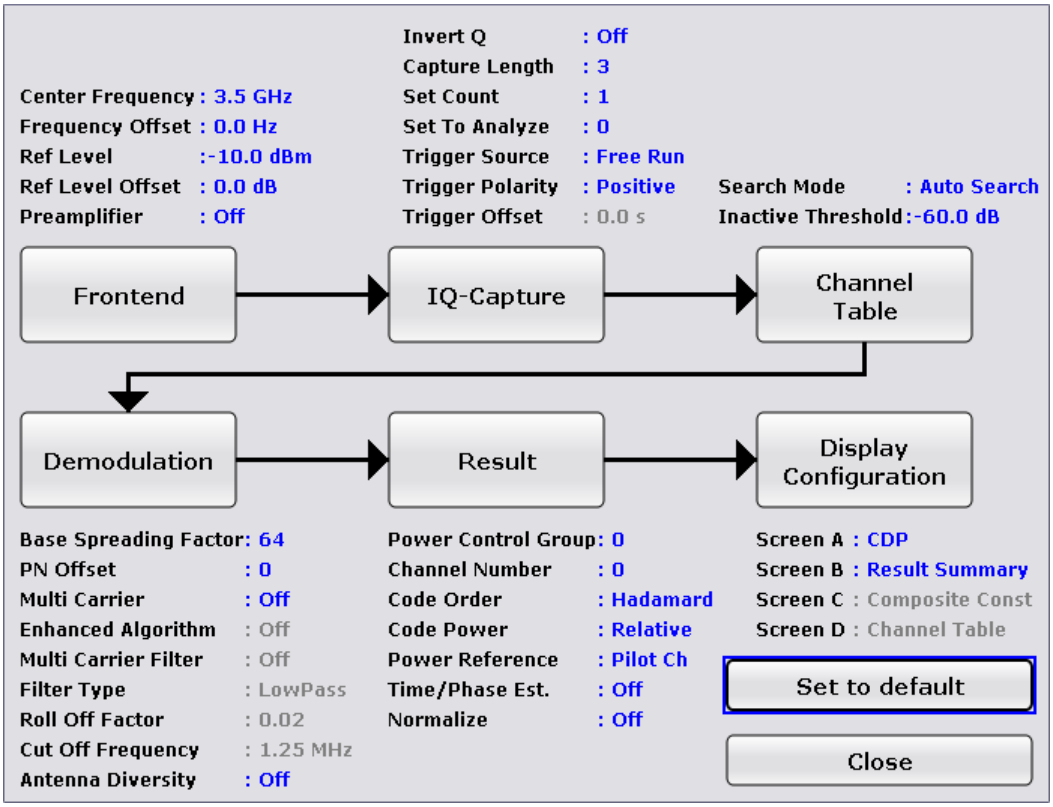


Fig. 4-15: Settings overview in CDMA2000 BTS mode (K82)

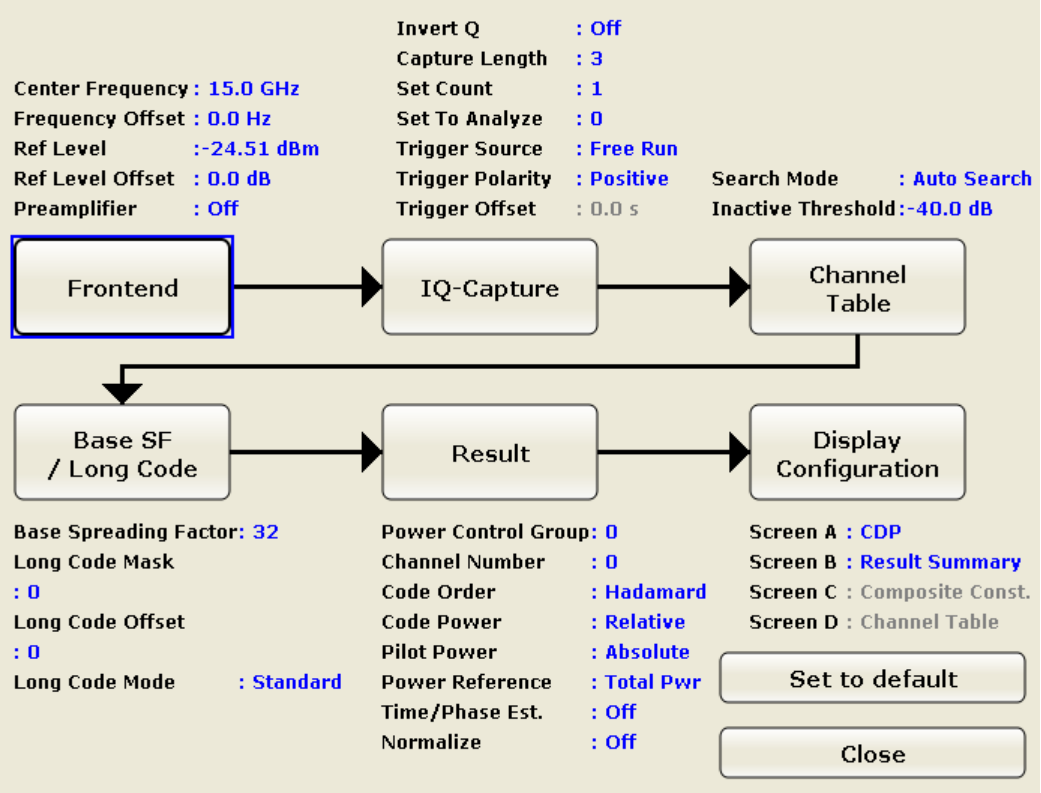


Fig. 4-16: Settings overview in CDMA2000 MS mode (K83)

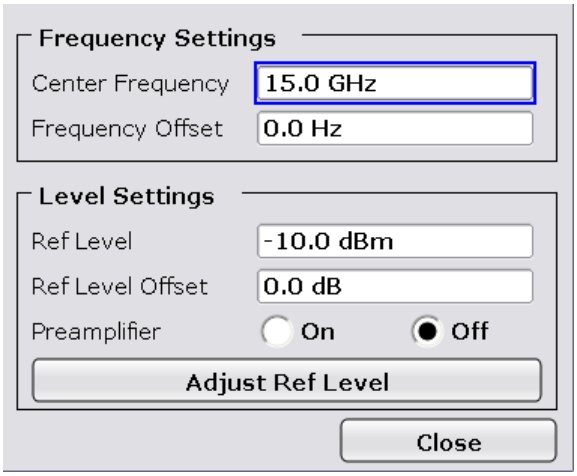
To change the settings, either use the rotary knob or the cursor keys to change the focus to any other block or press one of the following buttons:

- "Frontend Settings" on page 59
- "IQ Capture Settings" on page 61
- "Demod Settings (BTS mode)" on page 67
- "Base SF/Long Code (MS mode)" on page 70
- "Channel Table Settings" on page 63
- "Result Settings" on page 72
- "Display Config" on page 75

When using the rotary knob or the cursor keys, press the ENTER key to open the corresponding dialog box. The "Settings Overview" dialog box always remains open while settings are modified.

Frontend Settings

This softkey opens the "Frontend Settings" dialog box to modify the following parameters:



Center ← Frontend Settings
Opens an edit dialog box to enter the center frequency. The allowed range of values for the center frequency depends on the frequency span.

span > 0: $span_{min}/2 \leq f_{center} \leq f_{max} - span_{min}/2$

span = 0: $0\ Hz \leq f_{center} \leq f_{max}$

f_{max} and $span_{min}$ are specified in the data sheet.

SCPI command:
`[SENSe:]FREQuency:CENTer` on page 256

Frequency Offset ← Frontend Settings
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset. The softkey indicates the current setting. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

SCPI command:
`[SENSe:]FREQuency:OFFSet` on page 257

Ref Level ← Frontend Settings
Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dBµV, etc).

The reference level value is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 228

Ref Level Offset ← Frontend Settings
Opens an edit dialog box to enter the arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly. The setting range is ±200 dB in 0.1 dB steps.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 228

Preamp On/Off (option RF Preamplifier, B22/B24) ← Frontend Settings
Switches the preamplifier on or off.

If option R&S FSV-B22 is installed,the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

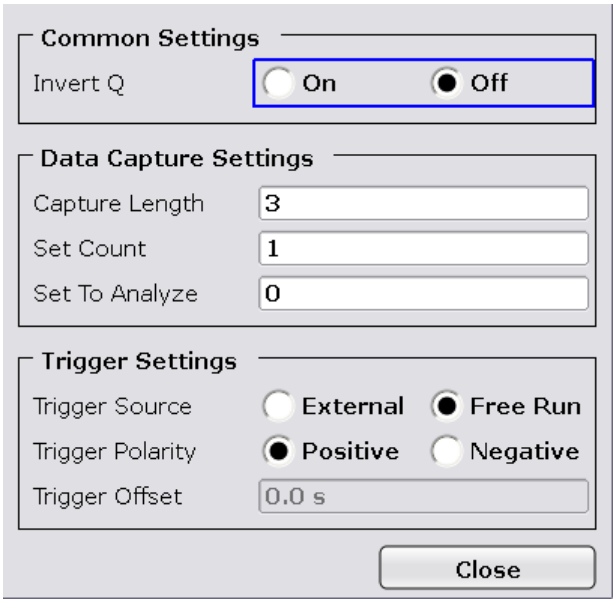
This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:GAIN:STATe` on page 290

Adjust Ref Lvl ← Frontend Settings
Defines the optimal reference level for the current measurement automatically.

SCPI command:
`[SENSe:]ADJust:LEVel` on page 240

IQ Capture Settings
This softkey opens the "IQ Capture Settings" dialog box.



Invert Q ← IQ Capture Settings
Inverts the sign of the signal's Q-component. The default setting is OFF.

SCPI command:
`[SENSe:]CDPower:QINVert` on page 237

Capture Length ← IQ Capture Settings
Sets the number of PCGs you want to analyze. The input value is always in multiples of the PCGs. The maximum capture length is 64.

The "Capture Length" field is available if" Set Count" equals 1.

The default value is 3.

SCPI command:
`[SENSe:]CDPower:IQLength` on page 233

Set Count ← IQ Capture Settings
Defines the number of consecutive sets to be stored in the instrument's IQ memory. One set consists of 64 PCGs. The analyzer can capture up to 31360 PCGs (about 26 seconds) in a single sweep, i.e. the possible value range is from 1 to 490 sets.

The default setting is 1. In that case you can still define the number of PCGs (see "Capture Length" on page 61). In case you want to capture more than one set, the capture length is always 64. The analyzer automatically sets the capture length to 64 and the "Capture Length" on page 61 field is not available for modification.

SCPI command:
`[SENSe:]CDPower:SET:COUNt` on page 237

Set to Analyze ← IQ Capture Settings
Selects a specific set for further analysis. The value range depends on the "Set Count" and is between 0 and "Set Count" – 1.

SCPI command:
`[SENSe:]CDPower:SET` on page 238

Trigger Source Free Run ← IQ Capture Settings
The start of a sweep is not triggered. Once a measurement is completed, another is started immediately.

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

SCPI command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 294

Trigger Source External ← IQ Capture Settings
Defines triggering via a TTL signal at the "EXT TRIG/GATE IN" input connector on the rear panel.

An edit dialog box is displayed to define the external trigger level.

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

SCPI command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 294

Trigger Polarity ← IQ Capture Settings
Sets the polarity of the trigger source.

The sweep starts after a positive or negative edge of the trigger signal. The default setting is "Pos". The setting applies to all modes with the exception of the "Free Run" and "Time" mode.

This softkey is available for code domain measurements.

"Pos" Level triggering: the sweep is stopped by the logic "0" signal and restarted by the logical "1" signal after the gate delay time has elapsed.

"Neg" Edge triggering: the sweep is continued on a "0" to "1" transition for the gate length duration after the gate delay time has elapsed.

SCPI command:

`TRIGger<n>[:SEQuence]:SLOPe` on page 293

`[SENSe:]SWEep:EGATe:POLarity` on page 270

Trigger Offset ← IQ Capture Settings

Opens an edit dialog box to enter the time offset between the trigger signal and the start of the sweep.

offset > 0:	Start of the sweep is delayed
offset < 0:	Sweep starts earlier (pre-trigger) Only possible for span = 0 (e.g. I/Q Analyzer mode) and gated trigger switched off Maximum allowed range limited by the sweep time: $pretrigger_{max}$ = sweep time When using digital baseband interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples. See the digital baseband interface(R&S FSV-B17) description in the base unit.

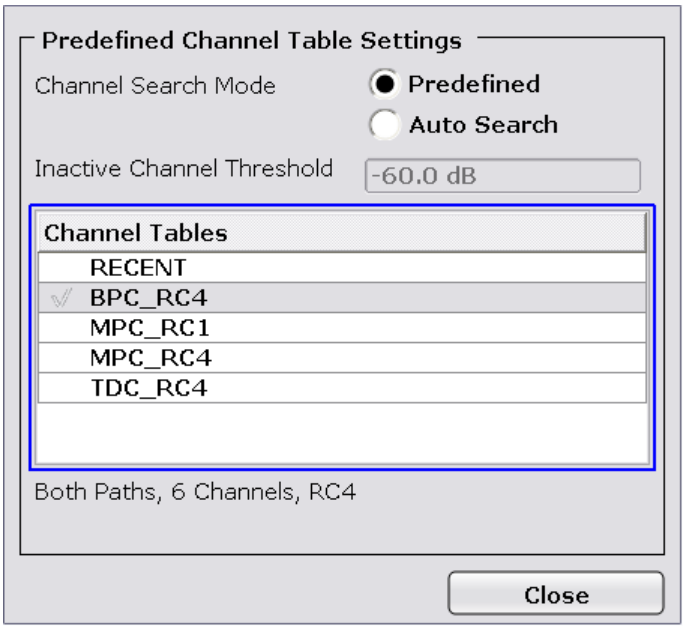
In the "External" or "IF Power" trigger mode, a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger delay (trigger offset) as well.

SCPI command:

`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 293

Channel Table Settings

Opens the "Channel Table Settings" dialog box and the corresponding submenu.



Predefined channel tables allow you to customize measurements very quickly and easily. They are included in the option by default and contain settings according to specific standards. For details on the predefined channel tables refer to chapter 4.4.4.1, "Predefined Channel Tables", on page 145. In addition, new channel tables can be created and saved to be used in measurements.

Channel Search Mode ← Channel Table Settings
Defines the kind of channel table used for the measurement.

"Auto" The Auto Search mode scans the whole code domain, including all permissible symbol rates and channel numbers, for active channels.
The automatic search provides an overview of the channels contained in the signal. If channels are not detected as being active, change the threshold (see "Inactive Channel Threshold" on page 64) or select the Predefined channel search type.

"Predef" Performs the code domain measurement on the basis of the active predefined channel table. All channels of a channel table are assumed to be active. For further details also refer to the "Channel Tables" on page 64 field and the chapter 4.4.4.1, "Predefined Channel Tables", on page 145 .

SCPI command:
`CONFigure:CDPower[:BTS]:CTABle[:STATe]` on page 216
`CONFigure:CDPower[:BTS]:CTABle:SELect` on page 220

Inactive Channel Threshold ← Channel Table Settings
Defines the minimum power which a single channel must have compared to the total signal in order to be recognized as an active channel. Channels below the specified threshold are regarded as "inactive". The parameter is available in the Auto Search mode of the Channel Table Settings dialog box.

The default value is -60 dB. With this value all channels with signals such as the CDMA2000 test models are located by the Code Domain Power analysis. Decrease the Inactive Channel Threshold value, if not all channels contained in the signal are detected.

SCPI command:
`[SENSe:]CDPower:ICThreshold` on page 232

Channel Tables ← Channel Table Settings
In this field a list of the available channel tables is shown. The selected channel table is the basis for future measurements (until you choose another or activate "Auto Search").

An active channel table must describe the supplied signal completely, also in regard to the transmit diversity (see "Antenna Diversity" on page 70).

Using the softkeys, customized channel tables can be defined or existing channel tables can be modified.

The following channel tables are available by default:

"RECENT" Contains the last configuration used before switching from "Auto Search" to "Predefined"

"BPC_RC4, MPC_RC1, MPC_RC4, TDC_RC4" — Channel tables for BTS mode (K82); configured according to a specific standard

"EACHOP, RCCCHOP, RTCHOP3, RTCHOP5" — Channel tables for MS mode (K83); configured according to a specific standard

SCPI command:

`CONFigure:CDPower[:BTS]:CTABle:CATalog` on page 216

New / Copy / Edit ← Channel Table Settings

All three softkeys open a dialog box with the same layout and the same corresponding submenu.

The "New" softkey opens the "New Channel Table" dialog box. In this dialog you can build a new channel table. All fields are empty.

The "Copy" softkey copies all elements of the selected channel table and opens the "Copy Channel Table" dialog box. The name of the new channel table is set to "Copy of <SourceChannelTableName>".

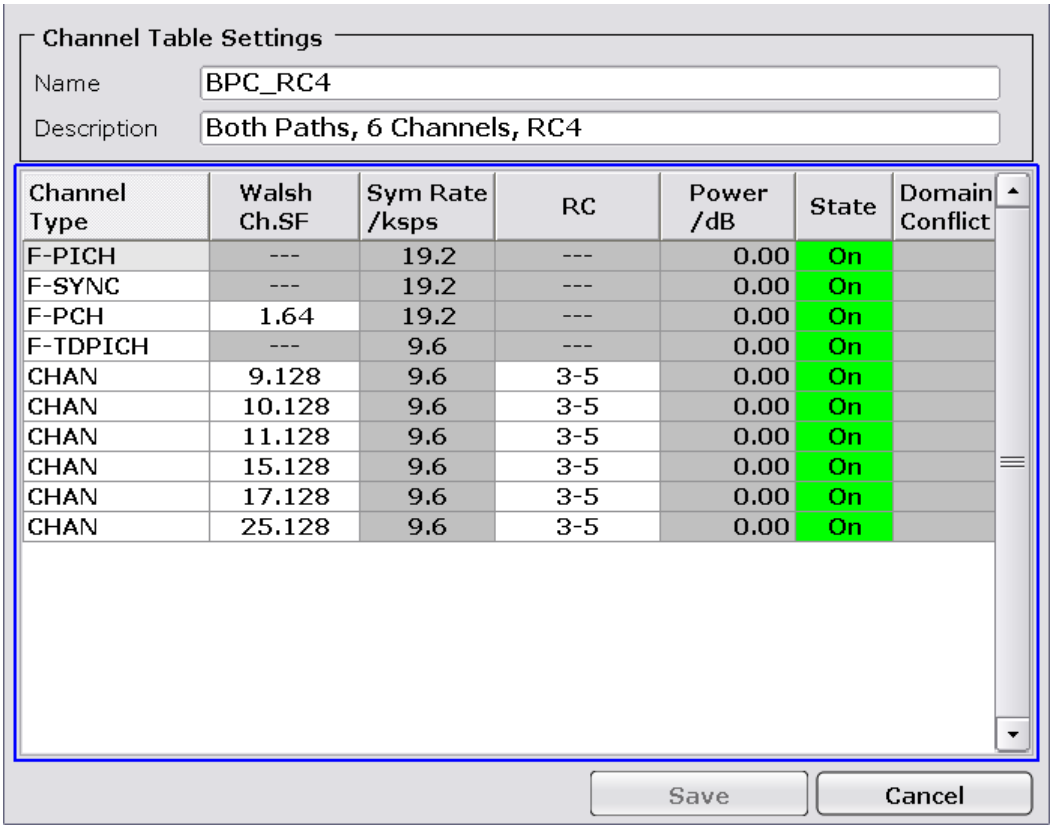
The "Edit" softkey opens the "Edit Channel Table" dialog box and the corresponding menu. In this dialog box you can edit an existing channel table.

Note that changes are never saved automatically. Save your channel tables before ending the application (Save softkey). For more information see chapter 4.4.4.2, "Working with Channel Tables", on page 149.

The dialog box contains the following items. You can modify the white fields as you like. The grey fields can not be modified; these are automatically calculated by the analyzer:

Item	Description
Name	Enter the name of the selected channel table, which will be saved under <name>.xml. The name is case sensitive and may not contain spaces. It must be a valid MS Windows file name. Note that the old channel table file is not deleted.
Description	Enter further information about the channel table.
Channel Type	Select one of the channel types from the dropdown menu.
Walsh Ch.SF	Enter the Channel Number (Ch) and Spreading Factor (SF). For some channel types the possible values are limited or preset (e.g. F-PICH, F-TDPICH and F-PDCH).
Symbol Rate/ksps	Display of the symbol rate
RC (BTS mode only)	The Radio Configuration (RC) can be customized for two channel types. For the F-PDCH the you can set the configuration to either 10 (QPSK), 10 (8PSK) and 10 (16QAM). For CHAN channels, you can set the radio configuration to 1-2 or 3-5.
Mapping (MS mode only)	Specifies whether the channel is active on the I or Q branch.
Power/dB	Contains the measured relative code domain power. The unit is dB. The fields are filled with values after pressing the Meas softkey.

Item	Description
State	Indicates whether a channel is active or inactive.
DomainConflict	A red bullet indicates a conflict of any sorts between two or more channels (e.g. two conflicting channel codes)



Add Channel ← New / Copy / Edit ← Channel Table Settings
Inserts a new channel below the selected one. For a description of the parameters of the channel refer to the "New / Copy / Edit" on page 65 softkey. The default values for a new channel are:

ChannelType	CHAN
Walsh.SF	0.64
Sym Rate/ksps	automatically calculated
RC (BTS mode only)	3-5
Mapping (MS mode only)	I
Power/dB	automatically calculated
State	Off
DomainConflict	automatically calculated

The analyzer automatically checks for conflicts between two active channels.

SCPI command:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 217

Delete Channel ← New / Copy / Edit ← Channel Table Settings
Deletes the selected channel without further notice.

Meas ← New / Copy / Edit ← Channel Table Settings
Initiates a measurement in "Auto Search" mode (see "Channel Search Mode" on page 64). The measurement results are applied to the active channel table. The active channel table is overwritten without further notice.

The softkey is only available if the "Auto Search" mode is enabled "in the Channel Table Settings" dialog box.

Sort ← New / Copy / Edit ← Channel Table Settings
Sorts the table according to the following criteria (in the specified order):

- Channel state (active channels first, then inactive channels)
- Channel type (special channels like F-PICH or F-SYNC first, then data channels)
- Spreading factor (in ascending order)
- Code number (in ascending order)

Save ← New / Copy / Edit ← Channel Table Settings
Saves the table under its specified name in the xml-format. If you edit a channel table and want to keep the original channel table, change the name of the edited channel table before saving it.

Cancel ← New / Copy / Edit ← Channel Table Settings
Closes the dialog box and returns to the "Channel Table Settings" dialog box. Changes applied to the channel table are lost.

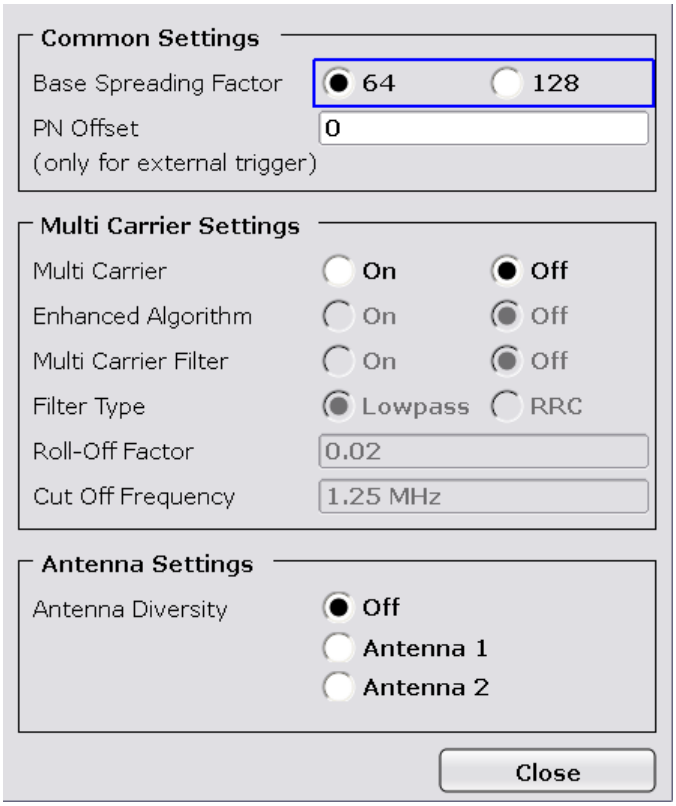
Reload ← New / Copy / Edit ← Channel Table Settings
Reloads the original content of the copied channel table.

This softkey is available for the "New Channel Table" dialog box and the "Edit Channel Table" dialog box.

Delete ← Channel Table Settings
Deletes the selected channel table. The currently active channel table cannot be deleted.

Restore Default Tables ← Channel Table Settings
Restores the predefined channel tables (see chapter 4.4.4.1, "Predefined Channel Tables", on page 145) to their factory-set values. Existing channel tables with the same name as default channel tables are replaced by this action. In this way, you can undo unintentional overwriting.

Demod Settings (BTS mode)
This softkey opens the "Demodulation Settings" dialog box.



Base Spreading Factor ← Demod Settings (BTS mode)
Sets the base spreading factor to either 64 or 128. If you set the base spreading factor to 64 for channels with a base spreading factor of 128 (code class 7), an alias power is displayed in the Code Domain Power and Code Domain Error Power diagrams.

SCPI command:
`[SENSe:]CDPower:SFACtor` on page 238

PN Offset ← Demod Settings (BTS mode)
Specifies the Pseudo Noise (PN) offset of the base station. In a CDMA2000 system, the PN offset is used to distinguish the base stations.

The PN offset determines the offset in the circulating PN sequence in multipls of 64 chips with reference to the event second clock trigger.

Although the parameter is always available, it has an effect only in External trigger mode.

SCPI command:
`[SENSe:]CDPower:PNOFfset` on page 236

Multi Carrier ← Demod Settings (BTS mode)
Activates or deactivates the Multi Carrier mode. The mode improves the processing of multi carrier signals. It allows the measurement on one carrier out of a multi carrier signal.

SCPI command:
`CONFigure:CDPower[:BTS]:MCARrier [:STATe]` on page 220

Enhanced Algorithm ← Demod Settings (BTS mode)
Activates or deactivates the enhanced algorithm that is used for signal detection on multi-carrier signals. This algorithm slightly increases the calculation time.

If both the Enhanced Algorithm and the "Multi Carrier Filter" on page 69 are deactivated, the multi carrier mode is automatically switched off.

SCPI command:
`CONFigure:CDPower[:BTS]:MCARrier:MALGo` on page 222

Multi Carrier Filter ← Demod Settings (BTS mode)
Activates or deactivates the usage of a filter for signal detection on multi-carrier signals.

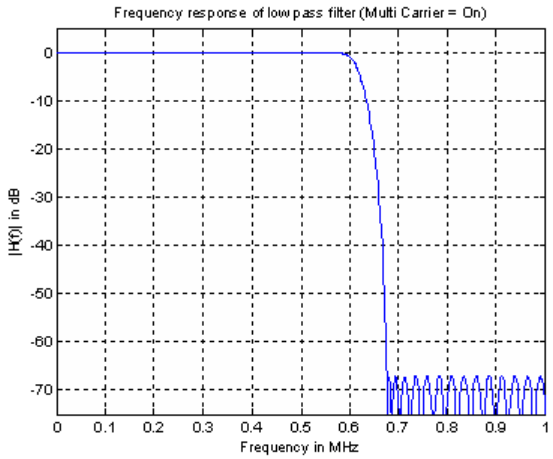
If both the "Enhanced Algorithm" on page 69 and the Multi Carrier Filter are deactivated, the multi carrier mode is automatically switched off.

SCPI command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer [:STATe]` on page 220

Filter Type ← Demod Settings (BTS mode)
Selects the filter type if "Multi Carrier Filter" on page 69 is activated.

Two filter types are available for selection: a low-pass filter and a RRC filter.

By default, the low-pass filter is active. The low-pass filter affects the quality of the measured signal compared to a measurement without a filter. The frequency response of the low-pass filter is shown below.



The RRC filter comes with an integrated Hamming window. If selected, two more settings become available for configuration: the "Roll-Off Factor" on page 69 and the "Cut Off Frequency" on page 70.

SCPI command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 221

Roll-Off Factor ← Demod Settings (BTS mode)
Defines the roll-off factor of the RRC filter. The roll-off factor defines the slope of the filter curve and therefore the excess bandwidth of the filter. Possible values are between 0.01 and 0.99 in 0.01 steps. The default value is 0.02.

This parameter is available for the RRC filter.

SCPI command:

CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE on page 221

CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF on page 221

Cut Off Frequency ← Demod Settings (BTS mode)

Defines the cut-off frequency of the RRC filter. The cutoff frequency is the frequency at which the passband of the filter begins. Possible values are between 0.1 MHz and 2.4 MHz in 1 Hz steps. The default value is 1.25 MHz

This parameter is available for the RRC filter.

SCPI command:

CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE on page 221

CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency on page 221

Antenna Diversity ← Demod Settings (BTS mode)

Activates or deactivates the orthogonal transmit diversity (two-antenna system) and defines the antenna for which the results are displayed.

"Antenna 1" The signal of antenna 1 is fed in.
The pilot channel (F-PICH) with channel number 0 and spreading factor 64 (0.64) is required.
If a channel table is used in the measurement (see Channel Table), it must contain the pilot channel (F-PICH), but must not contain the transmit diversity pilot channel (F-TDPICH).
As reference for the code power (Power Reference), PICH is used.

"Antenna 2" The signal of antenna 2 is fed in.
The transmit diversity pilot channel (F-TDPICH) with channel number 16 and spreading factor 128 (16.128) is required.
If a channel table is used in the measurement (see Channel Table), it must contain the transmit diversity pilot channel (F-TDPICH), but must not contain the pilot channel (F-PICH).
As reference for the code power (Power Reference), F-TDPICH is used.

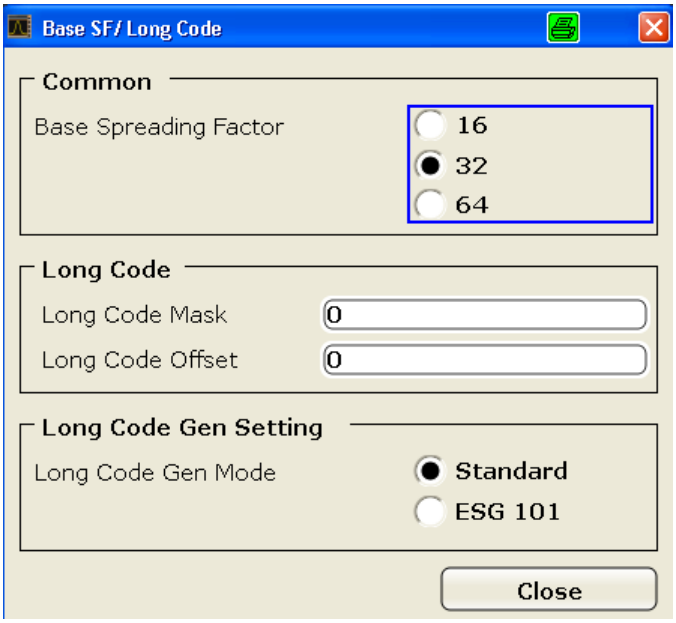
"Off" The aggregate signal from both antennas is fed in.
The pilot channels of both antennas are required.
If a channel table is used in the measurement (see Channel Table), it must contain both the transmit diversity pilot channel (F-TDPICH) and the pilot channel (F-PICH).
As reference for the code power (Power Reference), F-PICH is used.

SCPI command:

[SENSe:]CDPower:ANTenna on page 232

Base SF/Long Code (MS mode)

This softkey opens the "Base SF/Long Code" dialog box. These settings are used to identify the base stations during mobile measurements.



Base Spreading Factor ← Base SF/Long Code (MS mode)
Sets the base spreading factor. Possible values are 16, 32, 64.

If channels with a spreading factor of 64 are analyzed, use the base spreading factor 64. Otherwise alias power is displayed in the "CODE DOMAIN POWER" and "CODE DOMAIN ERROR POWER" diagram.

SCPI command:
`[SENSe:]CDPower:SFACtor` on page 238

Long Code Mask ← Base SF/Long Code (MS mode)
Defines the long code mask of the mobile in hexadecimal form. The value range is from `0` to `4FFFFFFFFF`.

For the default mask value of `0` the long code offset (refer to the "LONG CODE OFFSET" softkey) is not taken into consideration.

SCPI command:
`[SENSe:]CDPower:LCODe:MASK` on page 233

Long Code Offset ← Base SF/Long Code (MS mode)
Defines the long code offset, including the PN offset, in chips in hexadecimal format with a 52-bit resolution. This value corresponds to the GPS timing since 6.1.1980 00:00:00 UTC. This offset is applied at the next trigger pulse (which cannot occur until a setup time of 300 ms has elapsed). The default value is 0.

The setting is ignored if the "Long Code Mask" is set to 0.

The chips offset is calculated as follows:

```
tSinceStartGPS  * 1.2288 MChips/s
```

where `tSinceStartGPS` is defined in seconds

SCPI command:
`[SENSe:]CDPower:LCODe:OFFSet` on page 234

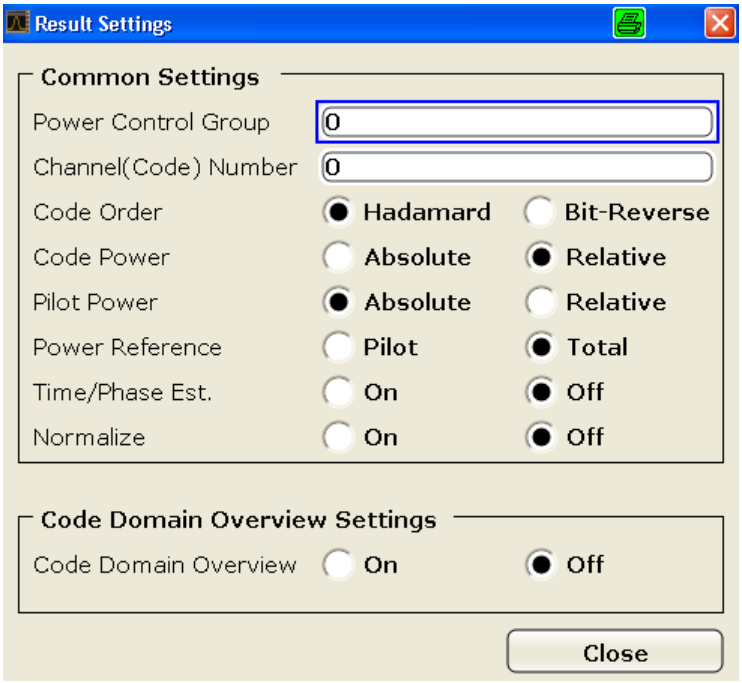
Long Code Gen Mode ← Base SF/Long Code (MS mode)
Selects the mode of the long code generation.

"Standard" The cdma2000 standard long code generator is used.

"ESG 101" The Agilent ESG option 101 long code is used; in this case, only signals from that generator can be analysed.

SCPI command:
`[SENSe:]CDPower:LCODe:MODE` on page 235

Result Settings
This softkey opens the "Result Settings" dialog box to modify the following parameters:



Power Control Group ← Result Settings
In some measurements it is possible to highlight the data of a specific PCG. Select the PCG on which to put the focus on in this field. The range of the value depends on the "Capture Length" on page 61 defined in the IQ Capture Settings dialog box. Therefore the range is (0 to Capture Length-1).

The defined value is valid for any measurement which takes PCGs into account (for further information see also the "Select" on page 76 softkey). The selected PCG is highlighted in red on the screen (as opposed to the others which are displayed in yellow).

SCPI command:
`[SENSe:]CDPower:SLOT` on page 238

Channel (Code) Number ← Result Settings
The entry in this field corresponds to a specific code to be examined. The valid range is from 0 to BSF-1. The base spreading factor (BSF) is either 64 or 128 depending on the setting of the "Base Spreading Factor" on page 68 field. It can not be edited via this field. The selected channel is marked red in the Channel Table. In the Code Domain Power display and the Code Domain Error Power display, all codes belonging to this channel are marked red.

The defined value is valid for any measurement that takes a selected channel into account. For further information see the "Select" on page 76 softkey.

The rotary knob behavior depends on the result display and the graphic display:

- in the Code Domain Power and Code Domain Error result displays, the rotary knob always selects the adjacent channel. The position of the adjacent channel in the diagram depends on the "Code Order" on page 73.
- in the Channel Table result display, the rotary knob is used to scroll through the list.

SCPI command:
`[SENSe:]CDPower:CODE` on page 232

Code Order ← Result Settings
Sets the sorting of the channels for the Code Domain Power and Code Domain Error result displays.

Hadamard order:	By default, the codes are sorted in Hadamard order, i.e. in ascending order. You can see the power of each code in this way; there is no distinction between channels apparent. If there is a channel covering several codes, the display shows the individual power of each code. *Example (for base spreading factor of 64):* 0.64, 1.64, 2.64, …, 63.64.
Bit-Reverse order:	Bundles the channels with concentrated codes, i.e. all codes of a channel are next to one another. In this way you can see the total power of a concentrated channel. *Example (for base spreading factor of 64):* 0.64, 32.64, 16.64, 48.64, 8.64, 40.64, …, 15.64, 47.64,31.64, 63.64

For further details on the code order refer to the Hadamard and BitReverse Code Tables in the Appendix on page.

SCPI command:
`[SENSe:]CDPower:ORDer` on page 235

Code Power ← Result Settings
Selects the y-axis scaling for the Code Domain Power result display.

- Absolute scaling shows the code power in dBm.
- Relative scaling shows the code power in dB.
  You can set the reference in the "Power Reference" on page 74 field.

SCPI command:
`CALCulate<n>:FEED` on page 173

Pilot Power (MS mode only) ← Result Settings
Displays the pilot power in absolute or relative values.

SCPI command:
[SENSe:]CDPower:PPReference on page 236

Power Reference ← Result Settings
Determines the reference power for relative power measurements.

Pilot Channel	By default, the reference power is the power of the pilot channel. Which pilot channel is used as the reference depends on the "Antenna Diversity" on page 70.
Total Power	The power is measured over one PCG. The reference power is the total power of the signal for the corresponding PCG.

By default, the power of the channels is referred to the power of the pilot channel (code number 0). The power of the pilot channel is identical over all PCGs. Therefore it can be used as a constant reference for the result display. In contrast, the total power can vary from PCG to PCG due to the possibility of a power level change in the different code channels.

In the Power vs PCG result display, with enabled power control and reference to the total power of the signal, the power control of the selected channel is not necessarily reflected.

Example (theoretical):

There is just one data channel in the signal and its power is controlled.

The power is referred to the total power of the signal (which consists only of the contribution from this one data channel).

In the Power vs. PCG diagram, a straight line is displayed instead of the expected power staircase.

For relative result displays, the reference value Total Power is therefore only meaningful if the signal does not contain power control. For signals with enabled power control, use the Pilot Channel setting, since the pilot channel is not subject to power control under any circumstances.

SCPI command:
[SENSe:]CDPower:PREFerence on page 236

Time/Phase Estimation ← Result Settings
Actives or deactivates the timing and phase offset calculation of the channels as to the pilot channel. If deactivated or more than 50 active channels are in the signal, the calculation does not take place and dashes instead of values are displayed as results.

SCPI command:
[SENSe:]CDPower:TPMeas on page 239

Normalize ← Result Settings
Activate this parameter to eliminate the DC offset from the signal. By default, the parameter is deactivated.

SCPI command:
[SENSe:]CDPower:TPMeas on page 239

Code Domain Overview (MS mode only) ← Result Settings
If enabled, both branches are displayed at once for a code domain power measurement (see chapter 4.4.1, "Measurements and Result Displays (BTS Mode)", on page 38). Otherwise, only the selected branch and the result summary are displayed.

SCPI command:
`[SENSe:]CDPower:OVERview` on page 236

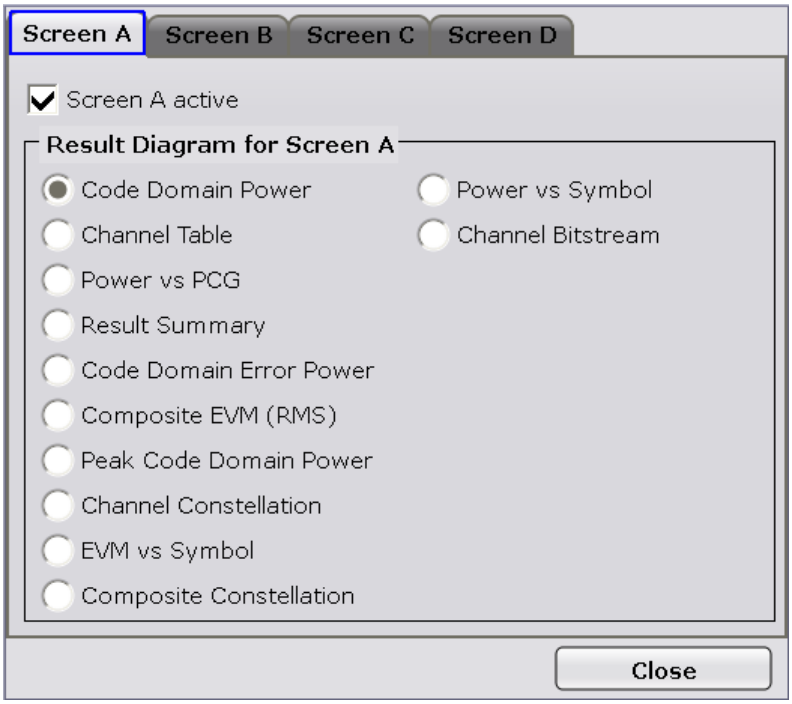
Display Config
This softkey opens the "Display Config" dialog box to select the result display configuration.

The Code Domain Analyzer provides the following result display configurations for measurements in the code domain:

Result Display Configuration	Definition
Code Domain Power	Code Domain Power result display in relative or absolute scaling MS mode: only for the selected branch
Channel Table	Channel occupancy table
Power vs PCG	Power of the selected channel versus all PCGs MS mode: only for the selected branch
Result Summary	Results in a table
Code Domain Error Power	Code Domain Error Power result display MS mode: only for the selected branch
Composite EVM (RMS)	Averaged error between the test signal and the ideal reference signal
Peak Code Domain Error	Projection of the maximum error between the test signal and the reference signal MS mode: only for the selected branch
Channel Constellation	Channel Constellation result display
EVM vs Symbol	Error Vector Magnitude result display
Composite Constellation	Composite Constellation result display
Power vs Symbol	Power of the selected channel and of the selected PCG versus all symbols
Channel Bitstream	Display of demodulated bits

For details on the displayed results and default settings refer to chapter 4.4.1.3, "Code Domain Analysis Results", on page 40.

You can configure the result displays via the "Result Settings" on page 72 dialog box.



The code domain analyzer can show up to four result diagrams in four different screens (windows) at one time. For each screen, you can define which type of result diagram is to be displayed, or deactivate the screen temporarily.

The current configuration of the display, i.e. which screens are displayed and which result diagram is displayed in which screen, can be stored and retrieved later. Thus, you can easily switch between predefined display configurations.

For details see chapter 4.4.1.2, " Configuring the Display", on page 39.

Select
Opens a dialog box to select a specific channel, PCG or branch (MS mode only). The results of that channel/PCG/branch are then shown in the result display.

For details on the effects of this softkey, refer to "Channel (Code) Number" on page 73 and "Power Control Group" on page 72.

For the following measurements an evaluation on PCG level is possible:

- "Code Domain Power", on page 41
- "Channel Table", on page 42
- "Result Summary", on page 44
- "Code Domain Error Power", on page 46
- "Channel Constellation", on page 49
- "EVM vs Symbol", on page 50
- "Composite Constellation", on page 51
- "Power vs Symbol", on page 51
- "Channel Bitstream", on page 52

For the following measurements an evaluation on channel level is possible:

- "Power vs PCG", on page 43
- "Result Summary", on page 44
- "Channel Constellation", on page 49

- "EVM vs Symbol", on page 50
- "Power vs Symbol", on page 51
- "Channel Bitstream", on page 52

SCPI command:
[SENSe:]CDPower:CODE on page 232
[SENSe:]CDPower:SLOT on page 238
[SENSe:]CDPower:MAPPing on page 233

4.4.2.2 Softkeys of the Frequency Menu

The following chapter describes all softkeys available in the "Frequency" menu in "CDMA2000 Analysis" for CDA measurements.

For RF measurements, see the description of the "Frequency" menu for the base unit.

Center....77
CF Stepsize....77
Frequency Offset....77

Center
Opens an edit dialog box to enter the center frequency. The allowed range of values for the center frequency depends on the frequency span.

span > 0: $span_{min}/2 \le f_{center} \le f_{max} - span_{min}/2$

span = 0: 0 Hz ≤ f_{center} ≤ f_{max}

f_{max} and $span_{min}$ are specified in the data sheet.

SCPI command:
[SENSe:]FREQuency:CENTer on page 256

CF Stepsize
Opens an edit dialog box to enter a fixed step size for the center frequency.

This softkey is available for code domain and power vs time measurements.

SCPI command:
[SENSe:]FREQuency:CENTer:STEP[:VALue] on page 256

Frequency Offset
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset. The softkey indicates the current setting. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

SCPI command:
[SENSe:]FREQuency:OFFSet on page 257

4.4.2.3 Softkeys of the Amplitude Menu

The following chapter describes all softkeys available in the "Amplitude" menu in "CDMA2000 BTS Analysis" mode for CDA measurements. For RF measurements, see chapter 4.4.3.4, "Softkeys of the Amplitude Menu", on page 126.

Ref Level....78
Scale....78
└ Auto Scale Once....78
└ Y-Axis Maximum....78
└ Y-Axis Minimum....78
Ref Level Offset....79
Preamp On/Off (option RF Preamplifier, B22/B24)....79
RF Atten Manual/Mech Att Manual....79
RF Atten Auto/Mech Att Auto....79
EI Atten On/Off....79
EI Atten Mode (Auto/Man)....80
Input (AC/DC)....80

Ref Level
Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dBµV, etc).

The reference level value is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 228

Scale
Opens a submenu to define the amplitude scaling type.

This softkey and its submenu is available for code domain measurements in BTS mode (K82).

Auto Scale Once ← Scale
Automatically scales the y-axis of the grid of the selected screen with respect to the measured data.

The softkey is available for code domain measurements.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO` on page 226

Y-Axis Maximum ← Scale
Opens a dialog box to set the maximum value for the y-axis of the grid of the selected screen.

The softkey is available for code domain measurements.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MAXimum` on page 229

Y-Axis Minimum ← Scale
Opens a dialog box to set the minimum value for the y-axis of the grid of the selected screen.

The softkey is available for code domain measurements.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MINimum` on page 230

Ref Level Offset
Opens an edit dialog box to enter the arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly. The setting range is ±200 dB in 0.1 dB steps.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 228

Preamp On/Off (option RF Preamplifier, B22/B24)
Switches the preamplifier on or off.

If option R&S FSV-B22 is installed,the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:GAIN:STATe` on page 290

RF Atten Manual/Mech Att Manual
Opens an edit dialog box to enter the attenuation, irrespective of the reference level. If electronic attenuation is activated (option R&S FSV-B25 only; "El Atten Mode Auto" softkey), this setting defines the mechanical attenuation.

The mechanical attenuation can be set in 10 dB steps.

The RF attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). The range is specified in the data sheet. If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

Note: Values under 10 dB can only be entered via the numeric keypad or via remote control command in order to protect the input mixer against overload.

The RF attenuation defines the level at the input mixer according to the formula:

"$level_{mixer}$ = $level_{input}$ – RF attenuation"

The maximum mixer level allowed is -10 dBm. mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display.

SCPI command:
`INPut:ATTenuation` on page 285

RF Atten Auto/Mech Att Auto
Sets the RF attenuation automatically as a function of the selected reference level. This ensures that the optimum RF attenuation is always used. It is the default setting.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:ATTenuation:AUTO` on page 285

El Atten On/Off
This softkey switches the electronic attenuator on or off. This softkey is only available with option R&S FSV-B25.

When the electronic attenuator is activated, the mechanical and electronic attenuation can be defined separately. Note however, that both parts must be defined in the same mode, i.e. either both manually, or both automatically.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

- To define the mechanical attenuation, use the RF Atten Manual/Mech Att Manual or RF Atten Auto/Mech Att Auto softkeys.
- To define the electronic attenuation, use the El Atten Mode (Auto/Man) softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, this function is available again.
When the electronic attenuator is switched off, the corresponding RF attenuation mode (auto/manual) is automatically activated.

SCPI command:
`INPut:EATT:AUTO` on page 290

El Atten Mode (Auto/Man)
This softkey defines whether the electronic attenuator value is to be set automatically or manually. If manual mode is selected, an edit dialog box is opened to enter the value. This softkey is only available with option R&S FSV-B25, and only if the electronic attenuator has been activated via the El Atten On/Off softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, electronic attenuation is available again. If the electronic attenuation was defined manually, it must be re-defined.

The attenuation can be varied in 1 dB steps from 0 to 30 dB. Other entries are rounded to the next lower integer value.

To re-open the edit dialog box for manual value definition, select the "Man" mode again.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

SCPI command:
`INPut:EATT:AUTO` on page 290
`INPut:EATT` on page 289

Input (AC/DC)
Toggles the RF input of the analyzer between AC and DC coupling.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:COUPling` on page 286

4.4.2.4 Softkeys of the Sweep Menu

The following chapter describes all softkeys available in the "Sweep" menu in "CDMA2000 BTS Analysis" mode for CDA measurements. For RF measurements, see chapter 4.4.3.6, "Softkeys of the Sweep Menu", on page 137.

Continuous Sweep....81
Single Sweep....81
Continue Single Sweep....81
Sweep Count....81

Continuous Sweep
Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting. The trace averaging is determined by the sweep count value (see the "Sweep Count" softkey, "Sweep Count" on page 81).

SCPI command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 296

Single Sweep
Sets the single sweep mode: after triggering, starts the number of sweeps that are defined by using the Sweep Count softkey. The measurement stops after the defined number of sweeps has been performed.

SCPI command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 296

Continue Single Sweep
Repeats the number of sweeps set by using the Sweep Count softkey, without deleting the trace of the last measurement.

This is particularly of interest when using the trace configurations "Average" or "Max Hold" to take previously recorded measurements into account for averaging/maximum search.

SCPI command:
`INITiate<n>:CONMeas` on page 295

Sweep Count
Opens an edit dialog box to enter the number of sweeps to be performed in the single sweep mode. Values from 0 to 32767 are allowed. If the values 0 or 1 are set, one sweep is performed. The sweep count is applied to all the traces in a diagram.

If the trace configurations "Average", "Max Hold" or "Min Hold" are set, the sweep count value also determines the number of averaging or maximum search procedures.

In continuous sweep mode, if sweep count = 0 (default), averaging is performed over 10 sweeps. For sweep count =1, no averaging, maxhold or minhold operations are performed.

SCPI command:
`[SENSe:]SWEep:COUNt` on page 268

4.4.2.5 Softkeys of the Trigger Menu for CDA measurements

The following chapter describes all softkeys available in the "Trigger" menu for CDA measurements.

For RF measurements, see the description for the base unit.

Trigger Source Free Run....82
Trigger Source External....82
Trigger Polarity....82
Trigger Offset....83

Trigger Source Free Run
The start of a sweep is not triggered. Once a measurement is completed, another is started immediately.

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

SCPI command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 294

Trigger Source External
Defines triggering via a TTL signal at the "EXT TRIG/GATE IN" input connector on the rear panel.

An edit dialog box is displayed to define the external trigger level.

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

SCPI command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 294

Trigger Polarity
Sets the polarity of the trigger source.

The sweep starts after a positive or negative edge of the trigger signal. The default setting is "Pos". The setting applies to all modes with the exception of the "Free Run" and "Time" mode.

This softkey is available for code domain measurements.

"Pos" Level triggering: the sweep is stopped by the logic "0" signal and restarted by the logical "1" signal after the gate delay time has elapsed.

"Neg" Edge triggering: the sweep is continued on a "0" to "1" transition for the gate length duration after the gate delay time has elapsed.

SCPI command:
`TRIGger<n>[:SEQuence]:SLOPe` on page 293
`[SENSe:]SWEep:EGATe:POLarity` on page 270

Trigger Offset
Opens an edit dialog box to enter the time offset between the trigger signal and the start of the sweep.

offset > 0:	Start of the sweep is delayed
offset < 0:	Sweep starts earlier (pre-trigger) Only possible for span = 0 (e.g. I/Q Analyzer mode) and gated trigger switched off Maximum allowed range limited by the sweep time: $pretrigger_{max}$ = sweep time When using digital baseband interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples. See the digital baseband interface(R&S FSV-B17) description in the base unit.

In the "External" or "IF Power" trigger mode, a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger delay (trigger offset) as well.

SCPI command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 293

4.4.2.6 Softkeys of the Trace Menu for CDA Measurements

The following chapter describes all softkeys available in the "Trace" menu in "CDMA2000 BTS Analysis" Mode for Code Domain Analysis measurements.

For RF measurements, see the description for the base unit.

Clear Write....83
Max Hold....83
Min Hold....84
Average....84
View....84

Clear Write
Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

All available detectors can be selected.

SCPI command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

Max Hold
The maximum value is determined over several sweeps and displayed. The analyzer saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each sweep until all signal components are detected in a kind of envelope.

This mode is not available for statistics measurements.

SCPI command:

`DISP:TRAC:MODE MAXH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

Min Hold

The minimum value is determined from several measurements and displayed. The analyzer saves for each sweep the smallest of the previously stored/currently measured values in the trace memory.

The detector is automatically set to "Negative Peak".

This mode is useful e.g. for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed whereas a CW signal is recognized by its constant level.

This mode is not available for statistics measurements.

SCPI command:

`DISP:TRAC:MODE MINH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

Average

The average is formed over several sweeps. The "Sweep Count" determines the number of averaging procedures.

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 4.4.4.3, "Detector Overview", on page 150).

This mode is not available for statistics measurements.

For more information see

- "Sweep Count" on page 81

SCPI command:

`DISP:TRAC:MODE AVER`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

View

The current contents of the trace memory are frozen and displayed.

If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the trace and the current instrument setting do not correspond any more is indicated by the icon on the tab label.

If the level range or reference level is changed, the analyzer automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

SCPI command:

`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

4.4.2.7 Softkeys of the Marker Menu for CDA Measurements

The following chapter describes all softkeys available in the "Marker" menu in "CDMA2000 BTS Analysis" mode for CDA measurements. For RF measurements, see chapter 4.4.3.7, "Softkeys of the Marker Menu for RF Measurements", on page 141.

Marker 1/2/3/4 85
Marker Norm/Delta 85
All Marker Off 85

Marker 1/2/3/4
Selects the corresponding marker and activates it.

Marker 1 is always a normal marker. After Marker 2 to 4 have been switched on, they are delta markers that are referenced to Marker 1. These markers can be converted into markers with absolute value displays using the "Marker Norm/Delta" softkey. When Marker 1 is the active marker, pressing the "Marker Norm/Delta" softkey switches on an additional delta marker. Pressing the "Marker 1" to "Marker 4" softkey again switches the corresponding marker off.

For the Channel Bitstream measurement only one marker (Marker 1) is available. It can be used for scrolling and to display the number and value of a bit.

SCPI command:
`CALCulate<n>:MARKer<m>[:STATe]` on page 205
`CALCulate<n>:MARKer<m>:X` on page 206
`CALCulate<n>:MARKer<m>:Y` on page 207
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 188
`CALCulate<n>:DELTamarker<m>:X` on page 189
`CALCulate<n>:DELTamarker<m>:X:RELative` on page 189
`CALCulate<n>:DELTamarker<m>:Y` on page 190

Marker Norm/Delta
Changes the active marker to a normal (norm) or delta marker (with respect to marker 1).

SCPI command:
`CALCulate<n>:MARKer<m>[:STATe]` on page 205
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 188

All Marker Off
Switches all markers off. It also switches off all functions and displays that are associated with the markers/delta markers.

SCPI command:
`CALCulate<n>:MARKer<m>:AOFF` on page 202

4.4.2.8 Softkeys of the Marker To Menu

The following chapter describes all softkeys available in the "Marker To" menu in "CDMA2000 BTS Analysis" mode for CDA measurements.

For RF measurements, see the description for the base unit.

Select 1/2/3/4/Δ....86
Peak....86
Next Peak....86
Next Peak Mode....86
F-PICH (BTS mode only)....87
F-TDPICH (BTS mode only)....87
PICH (MS mode only)....87
Min....87
Next Min....87
Next Min Mode....87
Center =Mkr Freq (span > 0)....88

Select 1/2/3/4/Δ
Selects the normal marker or the delta marker and activates the marker. "Δ" stands for delta marker 1.

`CALCulate<n>:MARKer<m>[:STATe]` on page 205

`CALCulate<n>:MARKer<m>:X` on page 206

`CALCulate<n>:MARKer<m>:Y` on page 207

Peak
Sets the active marker/delta marker to the highest maximum of the trace.

SCPI command:
`CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 203

Next Peak
Sets the active marker/delta marker to the next maximum of the selected trace.

SCPI command:
`CALCulate<n>:MARKer<m>:MAXimum:NEXT` on page 202
`CALCulate<n>:DELTamarker<m>:MAXimum:NEXT` on page 186

Next Peak Mode
Selects the mode of the Next Peak softkey.

This softkey is available for code domain measurements.

Three settings are available:

"<" Sets the active marker/delta marker to the next maximum left to the marker of the selected trace.

"abs" Sets the active marker/delta marker to the next lower maximum of the selected trace.

">" Sets the active marker/delta marker to the next maximum right to the marker of the selected trace.

SCPI command:

`CALC:MARK:MAX:LEFT` (<): `CALCulate<n>:MARKer<m>:MAXimum:LEFT` on page 202

`CALCulate<n>:DELTamarker<m>:MAXimum:LEFT` on page 186

`CALC:MARK:MAX:RIGH` (>): `CALCulate<n>:MARKer<m>:MAXimum:RIGHt` on page 203

`CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt` on page 187

`CALC:DELT:MAX:NEXT` (abs): `CALCulate<n>:MARKer<m>:MAXimum:NEXT` on page 202

`CALCulate<n>:DELTamarker<m>:MAXimum:NEXT` on page 186

F-PICH (BTS mode only)
Sets the marker to the F-PICH channel. The softkey is only available if the x-axis of the active screen is a code axis.

This softkey is available for code domain measurements.

`CALCulate<n>:MARKer<m>:FUNCtion:PICH` on page 177

F-TDPICH (BTS mode only)
Sets the marker to the F-TDPICH channel. The softkey is only available if the x-axis of the active screen is a code axis.

This softkey is available for code domain measurements.

`CALCulate<n>:MARKer<m>:FUNCtion:TDPIch` on page 181

PICH (MS mode only)
Sets the marker to the PICH channel. The softkey is only available if the x-axis of the active screen is a code axis.

This softkey is available for code domain measurements.

`CALCulate<n>:MARKer<m>:FUNCtion:PICH` on page 177

Min
Sets the active marker/delta marker to the minimum of the selected trace.

SCPI command:

`CALCulate<n>:MARKer<m>:MINimum[:PEAK]` on page 204

Next Min
Sets the active marker/delta marker to the next minimum of the selected trace.

SCPI command:

`CALCulate<n>:MARKer<m>:MINimum:NEXT` on page 204

`CALCulate<n>:DELTamarker<m>:MINimum:NEXT` on page 187

Next Min Mode
Sets the mode for the Next Min softkey.

This softkey is available for code domain measurements.

Three settings are available:

"<" Sets the active marker/delta marker to the next minimum left to the marker of the selected trace.

"abs" Sets the active marker/delta marker to the next higher minimum of the selected trace.

">" Sets the active marker/delta marker to the next minimum right to the marker of the selected trace.

SCPI command:

CALC:MARK:MIN:LEFT (>): CALCulate<n>:MARKer<m>:MINimum:LEFT on page 203

CALCulate<n>:DELTamarker<m>:MINimum:LEFT on page 187

CALC:MARK:MIN:RIGH (>): CALCulate<n>:MARKer<m>:MINimum:RIGHt on page 204

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt on page 188

CALC:MARK:MIN:NEXT (abs): CALCulate<n>:MARKer<m>:MINimum:NEXT on page 204

CALCulate<n>:DELTamarker<m>:MINimum:NEXT on page 187

Center =Mkr Freq (span > 0)

Sets the center frequency to the current marker or delta marker frequency. A signal can thus be set to as center frequency, for example to examine it in detail with a smaller span.

This softkey is available for RF measurements.

SCPI command:

CALCulate<n>:MARKer<m>:FUNCtion:CENTer on page 177

4.4.2.9 Softkeys of the Auto Set Menu

The following chapter describes all softkeys available in the "Auto Set" menu in "CDMA2000 BTS Analysis" mode for CDA measurements.

Auto All....88
Auto Freq....89
Auto Level....89
Settings....89
└ Meas Time Manual....89
└ Meas Time Auto....89

Auto All

Performs all automatic settings.

- "Auto Freq" on page 89
- "Auto Level" on page 89

SCPI command:

[SENSe:]ADJust:ALL on page 239

Auto Freq
Defines the center frequency automatically by determining the highest frequency level in the frequency span. This function uses the signal counter; thus it is intended for use with sinusoidal signals.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`[SENSe:]ADJust:FREQuency` on page 240

Auto Level
Defines the optimal reference level for the current measurement automatically. The measurement time for automatic leveling can be defined using the Settings softkey.

SCPI command:
`[SENSe:]ADJust:LEVel` on page 240

Settings
Opens a submenu to define settings for automatic leveling.

Possible settings are:

- "Meas Time Manual" on page 89
- "Meas Time Auto" on page 89

Meas Time Manual ← Settings
Opens an edit dialog box to enter the duration of the level measurement in seconds. The level measurement is used to determine the optimal reference level automatically (see the "Auto Level" softkey, "Auto Level" on page 89). The default value is 1 ms.

SCPI command:
`[SENSe:]ADJust:CONFigure:LEVel:DURation` on page 240

Meas Time Auto ← Settings
The level measurement is used to determine the optimal reference level automatically (see the Auto Level softkey).

This softkey resets the level measurement duration for automatic leveling to the default value of 100 ms.

4.4.2.10 Softkeys of the Input/Output Menu for CDA Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for CDA measurements. For RF measurements, see chapter 4.4.3.8, "Softkeys of the Input/Output Menu for RF Measurements", on page 144.

Input (AC/DC) 90
Noise Source 90
Signal Source 90
└ Input Path 90
└ Connected Device 90
└ Input Sample Rate 91
└ Full Scale Level 91
└ Level Unit 91

└ Adjust Reference Level to Full Scale Level....91
Digital Baseband Info....91
EXIQ....92
└ TX Settings....92
└ RX Settings....92
└ Send To....93
└ Firmware Update....93
└ R&S Support....93
└ DigIConf....93

Input (AC/DC)
Toggles the RF input of the analyzer between AC and DC coupling.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:COUPling` on page 286

Noise Source
Switches the supply voltage for an external noise source on or off. For details on connectors refer to the Quick Start Guide, chapter 1 "Front and Rear Panel".

SCPI command:
`DIAGnostic<n>:SERVice:NSOurce` on page 295

Signal Source
Opens a dialog box to select the signal source. For "Digital Baseband (I/Q)", the source can also be configured here.

Input Path ← Signal Source
Defines whether the "RF Radio Frequency" or the "Baseband Digital" input path is used for measurements. "Baseband Digital" is only available if option R&S FSV-B17 (Digital Baseband interface) is installed.

Note: Note that the input path defines the characteristics of the signal, which differ significantly between the RF input and digital input.

SCPI command:
`INPut:SELect` on page 291

Connected Device ← Signal Source
Displays the name of the device connected to the optional Digital Baseband interface (R&S FSV-B17) to provide Baseband Digital input. The device name cannot be changed here.

The device name is unknown.

SCPI command:
`INPut:DIQ:CDEVice` on page 286

Input Sample Rate ← Signal Source
Defines the sample rate of the digital I/Q signal source. This sample rate must correspond with the sample rate provided by the connected device, e.g. a generator.

SCPI command:
`INPut:DIQ:SRATe` on page 289

Full Scale Level ← Signal Source
The "Full Scale Level" defines the level that should correspond to an I/Q sample with the magnitude "1".

The level can be defined either in dBm or Volt.

SCPI command:
`INPut:DIQ:RANGe[:UPPer]` on page 288

Level Unit ← Signal Source
Defines the unit used for the full scale level.

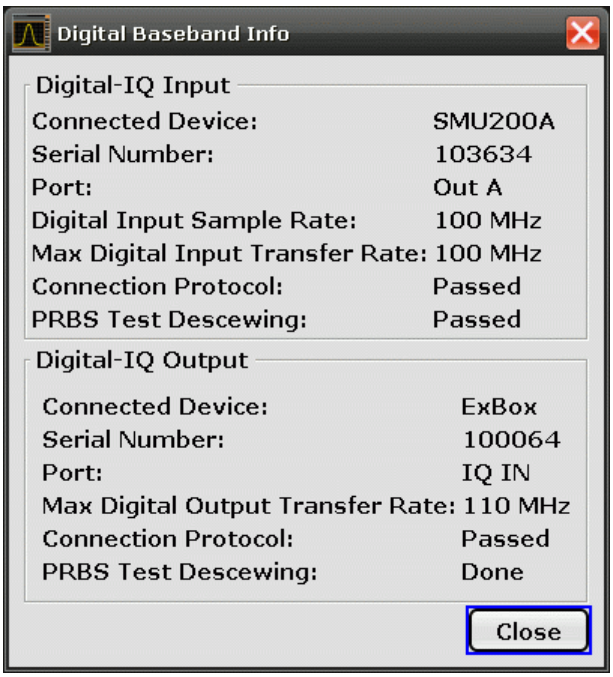
SCPI command:
`INPut:DIQ:RANGe[:UPPer]:UNIT` on page 288

Adjust Reference Level to Full Scale Level ← Signal Source
If enabled, the reference level is adjusted to the full scale level automatically if any change occurs.

SCPI command:
`INPut:DIQ:RANGe:COUPling` on page 288

Digital Baseband Info
Displays a dialog box with information on the digital I/Q input and output connection via the optional Digital Baseband interface (R&S FSV-B17), if available. The information includes:

- Device identification
- Used port
- (Maximum) digital input/output sample rates and maximum digital input/output transfer rates
- Status of the connection protocol
- Status of the PRBS descewing test



For details see "Interface Status Information" in "Instrument Functions - Digital Baseband Interface (Option R&S FSV-B17)" in the description of the base unit.

SCPI command:

`INPut:DIQ:CDEVice` on page 286

EXIQ

Opens a configuration dialog box for an optionally connected R&S EX-IQ-BOX and a submenu to access the main settings quickly.

If the optional R&S DigIConf software is installed, the submenu consists only of one key to access the software. **Note that R&S DigIConf requires a USB connection (not LAN!) from the analyzer to the R&S EX-IQ-BOX in addition to the Digital Baseband Interface connection. R&S DigIConf version 2.10 or higher is required.**

For typical applications of the R&S EX-IQ-BOX see also the description of the Digital Baseband Interface (R&S FSV-B17) in the base unit manual.

For details on configuration see the "R&S®Ex I/Q Box - External Signal Interface Module Manual".

For details on installation and operation of the R&S DigIConf software, see the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

TX Settings ← EXIQ

Opens the "EX-IQ-BOX Settings" dialog box to configure the analyzer for digital output to a connected device ("Transmitter" Type).

RX Settings ← EXIQ

Opens the "EX-IQ-BOX Settings" dialog box to configure the analyzer for digital input from a connected device ("Receiver" Type).

Send To ← EXIQ
The configuration settings defined in the dialog box are transferred to the R&S EX-IQ-BOX.

Firmware Update ← EXIQ
If a firmware update for the R&S EX-IQ-BOX is delivered with the analyzer firmware, this function is available. In this case, when you select the softkey, the firmware update is performed.

R&S Support ← EXIQ
Stores useful information for troubleshooting in case of errors.

This data is stored in the `C:\R_S\Instr\user\Support` directory on the instrument.

If you contact the Rohde&Schwarz support to get help for a certain problem, send these files to the support in order to identify and solve the problem faster.

DigIConf ← EXIQ
Starts the optional R&S DigIConf application. This softkey is only available if the optional software is installed.

To return to the analyzer application, press any key on the front panel. The application is displayed with the "EXIQ" menu, regardless of which key was pressed.

For details on the R&S DigIConf application, see the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".

Note: If you close the R&S DigIConf window using the "Close" icon, the window is minimized, not closed.
If you select the "File > Exit" menu item in the R&S DigIConf window, the application is closed. Note that in this case the settings are lost and the EX-IQ-BOX functionality is no longer available until you restart the application using the "DigIConf" softkey in the analyzer once again.

SCPI command:
Remote commands for the R&S DigIConf software always begin with `SOURce:EBOX`.
Such commands are passed on from the analyzer to the R&S DigIConf automatically which then configures the R&S EX-IQ-BOX via the USB connection.
All remote commands available for configuration via the R&S DigIConf software are described in the "R&S®EX-IQ-BOX Digital Interface Module R&S®DigIConf Software Operating Manual".
Example 1:
```
SOURce:EBOX:*RST
SOURce:EBOX:*IDN?
```
Result:
"Rohde&Schwarz,DigIConf,02.05.436 Build 47"
Example 2:
```
SOURce:EBOX:USER:CLOCk:REFerence:FREQuency 5MHZ
```
Defines the frequency value of the reference clock.

4.4.3 Softkeys and Menus for RF Measurements (K82)

The following chapter describes the softkeys and menus available for RF measurements in CDMA2000 BTS Analysis mode.

All menus not described here are the same as for the base unit, see the description there.

4.4.3.1 Softkeys of the Measurement Menu....94
4.4.3.2 Softkeys of the Frequency Menu....121
4.4.3.3 Softkeys of the Span Menu for RF Measurements....124
4.4.3.4 Softkeys of the Amplitude Menu....126
4.4.3.5 Softkeys of the Bandwidth Menu....131
4.4.3.6 Softkeys of the Sweep Menu....137
4.4.3.7 Softkeys of the Marker Menu for RF Measurements....141
4.4.3.8 Softkeys of the Input/Output Menu for RF Measurements....144

4.4.3.1 Softkeys of the Measurement Menu

The following chapter describes all softkeys available in the "Measurement" menu in "CDMA2000 Analysis" or "1xEV-DO Analysis" mode. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Code Domain Analyzer....96
Power....96
- Adjust Ref Lvl....97

Ch Power ACLR....97
- Bandclass....97
- CP/ACLR Settings....98
  - # of TX Chan....98
  - # of Adj Chan....98
  - Channel Setup....99
    - Bandwidth....99
      - ACLR Reference....100
    - Spacing....100
    - Names....102
    - Weighting Filter....102
    - Limits....102
      - Limit Checking....102
      - Relative Limit....103
      - Absolute Limit....103
      - Check....103
  - Chan Pwr/Hz....103
  - Power Mode....104
    - Clear/Write....104
    - Max Hold....104

└ Select Trace....104
└ ACLR (Abs/Rel)....104
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└ Sweep Time....105
└ Fast ACLR (On/Off)....105
└ Set CP Reference....105
└ Noise Correction....106
└ Adjust Ref Lvl....106
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└ Sweep List....106
└ Sweep List dialog box....106
└ Range Start / Range Stop....107
└ Fast SEM....107
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└ List Evaluation (On/Off)....111
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└ ASCII File Export....112
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└ Bandclass....115
└ Load Standard....115
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Occupied Bandwidth....116
└ % Power Bandwidth (span > 0)....116
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└ Adjust Ref Lvl (span > 0)....116
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└ Res BW....117
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└ Scaling....117
└ x-Axis Ref Level....117
└ x-Axis Range....118
└ Range Log 100 dB....118
└ Range Log 50 dB....118
└ Range Log 10 dB....118
└ Range Log 5 dB....118
└ Range Log 1 dB....119
└ Range Log Manual....119
└ Range Linear %....119
└ Range Lin. Unit....119
└ y-Axis Max Value....119
└ y-Axis Min Value....120
└ y-Unit %/Abs....120
└ Default Settings....120
└ Adjust Settings....120
└ Gated Trigger (On/Off)....120
└ Gate Ranges....120
└ Adjust Settings....121

Code Domain Analyzer
Starts the Code Domain Analyzer and opens the "Code Domain Analyzer" menu. Select the desired result display via this menu.

For details refer to chapter 4.4.2.1, "Softkeys of the Code Domain Analyzer Menu", on page 56. For details on the measurements in the code domain, initial configuration and screen layout refer to chapter 4.4.1, "Measurements and Result Displays (BTS Mode)", on page 38.

SCPI command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 222

Power
Starts the Signal Channel Power measurement, in which the power of a single channel is determined.

SCPI command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 222
`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` on page 178

Adjust Ref Lvl ← Power
Adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the analyzer or limiting the dynamic range by a too small S/N ratio.

For details on manual settings see "Settings of CP/ACLR test parameters" in the description of the base unit.

The reference level is not influenced by the selection of a standard. To achieve an optimum dynamic range, the reference level has to be set in a way that places the signal maximum close to the reference level without forcing an overload message. Since the measurement bandwidth for channel power measurements is significantly lower than the signal bandwidth, the signal path may be overloaded although the trace is still significantly below the reference level.

SCPI command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 264

Ch Power ACLR
Activates the Adjacent Channel Power measurement.

In this measurement the power of the carrier and its adjacent and alternate channels is determined.

SCPI command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 222
`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` on page 178

Bandclass ← Ch Power ACLR
Opens a dialog box to select the bandclass. The following bandclasses are available:

Band Class 0	800 MHz Cellular Band
Band Class 1	1.9 GHz PCS Band
Band Class 2	TACS Band
Band Class 3A	JTACS Band: >832 MHz and ≤ 834 MHz >838 MHz and ≤ 846 MHz >860 MHz and ≤ 895 MHz
Band Class 3B	JTACS Band: >810 MHz and ≤ 860 MHz except: >832 MHz and ≤ 834 MHz >838 MHz and ≤ 846 MHz
Band Class 3C	JTACS Band: ≤810 MHz and >895 MHz
Band Class 4	Korean PCS Band
Band Class 5	450 MHz NMT Band
Band Class 6	2 GHz IMT-2000 Band

Band Class 7	700 MHz Band
Band Class 8	1800 MHz Band
Band Class 9	900 MHz Band
Band Class 10	Secondary 800 MHz
Band Class 11	400 MHz European PAMR Band
Band Class 12	800 MHz PAMR Band
Band Class 13	2.5 GHz IMT-2000 Extension Band
Band Class 14	US PCS 1.9 GHz Band
Band Class 15	AWS Band
Band Class 16	US 2.5 GHz Band
Band Class 17	US 2.5 GHz Forward Link Only Band

SCPI command:
`CONFigure:CDPower[:BTS]:BCLass` on page 214

CP/ACLR Settings ← Ch Power ACLR
Opens a submenu to configure the channel power and adjacent channel power measurement independently of the predefined standards (for details see also chapter 4.4.4.13, "Predefined CP/ACLR Standards", on page 166 and chapter 4.4.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 167).

# of TX Chan ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the number of carrier signals to be taken into account in channel and adjacent-channel power measurements. Values from 1 to 18 are allowed.

SCPI command:
`[SENSe:]POWer:ACHannel:TXCHannel:COUNt` on page 266

# of Adj Chan ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the number of adjacent channels to be considered in the adjacent-channel power measurement. Values from 0 to 12 are allowed.

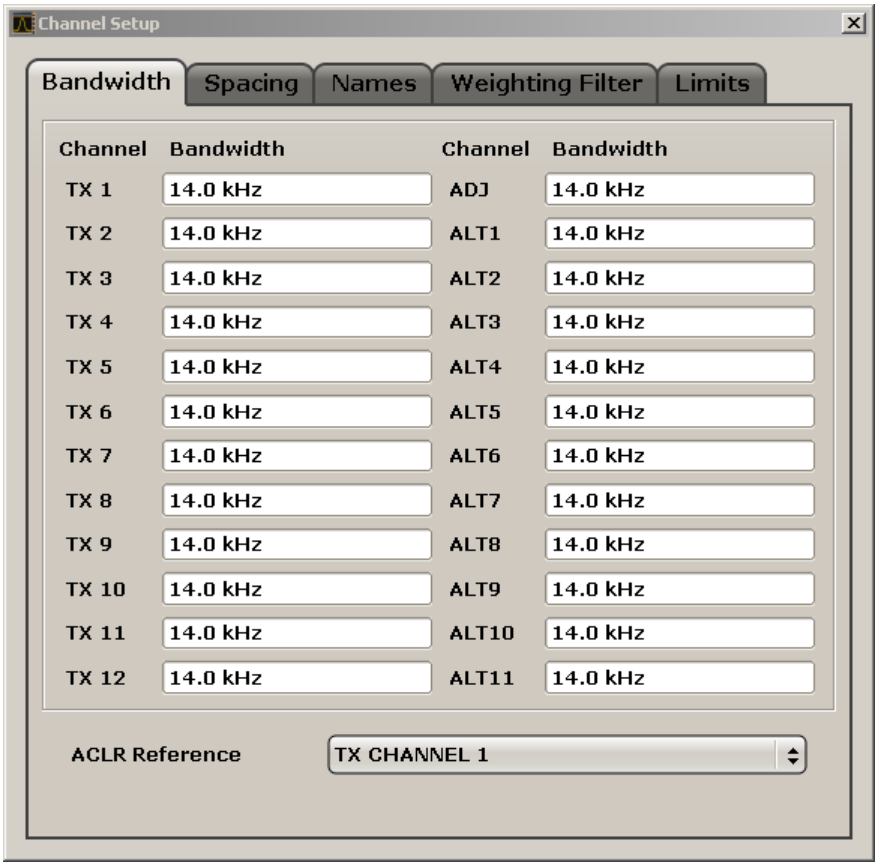
The following measurements are performed depending on the number of the channels:

0	Only the channel powers are measured.
1	The channel powers and the power of the upper and lower adjacent channel are measured.
2	The channel powers, the power of the upper and lower adjacent channel, and of the next higher and lower channel (alternate channel 1) are measured.
3	The channel power, the power of the upper and lower adjacent channel, the power of the next higher and lower channel (alternate channel 1), and of the next but one higher and lower adjacent channel (alternate channel 2) are measured.

…	…
12	The channel power, the power of the upper and lower adjacent channel, and the power of the all higher and lower channels (alternate channel 1 to 11) are measured.

SCPI command:
`[SENSe:]POWer:ACHannel:ACPairs` on page 259

Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Opens a dialog to define the channel settings for all channels, independant of the defined number of *used* TX or adjacent channels.



The dialog contains the following tabs:

- "Bandwidth" on page 99
- "Spacing" on page 100
- "Names" on page 102
- "Weighting Filter" on page 102
- "Limits" on page 102

Bandwidth ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define the channel bandwidths for the transmission channels and the adjacent channels. "TX" is only available for the multi-carrier ACLR measurement. When you change the bandwidth for one channel, the value is automatically also defined for all subsequent channels of the same type.

The transmission-channel bandwidth is normally defined by the transmission standard. The correct bandwidth is set automatically for the selected standard (see chapter 4.4.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 167).

- Measurements in zero span (see Fast ACLR (On/Off) softkey) are performed in the zero span mode. The channel limits are indicated by vertical lines. For measurements requiring channel bandwidths deviating from those defined in the selected standard the IBW method is to be used.
- With the IBW method (see Fast ACLR (On/Off) softkey), the channel bandwidth limits are marked by two vertical lines right and left of the channel center frequency. Thus you can visually check whether the entire power of the signal under test is within the selected channel bandwidth.
  If measuring according to the IBW method ("Fast ACLR Off"), the bandwidths of the different adjacent channels are to be entered numerically. Since all adjacent channels often have the same bandwidth, the other alternate channels are set to the bandwidth of the adjacent channel when it is changed. Thus, only one value needs to be entered in case of equal adjacent channel bandwidths.

For details on available channel filters see chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153.

SCPI command:

`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]` on page 259

`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel` on page 259

`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>` on page 260

ACLR Reference ← Bandwidth ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR

Select the transmission channel to which the relative adjacent-channel power values should be referenced.

TX Channel 1	Transmission channel 1 is used.
Min Power TX Channel	The transmission channel with the lowest power is used as a reference channel.
Max Power TX Channel	The transmission channel with the highest power is used as a reference channel.
Lowest & Highest Channel	The outer left-hand transmission channel is the reference channel for the lower adjacent channels, the outer right-hand transmission channel that for the upper adjacent channels.

SCPI command:

`[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual` on page 265

`[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO` on page 264

Spacing ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR

Define the channel spacings for the TX channels and for the adjacent channels.

- TX channels (left column)

TX1-2	spacing between the first and the second carrier
TX2-3	spacing between the second and the third carrier
…	…

The spacings between all adjacent TX channels can be defined separately. When you change the spacing for one channel, the value is automatically also defined for all subsequent TX channels in order to set up a system with equal TX channel spacing quickly. For different spacings, a setup from top to bottom is necessary.

If the spacings are not equal, the channel distribution according to the center frequency is as follows:

Odd number of TX channels	The middle TX channel is centered to center frequency.
Even number of TX channels	The two TX channels in the middle are used to calculate the frequency between those two channels. This frequency is aligned to the center frequency.

- Adjacent channels (right column)
  Since all the adjacent channels often have the same distance to each other, the modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, …): they are all multiplied by the same factor (new spacing value/old spacing value). Thus only one value needs to be entered in case of equal channel spacing. A modification of a higher adjacent-channel spacing (ALT1, ALT2, …) causes a change by the same factor in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.
  Example:
  In the default setting, the adjacent channels have the following spacing: 20 kHz ("ADJ"), 40 kHz ("ALT1"), 60 kHz ("ALT2"), 80 kHz ("ALT3"), 100 kHz ("ALT4"), …
  If the spacing of the first adjacent channel ("ADJ") is set to 40 kHz, the spacing of all other adjacent channels is multiplied by factor 2 to result in 80 kHz ("ALT1"), 120 kHz ("ALT2"), 160 kHz ("ALT3"), …
  If, starting from the default setting, the spacing of the 5th adjacent channel ("ALT4") is set to 150 kHz, the spacing of all higher adjacent channels is multiplied by factor 1.5 to result in 180 kHz ("ALT5"), 210 kHz ("ALT6"), 240 kHz ("ALT7"), …
  If a ACLR or MC-ACLR measurement is started, all settings according to the standard including the channel bandwidths and channel spacings are set and can be adjusted afterwards.

SCPI command:

`[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel>` on page 266

`[SENSe:]POWer:ACHannel:SPACing[:ACHannel]` on page 265

`[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel>` on page 266

Names ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define user-specific channel names for each channel. The names defined here are displayed in the result diagram and result table.

SCPI command:
`[SENSe:]POWer:ACHannel:NAME:ACHannel` on page 262
`[SENSe:]POWer:ACHannel:NAME:ALTernate<channel>` on page 263
`[SENSe:]POWer:ACHannel:NAME:CHANnel<channel>` on page 263

Weighting Filter ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define weighting filters for all channels. Weighting filters are not available for all supported standards and cannot always be defined manually where they are available.

The dialog contains the following fields:

Field	Description
Channel	• TX 1-18: TX channels • ADJ: Adjacent channel • ALT1-11: Alternate channels
Active	Activates/Deactivates the weighting filter for the selected and any subsequent channels of the same type
Alpha	Defines the alpha value for the weighting filter for the selected and any subsequent channels of the same type

SCPI command:
`POW:ACH:FILT:CHAN1 ON`, see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel>` on page 262
Activates the weighting filter for TX channel 1.
`POW:ACH:FILT:ALPH:CHAN1 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel>` on page 261
Sets the alpha value for the weighting filter for TX channel 1 to 0,35.
`POW:ACH:FILT:ACH ON` see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel` on page 261
Activates the weighting filter for the adjacent channel.
`POW:ACH:FILT:ALPH:ACH 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel` on page 260
Sets the alpha value for the weighting filter for the adjacent channel to 0,35.
`POW:ACH:FILT:ALT1 ON` see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTernate<channel>` on page 261
Activates the alpha value for the weighting filter for the alternate channel 1.
`POW:ACH:FILT:ALPH:ALT1 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel>` on page 260
Sets the alpha value for the weighting filter for the alternate channel 1 to 0,35.

Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Activate and define the limits for the ACLR measurement.

Limit Checking ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Activate or deactivate limit checking for the ACLR measurement.

The following rules apply for the limits:

- A separate limit can be defined for each adjacent channel. The limit applies to both the upper and the lower adjacent channel.
- A relative and/or absolute limit can be defined. The check of both limit values can be activated independently.
- The analyzer checks adherence to the limits irrespective of whether the limits are absolute or relative or whether the measurement is carried out with absolute or relative levels. If both limits are active and if the higher of both limit values is exceeded, the measured value is marked by a preceding asterisk.

SCPI command:
`CALCulate<n>:LIMit<k>:ACPower[:STATe]` on page 196
`CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult` on page 193
`CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]` on page 195

Relative Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Defines a limit relative to the carrier signal.

SCPI command:
`CALC:LIM:ACP ON`, see `CALCulate<n>:LIMit<k>:ACPower[:STATe]` on page 196
`CALC:LIM:ACP:<adjacent-channel> 0dBc,0dBc`
`CALC:LIM:ACP:<adjacent-channel>:STAT ON`

Absolute Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Defines an absolute limit.

SCPI command:
`CALC:LIM:ACP ON`, see `CALCulate<n>:LIMit<k>:ACPower[:STATe]` on page 196
`CALC:LIM:ACP:<adjacent-channel>:ABS -10dBm,-10dBm`
`CALC:LIM:ACP:<adjacent-channel>:ABS:STAT ON`, see `CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe` on page 191

Check ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Activate or deactivate the limit to be considered during a limit check. The check of both limit values can be activated independently.

Chan Pwr/Hz ← CP/ACLR Settings ← Ch Power ACLR
If deactivated, the channel power is displayed in dBm. If activated, the channel power density is displayed instead. Thus, the absolute unit of the channel power is switched from dBm to dBm/Hz. The channel power density in dBm/Hz corresponds to the power inside a bandwidth of 1 Hz and is calculated as follows:

"channel power density = channel power – $\log_{10}$(channel bandwidth)"

By means of this function it is possible e.g. to measure the signal/noise power density or use the additional functions "ACLR (Abs/Rel)" on page 104 and "ACLR Reference" on page 100 to obtain the signal to noise ratio.

SCPI command:
`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ` on page 179

Power Mode ← CP/ACLR Settings ← Ch Power ACLR
Opens a submenu to select the power mode.

Clear/Write ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR
If this mode is activated, the channel power and the adjacent channel powers are calculated directly from the current trace (default mode).

SCPI command:
`CALC:MARK:FUNC:POW:MODE WRIT`, see `CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE` on page 178

Max Hold ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR
If this mode is activated, the power values are calculated from the current trace and compared with the previous power value using a maximum algorithm. The higher value is retained. If activated, the enhancement label "Pwr Max" is displayed.

SCPI command:
`CALC:MARK:FUNC:POW:MODE MAXH`, see `CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE` on page 178

Select Trace ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the trace number on which the CP/ACLR measurement is to be performed. Only activated traces can be selected (for details on trace modes see chapter 4.4.4.4, "Trace Mode Overview", on page 152).

SCPI command:
`[SENSe:]POWer:TRACe` on page 267

ACLR (Abs/Rel) ← CP/ACLR Settings ← Ch Power ACLR
Switches between absolute and relative power measurement in the adjacent channels.

Abs	The absolute power in the adjacent channels is displayed in the unit of the y-axis, e.g. in dBm, dBµV.
Rel	The level of the adjacent channels is displayed relative to the level of the transmission channel in dBc.

SCPI command:
`[SENSe:]POWer:ACHannel:MODE` on page 262

Adjust Settings ← CP/ACLR Settings ← Ch Power ACLR
Automatically optimizes all instrument settings for the selected channel configuration (channel bandwidth, channel spacing) within a specific frequency range (channel bandwidth). The adjustment is carried out only once. If necessary, the instrument settings can be changed later.

For details on the settings of span, resolution bandwidth, video bandwidth, detector and trace averaging see chapter 4.4.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 167.

SCPI command:
`[SENSe:]POWer:ACHannel:PRESet` on page 263

Sweep Time ← Ch Power ACLR
Opens an edit dialog box to enter the sweep time. With the RMS detector, a longer sweep time increases the stability of the measurement results.

The function of this softkey is identical to the Sweeptime Manual softkey in the "Bandwidth" menu.

SCPI command:
`[SENSe:]SWEep:TIME` on page 273

Fast ACLR (On/Off) ← Ch Power ACLR
Switches between the IBW method ("Fast ACLR Off") and the zero span method ("Fast ACLR On").

When switched on, the analyzer sets the center frequency consecutively to the different channel center frequencies and measures the power with the selected measurement time (= sweep time/number of channels). The RBW filters suitable for the selected standard and frequency offset are automatically used (e.g. root raised cos with IS 136). For details on available channel filters see chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153.

The RMS detector is used for obtaining correct power measurement results. Therefore this requires no software correction factors.

Measured values are output as a list. The powers of the transmission channels are output in dBm, the powers of the adjacent channels in dBm.

The sweep time is selected depending on the desired reproducibility of results. Reproducibility increases with sweep time since power measurement is then performed over a longer time period. As a general approach, it can be assumed that approx. 500 non-correlated measured values are required for a reproducibility of 0.5 dB (99 % of the measurements are within 0.5 dB of the true measured value). This holds true for white noise. The measured values are considered as non-correlated if their time interval corresponds to the reciprocal of the measured bandwidth.

With IS 136 the measurement bandwidth is approx. 25 kHz, i.e. measured values at an interval of 40 µs are considered as non-correlated. A measurement time of 40 ms is thus required per channel for 1000 measured values. This is the default sweep time which the analyzer sets in coupled mode. Approx. 5000 measured values are required for a reproducibility of 0.1 dB (99 %), i.e. the measurement time is to be increased to 200 ms.

SCPI command:
`[SENSe:]POWer:HSPeed` on page 267

Set CP Reference ← Ch Power ACLR
Defines the currently measured channel power as the reference value if channel power measurement is activated. The reference value is displayed in the "Tx1 (Ref) Power" field; the default value is 0 dBm.

The softkey is available only for multi carrier ACLR measurements.

In adjacent-channel power measurement with one or several carrier signals, the power is always referenced to a transmission channel, i.e. no value is displayed for "Tx1 (Ref) Power".

SCPI command:
`[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE` on page 264

Noise Correction ← Ch Power ACLR
If activated, the results are corrected by the instrument's inherent noise, which increases the dynamic range.

When the function is switched on, a reference measurement of the instrument's inherent noise is carried out. The noise power measured is then subtracted from the power in the channel that is being examined.

The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A disable message is displayed on the screen.

To enable the correction function in conjunction with the changed setting, press the softkey once more. A new reference measurement is carried out.

SCPI command:
`[SENSe:]POWer:NCORrection` on page 267

Adjust Ref Lvl ← Ch Power ACLR
Adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the analyzer or limiting the dynamic range by a too small S/N ratio.

For details on manual settings see "Settings of CP/ACLR test parameters" in the description of the base unit.

The reference level is not influenced by the selection of a standard. To achieve an optimum dynamic range, the reference level has to be set in a way that places the signal maximum close to the reference level without forcing an overload message. Since the measurement bandwidth for channel power measurements is significantly lower than the signal bandwidth, the signal path may be overloaded although the trace is still significantly below the reference level.

SCPI command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 264

Spectrum Emission Mask
Performs a comparison of the signal power in different carrier offset ranges with the maximum values specified in the 1xEV-DO specification.

SCPI command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 222
`CALCulate<n>:LIMit<k>:FAIL` on page 197

Sweep List ← Spectrum Emission Mask
Opens a submenu to edit the sweep list and displays the "Sweep List" dialog box

Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
After a preset, the sweep list contains a set of default ranges and parameters. For each range, you can change the parameters listed below. To insert or delete ranges, use the "Insert Before Range", "Insert After Range", "Delete Range" softkeys. The measurement results are not updated during editing but on closing the dialog box ("Edit Sweep List/ Close Sweep List" softkey, see "Edit Sweep List/Close Sweep List" on page 110).

The changes of the sweep list are only kept until you load another parameter set (by pressing PRESET or by loading an XML file). If you want a parameter set to be available permanently, create an XML file for this configuration (for details refer to chapter 4.4.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 156).

If you load one of the provided XML files ("Load Standard" softkey, see "Load Standard" on page 115), the sweep list contains ranges and parameters according to the selected standard. For further details refer also to chapter 4.4.4.10, "Provided XML Files for the Spectrum Emission Mask Measurement", on page 162.

Note: If you edit the sweep list, always follow the rules and consider the limitations described in chapter 4.4.4.11, "Ranges and Range Settings", on page 164.

Range Start / Range Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the start frequency/stop frequency of the selected range. Follow the rules described in chapter 4.4.4.11, "Ranges and Range Settings", on page 164.

In order to change the start/stop frequency of the first/last range, select the appropriate span with the SPAN key. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last ranges are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Frequency values for each range have to be defined relative to the center frequency. The reference range has to be centered on the center frequency. The minimum span of the reference range is given by the current TX Bandwidth.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt` on page 245
`[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP` on page 246

Fast SEM ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates Fast SEM mode for all ranges in the sweep list. For details see chapter 4.4.4.12, "Fast Spectrum Emission Mask Measurements", on page 165.

SCPI command:
`[SENSe:]ESPectrum:HighSPeed` on page 242

Filter Type ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the filter type for this range. For details on filters see also chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE` on page 245

RBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the RBW value for this range.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:BANDwidth` on page 244

VBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the VBW value for this range.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo` on page 244

Sweep Time Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates or deactivates the auto mode for the sweep time.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO` on page 250

Sweep Time ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the sweep time value for the range.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME` on page 250

Ref. Level ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the reference level for the range.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:RLEVel` on page 250

RF Att. Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates or deactivates the auto mode for RF attenuation.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO` on page 247

RF Attenuator ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the attenuation value for that range.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation` on page 246

Preamp ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Switches the preamplifier on or off.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe` on page 247

Transd. Factor ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

- The transducer overlaps or equals the span of the range.
- The x-axis is linear.
- The unit is dB.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:TRANsducer` on page 251

Limit Check 1-4 ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the type of limit check for all ranges. Possible states are:

Table 4-1: Spectrum Emission Mask measurements:

Absolute	Checks only the absolute limits defined.
Relative	Checks only the relative limits. Relative limits are defined as relative to the measured power in the reference range.
Abs and Rel	Combines the absolute and relative limit. The limit check fails when both limits are violated.
Abs or Rel	Combines the absolute and relative limit. The limit check fails when one of the limits is violated.

The limit state affects the availability of all limit settings ("Abs Limit Start" on page 109, "Abs Limit Stop" on page 109, "Rel Limit Start" on page 109, "Rel Limit Stop" on page 110).

Depending on the number of active power classes (see "Power Class" dialog box), the number of limits that can be set varies. Up to four limits are possible. The sweep list is extended accordingly.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe` on page 249
`CALCulate<n>:LIMit<k>:FAIL` on page 197

Abs Limit Start ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets an absolute limit value at the start frequency of the range [dBm].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 109).

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt` on page 248

Abs Limit Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets an absolute limit value at the stop frequency of the range [dBm].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 109).

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP` on page 248

Rel Limit Start ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets a relative limit value at the start frequency of the range [dBc].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 109).

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt` on page 248

Rel Limit Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets a relative limit value at the stop frequency of the range [dBc].

This parameter is only available if the limit check is set accordingly (see "Sweep List dialog box" on page 106).

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP` on page 249

Edit Sweep List/Close Sweep List ← Sweep List ← Spectrum Emission Mask
Opens/closes the "Sweep List" dialog box. Closing the dialog box updates the measurement results.

Insert before Range ← Sweep List ← Spectrum Emission Mask
Inserts a new range to the left of the currently focused range. The range numbers of the currently focused range and all higher ranges are increased accordingly. The maximum number of ranges is 20.

For further details refer to chapter 4.4.4.11, "Ranges and Range Settings", on page 164.

SCPI command:
`ESP:RANG3:INS BEF`, see `[SENSe:]ESPectrum:RANGe<range>:INSert` on page 247

Insert after Range ← Sweep List ← Spectrum Emission Mask
Inserts a new range to the right of the currently focused range. The range numbers of all higher ranges are increased accordingly. The maximum number of ranges is 20.

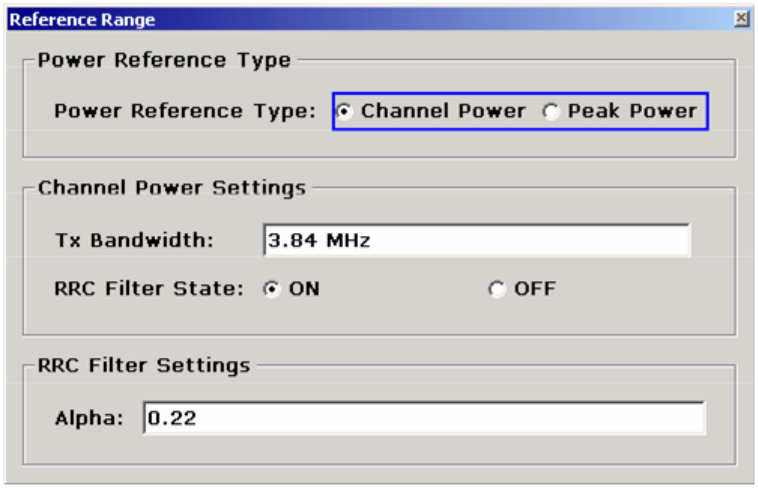
For further details refer to chapter 4.4.4.11, "Ranges and Range Settings", on page 164.

SCPI command:
`ESP:RANG1:INS AFT`, see `[SENSe:]ESPectrum:RANGe<range>:INSert` on page 247

Delete Range ← Sweep List ← Spectrum Emission Mask
Deletes the currently focused range, if possible. The range numbers are updated accordingly. For further details refer to chapter 4.4.4.11, "Ranges and Range Settings", on page 164.

SCPI command:
`[SENSe:]ESPectrum:RANGe<range>:DELete` on page 245

Edit Reference Range ← Sweep List ← Spectrum Emission Mask
Opens the "Reference Range" dialog box to edit the additional settings used for SEM measurements.



Two different power reference types are supported:

- "Peak Power"
  Measures the highest peak within the reference range.
- "Channel Power"
  Measures the channel power within the reference range (integral bandwidth method). If the "Channel Power" reference power type is activated, the dialog box is extended to define additional settings:
- "Tx Bandwidth"
  Defines the bandwidth used for measuring the channel power:
  minimum span ≤ value ≤ span of reference range
- "RRC Filter State"
  Activates or deactivates the use of an RRC filter.
- "RRC Filter Settings"
  Sets the alpha value of the RRC filter. This window is only available if the RRC filter is activated.

For further details refer to chapter 4.4.4.11, "Ranges and Range Settings", on page 164.

SCPI command:

`[SENSe:]ESPectrum:RTYPe` on page 251

`[SENSe:]ESPectrum:BWID` on page 241

`[SENSe:]ESPectrum:FILTer[:RRC][:STATe]` on page 242

`[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa` on page 242

List Evaluation ← Spectrum Emission Mask
Opens a submenu to edit the list evaluation settings.

List Evaluation (On/Off) ← List Evaluation ← Spectrum Emission Mask
Activates or deactivates the list evaluation.

SCPI command:

`CALCulate<n>:PSEarch|PEAKsearch:AUTO` on page 208

`TRACe<n>[:DATA]` on page 277

Margin ← List Evaluation ← Spectrum Emission Mask
Opens an edit dialog box to enter the margin used for the limit check/peak search.

SCPI command:
`CALCulate<n>:PSEarch|PEAKsearch:MARGin` on page 208

Show Peaks ← List Evaluation ← Spectrum Emission Mask
In the diagram, marks all peaks with blue squares that have been listed during an active list evaluation.

SCPI command:
`CALCulate<n>:PSEarch|PEAKsearch:PSHow` on page 209

Save Evaluation List ← List Evaluation ← Spectrum Emission Mask
Opens the "ASCII File Export Name" dialog box to save the result in ASCII format to a specified file and directory. For further details refer also to the "ASCII File Export" softkey ("ASCII File Export" on page 112).

SCPI command:
`MMEMory:STORe<n>:LIST` on page 296

ASCII File Export ← Save Evaluation List ← List Evaluation ← Spectrum Emission Mask
Opens the "ASCII File Export Name" dialog box and saves the active peak list in ASCII format to the specified file and directory.

The file consists of the header containing important scaling parameters and a data section containing the marker data. For details on an ASCII file see chapter 4.4.4.7, "ASCII File Export Format", on page 155.

This format can be processed by spreadsheet calculation programs, e.g. MS-Excel. It is necessary to define ';' as a separator for the data import. Different language versions of evaluation programs may require a different handling of the decimal point. It is therefore possible to select between separators '.' (decimal point) and ',' (comma) using the "Decim Sep" softkey (see "Decim Sep" on page 112).

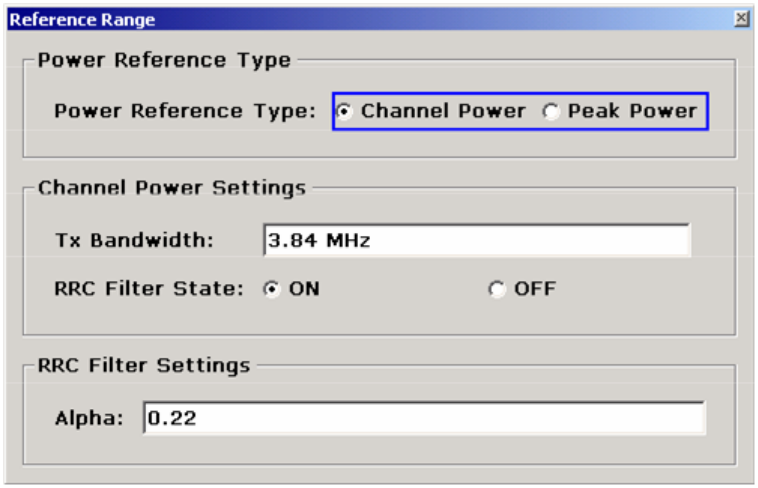
An example of an output file for Spectrum Emission Mask measurements is given in chapter 4.4.4.8, "ASCII File Export Format (Spectrum Emission Mask)", on page 156.

SCPI command:
`FORMat:DEXPort:DSEParator` on page 295
`MMEMory:STORe<n>:LIST` on page 296

Decim Sep ← Save Evaluation List ← List Evaluation ← Spectrum Emission Mask
Selects the decimal separator with floating-point numerals for the ASCII Trace export to support evaluation programs (e.g. MS-Excel) in different languages. The values '.' (decimal point) and ',' (comma) can be set.

SCPI command:
`FORMat:DEXPort:DSEParator` on page 295

Edit Reference Range ← Spectrum Emission Mask
Opens the "Reference Range" dialog box to edit the additional settings used for SEM measurements.



Two different power reference types are supported:

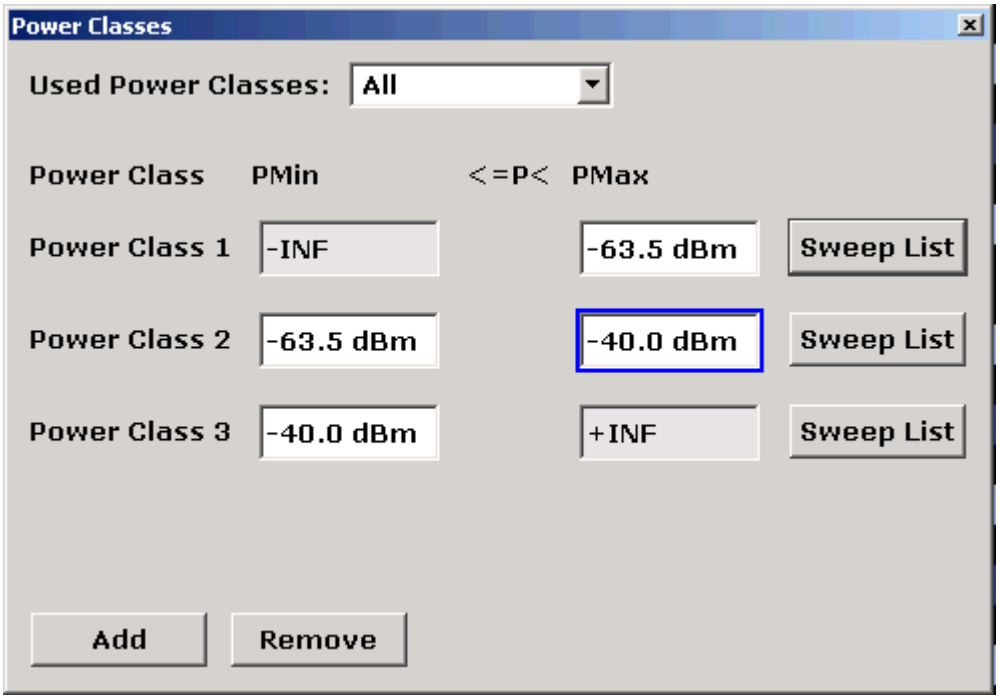
- "Peak Power"
  Measures the highest peak within the reference range.
- "Channel Power"
  Measures the channel power within the reference range (integral bandwidth method). If the "Channel Power" reference power type is activated, the dialog box is extended to define additional settings:
- "Tx Bandwidth"
  Defines the bandwidth used for measuring the channel power:
  minimum span ≤ value ≤ span of reference range
- "RRC Filter State"
  Activates or deactivates the use of an RRC filter.
- "RRC Filter Settings"
  Sets the alpha value of the RRC filter. This window is only available if the RRC filter is activated.

For further details refer to chapter 4.4.4.11, "Ranges and Range Settings", on page 164.

SCPI command:

`[SENSe:]ESPectrum:RTYPe` on page 251
`[SENSe:]ESPectrum:BWID` on page 241
`[SENSe:]ESPectrum:FILTer[:RRC][:STATe]` on page 242
`[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa` on page 242

Edit Power Classes ← Spectrum Emission Mask
Opens a dialog box to modify the power class settings.



Used Power Classes ← Edit Power Classes ← Spectrum Emission Mask
Choose the power classes to be used from this dropdown menu. It is only possible to select either one of the defined power classes or all of the defined power classes together.

Only power classes for which limits are defined are available for selection.

If "All" is selected, the power class that corresponds to the currently measured power in the reference range is used. The limits assigned to that power class are applied (see "PMin/PMax" on page 114).

SCPI command:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive]`
on page 198
To define all limits in one step:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe]`
on page 199

PMin/PMax ← Edit Power Classes ← Spectrum Emission Mask
Defines the level limits for each power class. The range always starts at -200 dBm (-INF) and always stops at 200 dBm (+INF). These fields cannot be modified. If more than one Power Class is defined, the value of "PMin" must be equal to the value of "PMax" of the last Power Class and vice versa.

Note that the power level may be equal to the lower limit, but must be lower than the upper limit:

$P_{min} \leqq P < P_{max}$

SCPI command:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum` on page 200
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum` on page 200

Sweep List ← Edit Power Classes ← Spectrum Emission Mask
See "Sweep List" on page 106

Add/Remove ← Edit Power Classes ← Spectrum Emission Mask
Activates or deactivates power classes to be defined. Up to four power classes can be defined. The number of active power classes affects the availability of the items of the Used Power Classes dropdown menu.

SCPI command:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive]` on page 198

Bandclass ← Spectrum Emission Mask
Opens a dialog box to select a specific bandclass.

For a list of predefined bandclasses refer to the "Bandclass" softkey in the ACP menu ("Bandclass" on page 97.

The settings for each bandclass are provided in *.xml files that are located in the directory `C:\R_S\INSTR\sem_std\evdo\dl`. The files themselves are named `DO_DL_BC01.XML` (bandclass 1) to `DO_DL_BC17.XML` (bandclass 17). By selecting one of the bandclasses from the dialog box, the correct file is loaded automatically. The file can also be loaded manually (see Load Standard softkey).

SCPI command:
`CONFigure:CDPower[:BTS]:BCLass` on page 214

Load Standard ← Spectrum Emission Mask
Opens a dialog box to select an XML file which includes the desired standard specification. For details on the provided XML files refer to chapter 4.4.4.10, "Provided XML Files for the Spectrum Emission Mask Measurement", on page 162.

SCPI command:
`[SENSe:]ESPectrum:PRESet[:STANdard]` on page 243

Save As Standard ← Spectrum Emission Mask
Opens the "Save As Standard" dialog box, in which the currently used SEM settings and parameters can be saved and exported into an *.xml file. Enter the name of the file in the "File name" field. For details on the structure and contents of the XML file refer to chapter 4.4.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 156.

SCPI command:
`[SENSe:]ESPectrum:PRESet:STORe` on page 243

Meas Start/Stop ← Spectrum Emission Mask
Aborts/restarts the current measurement and displays the status:

"Start" The measurement is currently running.

"Stop" The measurement has been stopped, or, in single sweep mode, the end of the sweep has been reached.

SCPI command:
`ABORt` on page 294
`INITiate<n>:ESPectrum` on page 296

Restore Standard Files ← Spectrum Emission Mask
Copies the XML files from the `C:\R_S\instr\sem_backup` folder to the `C:\R_S\instr\sem_std` folder. Files of the same name are overwritten.

SCPI command:
`[SENSe:]ESPectrum:PRESet:RESTore` on page 243

Occupied Bandwidth
Activates measurement of the bandwidth assigned to the signal.

SCPI command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 222
`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` on page 178

% Power Bandwidth (span > 0) ← Occupied Bandwidth
Opens an edit dialog box to enter the percentage of total power in the displayed frequency range which defines the occupied bandwidth. Values from 10% to 99.9% are allowed.

SCPI command:
`[SENSe:]POWer:BANDwidth|BWIDth` on page 267

Channel Bandwidth (span > 0) ← Occupied Bandwidth
Opens an edit dialog box to enter the channel bandwidth for the transmission channel. The specified channel bandwidth is used for optimization of the test parameters (for details see chapter 4.4.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 167). The default setting is 14 kHz.

For measurements in line with a specific transmission standard, the bandwidth specified by the standard for the transmission channel must be entered.

SCPI command:
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]` on page 259

Adjust Ref Lvl (span > 0) ← Occupied Bandwidth
Adjusts the reference level to the measured total power of the signal. the softkey is activated after the first sweep with active measurement of the occupied bandwidth has been completed and the total power of the signal is thus known.

Adjusting the reference level ensures that the signal path will not be overloaded and the dynamic range not limited by too low a reference level. Since the measurement bandwidth for channel power measurements is significantly lower than the signal bandwidth, the signal path may be overloaded although the trace is distinctly below the reference level. If the measured channel power is equal to the reference level, the signal path cannot be overloaded.

SCPI command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 264

Adjust Settings ← Occupied Bandwidth
Automatically optimizes all instrument settings for the selected channel configuration (channel bandwidth, channel spacing) within a specific frequency range (channel bandwidth). The adjustment is carried out only once. If necessary, the instrument settings can be changed later.

For details on the settings of span, resolution bandwidth, video bandwidth, detector and trace averaging see chapter 4.4.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 167.

SCPI command:
[SENSe:]POWer:ACHannel:PRESet on page 263

CCDF
Starts the measurement of the Complementary Cumulative Distribution Function and the Crest factor.

Also opens the CCDF submenu containing the following softkeys:

SCPI command:
CONFigure:CDPower[:BTS]:MEASurement on page 222

Res BW ← CCDF
Opens an edit dialog box to set the resolution bandwidth directly.

For correct measurement of the signal statistics the resolution bandwidth has to be wider than the signal bandwidth in order to measure the actual peaks of the signal amplitude correctly. In order not to influence the peak amplitudes the video bandwidth is automatically set to 10 MHz. The sample detector is used for detecting the video voltage.

SCPI command:
[SENSe:]BANDwidth|BWIDth[:RESolution] on page 252

# of Samples ← CCDF
Opens an edit dialog box to set the number of power measurements that are taken into account for the statistics.

Apart from the number of measurements the overall measurement time depends also on the set resolution bandwidth as the resolution bandwidth directly influences the sampling rate.

SCPI command:
CALCulate<n>:STATistics:NSAMples on page 210

Scaling ← CCDF
Opens a submenu to change the scaling parameters of x- and y-axis.

x-Axis Ref Level ← Scaling ← CCDF
Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dBµV, etc). The function of this softkey is identical to the "Ref Level" softkey in the "Amplitude" menu (see "Ref Level" on page 60).

For the APD function this value is mapped to the right diagram border. For the CCDF function there is no direct representation of this value on the diagram as the x-axis is scaled relatively to the measured mean power.

SCPI command:
CALCulate<n>:STATistics:SCALe:X:RLEVel on page 212

x-Axis Range ← Scaling ← CCDF
Opens the "Range" submenu to select a value for the level range to be covered by the statistics measurement selected.

SCPI command:
CALCulate<n>:STATistics:SCALe:X:RANGe on page 211

Range Log 100 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 100 dB.

SCPI command:
DISP:WIND:TRAC:Y:SPAC LOG
(To define logarithmic scaling, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 229.)
DISP:WIND:TRAC:Y 100DB (see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 226).

Range Log 50 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 50 dB.

SCPI command:
DISP:WIND:TRAC:Y:SPAC LOG
(To define logarithmic scaling, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 229.)
DISP:WIND:TRAC:Y 50DB
Sets the level display range to 50 dB (see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 226).

Range Log 10 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 10 dB.

SCPI command:
DISP:WIND:TRAC:Y:SPAC LOG
(To define logarithmic scaling, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 229.)
DISP:WIND:TRAC:Y 10DB (see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 226).

Range Log 5 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 5 dB.

SCPI command:
DISP:WIND:TRAC:Y:SPAC LOG
(To define logarithmic scaling, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 229.)
DISP:WIND:TRAC:Y 5DB (see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 226).

Range Log 1 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 1 dB.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISP:WIND:TRAC:Y 1DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226).

Range Log Manual ← x-Axis Range ← Scaling ← CCDF
Opens an edit dialog box to enter a value for logarithmic scaling for the level display range.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226

Range Linear % ← x-Axis Range ← Scaling ← CCDF
Selects linear scaling in % for the level display range, i.e. the horizontal grid lines are labeled in %. The grid is divided in decadal steps.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in % referenced to the voltage value at the position of marker 1. This is the default setting for linear scaling.

SCPI command:
`DISP:TRAC:Y:SPAC LIN`,see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229

Range Lin. Unit ← x-Axis Range ← Scaling ← CCDF
Selects linear scaling in dB for the level display range, i.e. the horizontal lines are labeled in dB.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in dB referenced to the power value at the position of marker 1.

SCPI command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229

y-Axis Max Value ← Scaling ← CCDF
Opens an edit dialog box to define the upper limit of the displayed probability range. Values on the y-axis are normalized which means that the maximum value is 1.0. The y-axis scaling is defined via the "Y-unit %/Abs" softkey (see "y-Unit %/Abs" on page 120). The distance between max and min value must be at least one decade.

SCPI command:
`CALCulate<n>:STATistics:SCALe:Y:UPPer` on page 213

y-Axis Min Value ← Scaling ← CCDF
Opens an edit dialog box to define the lower limit of the displayed probability range. Values in the range *1e-9 < value < 0.1* are allowed. The y-axis scaling is defined via the "y-Unit %/Abs" on page 120 softkey. The distance between max and min value must be at least one decade.

SCPI command:
`CALCulate<n>:STATistics:SCALe:Y:LOWer` on page 212

y-Unit %/Abs ← Scaling ← CCDF
Defines the scaling type of the y-axis. The default value is absolute scaling.

SCPI command:
`CALCulate<n>:STATistics:SCALe:Y:UNIT` on page 212

Default Settings ← Scaling ← CCDF
Resets the x- and y-axis scalings to their preset values.

x-axis ref level:	-10 dBm
x-axis range APD:	100 dB
x-axis range CCDF:	20 dB
y-axis upper limit:	1.0
y-axis lower limit:	1E-6

SCPI command:
`CALCulate<n>:STATistics:PRESet` on page 210

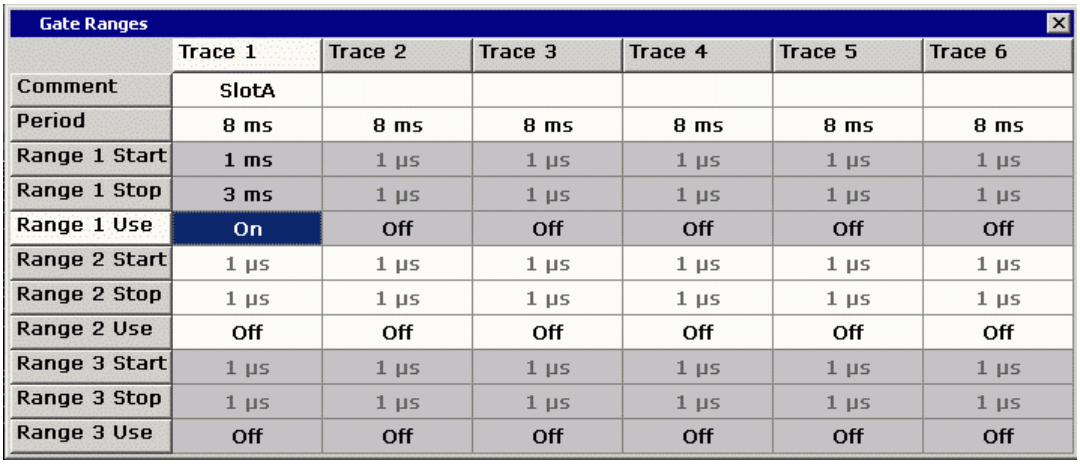
Adjust Settings ← Scaling ← CCDF
Adjusts the level settings according to the measured difference between peak and minimum power for APD measurement or peak and mean power for CCDF measurement in order to obtain maximum power resolution. Adjusts the reference level to the current input signal. For details see also the "Adjust Ref Lvl" softkey ("Adjust Ref Lvl" on page 97).

SCPI command:
`CALCulate<n>:STATistics:SCALe:AUTO ONCE` on page 211

Gated Trigger (On/Off) ← CCDF
Activates and deactivates the gating for statistics functions for the ACP and the CCDF channel. The trigger source is changed to "EXTERN" if this function is switched on. The gate ranges are defined using the "Gate Ranges" softkey (see "Gate Ranges" on page 120).

SCPI command:
`[SENSe:]SWEep:EGATe` on page 269
`[SENSe:]SWEep:EGATe:SOURce` on page 270

Gate Ranges ← CCDF
Opens a dialog to configure up to 3 gate ranges for each trace.



Gate Ranges

	Trace 1	Trace 2	Trace 3	Trace 4	Trace 5	Trace 6
Comment	SlotA					
Period	8 ms	8 ms	8 ms	8 ms	8 ms	8 ms
Range 1 Start	1 ms	1 µs	1 µs	1 µs	1 µs	1 µs
Range 1 Stop	3 ms	1 µs	1 µs	1 µs	1 µs	1 µs
Range 1 Use	On	Off	Off	Off	Off	Off
Range 2 Start	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 2 Stop	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 2 Use	Off	Off	Off	Off	Off	Off
Range 3 Start	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 3 Stop	1 µs	1 µs	1 µs	1 µs	1 µs	1 µs
Range 3 Use	Off	Off	Off	Off	Off	Off

SCPI command:

`SWE:EGAT ON` (see `[SENSe:]SWEep:EGATe` on page 269)

Switches on the external gate mode.

`SWE:EGAT:TRAC1:COMM "SlotA"` (see `[SENSe:]SWEep:EGATe:TRACe<k>:COMMent` on page 270)

Adds a comment to trace 1.

`SWE:EGAT:TRAC1:STAT1 ON` (see `[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>]` on page 271)

Activates tracing for range 1 of trace 1.

`SWE:EGAT:TRAC1:STAR1 3ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range>` on page 271)

Sets the starting point for range 1 on trace 1 at 3 ms.

`SWE:EGAT:TRAC1:STop1 5ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>:STOP<range>` on page 272)

Sets the stopping point for range 1 on trace 1 at 5 ms.

`SWE:EGAT:TRAC1:PER 5ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>: PERiod` on page 270)

Defines the period for gated triggering to 5 ms.

Adjust Settings ← CCDF

Adjusts the level settings according to the measured difference between peak and minimum power for APD measurement or peak and mean power for CCDF measurement in order to obtain maximum power resolution. Adjusts the reference level to the current input signal. For details see also the "Adjust Ref Lvl" softkey ("Adjust Ref Lvl" on page 97).

SCPI command:

`CALCulate<n>:STATistics:SCALe:AUTO ONCE` on page 211

4.4.3.2 Softkeys of the Frequency Menu

The following chapter describes all softkeys available in the "Frequency" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

Center....122
CF Stepsize....122
└ 0.1*Span (span > 0)....122
└ 0.1*RBW (zero span)....123
└ 0.5*Span (span > 0)....123
└ 0.5*RBW (zero span)....123
└ x*Span (span > 0)....123
└ x*RBW (zero span)....123
└ =Center....124
└ =Marker....124
└ Manual....124
Start....124
Stop....124
Frequency Offset....124

Center
Opens an edit dialog box to enter the center frequency. The allowed range of values for the center frequency depends on the frequency span.

span > 0: $span_{min}/2 \leq f_{center} \leq f_{max} - span_{min}/2$

span = 0: $0\ Hz \leq f_{center} \leq f_{max}$

f_{max} and $span_{min}$ are specified in the data sheet.

SCPI command:
`[SENSe:]FREQuency:CENTer` on page 256

CF Stepsize
Opens a submenu to set the step size of the center frequency. Apart from the =Center, =Marker and Manual softkeys, the other softkeys are displayed depending on the selected frequency span.

The step size can be coupled to the span (span > 0) or the resolution bandwidth (span = 0) or it can be manually set to a fixed value.

This softkey is available for RF measurements.

0.1*Span (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 10 % of the span.

SCPI command:
`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256
`FREQ:CENT:STEP:LINK:FACT 10PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 257

0.1*RBW (zero span) ← CF Stepsize
Sets the step size for the center frequency to 10 % of the resolution bandwidth. This is the default setting.

SCPI command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256
`FREQ:CENT:STEP:LINK:FACT 10PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 257

0.5*Span (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 50 % of the span.

SCPI command:
`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256
`FREQ:CENT:STEP:LINK:FACT 50PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 257

0.5*RBW (zero span) ← CF Stepsize
Sets the step size for the center frequency to 50 % of the resolution bandwidth.

SCPI command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256
`FREQ:CENT:STEP:LINK:FACT 50PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 257

x*Span (span > 0) ← CF Stepsize
Opens an edit dialog box to set the step size for the center frequency as % of the span.

SCPI command:
`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256
`FREQ:CENT:STEP:LINK:FACT 20PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256

x*RBW (zero span) ← CF Stepsize
Opens an edit dialog box to set the step size for the center frequency as % of the resolution bandwidth. Values between 1 and 100 % in steps of 1 % are allowed. The default setting is 10 %.

SCPI command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256
`FREQ:CENT:STEP:LINK:FACT 20PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 256

=Center ← CF Stepsize
Sets the step size to the value of the center frequency and removes the coupling of the step size to span or resolution bandwidth. This function is especially useful during measurements of the signal harmonic content because by entering the center frequency each stroke of the arrow key selects the center frequency of another harmonic.

=Marker ← CF Stepsize
Sets the step size to the value of the current marker and removes the coupling of the step size to span or resolution bandwidth. This function is especially useful during measurements of the signal harmonic content at the marker position because by entering the center frequency each stroke of the arrow key selects the center frequency of another harmonic.

Manual ← CF Stepsize
Opens an edit dialog box to enter a fixed step size for the center frequency.

SCPI command:
`[SENSe:]FREQuency:CENTer:STEP[:VALue]` on page 256

Start
Opens an edit dialog box to define the start frequency. The following range of values is allowed:

$f_{min} \leq f_{start} \leq f_{max} - span_{min}$

f_{min}, f_{max} and $span_{min}$ are specified in the data sheet.

SCPI command:
`[SENSe:]FREQuency:STARt` on page 258

Stop
Opens an edit dialog box to define the stop frequency. The following range of values for the stop frequency is allowed:

$f_{min} + span_{min} \leq f_{stop} \leq f_{max}$

f_{min} , f_{max} and $span_{min}$ are specified in the data sheet.

SCPI command:
`[SENSe:]FREQuency:STOP` on page 258

Frequency Offset
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset. The softkey indicates the current setting. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

SCPI command:
`[SENSe:]FREQuency:OFFSet` on page 257

4.4.3.3 Softkeys of the Span Menu for RF Measurements

The following chapter describes all softkeys available in the "Span" menu for RF measurements, except for "Power" measurements.

Span Manual.....125

Sweeptime Manual....125
Full Span....125
Last Span....125

Span Manual
Opens an edit dialog box to enter the frequency span. The center frequency is kept constant. The following range is allowed:

span = 0: 0 Hz

span >0: $span_{min} \leq f_{span} \leq f_{max}$

f_{max} and $span_{min}$ are specified in the data sheet.

SCPI command:
`[SENSe:]FREQuency:SPAN` on page 257

Sweeptime Manual
Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

Numeric input is always rounded to the nearest possible sweep time. For rotary knob or UPARROW/DNARROW key inputs, the sweep time is adjusted in steps either downwards or upwards.

The manual input mode of the sweep time is indicated by a green bullet next to the "SWT" display in the channel bar. If the selected sweep time is too short for the selected bandwidth and span, level measurement errors will occur due to a too short settling time for the resolution or video filters. In this case, the analyzer displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF measurements.

SCPI command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 273
`[SENSe:]SWEep:TIME` on page 273

Full Span
Sets the span to the full frequency range of the analyzer specified in the data sheet. This setting is useful for overview measurements.

SCPI command:
`[SENSe:]FREQuency:SPAN:FULL` on page 258

Last Span
Sets the span to the previous value. With this function e.g. a fast change between overview measurement and detailed measurement is possible.

4.4.3.4 Softkeys of the Amplitude Menu

The following table shows all softkeys available in the "Amplitude" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

Ref Level....126
Range....126
└ Range Log 100 dB....127
└ Range Log 50 dB....127
└ Range Log 10 dB....127
└ Range Log 5 dB....127
└ Range Log 1 dB....127
└ Range Log Manual....128
└ Range Linear %....128
└ Range Lin. Unit....128
Unit....128
Preamp On/Off (option RF Preamplifier, B22/B24)....129
RF Atten Manual/Mech Att Manual....129
RF Atten Auto/Mech Att Auto....129
EI Atten On/Off....129
EI Atten Mode (Auto/Man)....130
Ref Level Offset....130
Ref Level Position....130
Grid Abs/Rel....130
Input (AC/DC)....131
Input 50 Ω/75 Ω....131

Ref Level
Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dBµV, etc).

The reference level value is the maximum value the AD converter can handle without distortion of the measured value. Signal levels above this value will not be measured correctly, which is indicated by the "IFOVL" status display.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 228

Range
Opens a submenu to define the level display range.

This softkey and its submenu are available for RF measurements.

Range Log 100 dB ← Range
Sets the level display range to 100 dB.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISP:WIND:TRAC:Y 100DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226).

Range Log 50 dB ← Range
Sets the level display range to 50 dB.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISP:WIND:TRAC:Y 50DB`
Sets the level display range to 50 dB (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226).

Range Log 10 dB ← Range
Sets the level display range to 10 dB.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISP:WIND:TRAC:Y 10DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226).

Range Log 5 dB ← Range
Sets the level display range to 5 dB.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISP:WIND:TRAC:Y 5DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226).

Range Log 1 dB ← Range
Sets the level display range to 1 dB.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISP:WIND:TRAC:Y 1DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226).

Range Log Manual ← Range
Opens an edit dialog box to enter a value for logarithmic scaling for the level display range.

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229.)
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 226

Range Linear % ← Range
Selects linear scaling in % for the level display range, i.e. the horizontal grid lines are labeled in %. The grid is divided in decadal steps.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in % referenced to the voltage value at the position of marker 1. This is the default setting for linear scaling.

SCPI command:
`DISP:TRAC:Y:SPAC LIN`,see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229

Range Lin. Unit ← Range
Selects linear scaling in dB for the level display range, i.e. the horizontal lines are labeled in dB.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in dB referenced to the power value at the position of marker 1.

SCPI command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229

Unit
Opens the "Unit" submenu to select the unit for the level axis. The default setting is dBm. If a transducer is switched on, the softkey is not available.

In general, the signal analyzer measures the signal voltage at the RF input. The level display is calibrated in RMS values of an unmodulated sine wave signal. In the default state, the level is displayed at a power of 1 mW (= dBm). Via the known input impedance (50 Ω or 75 Ω), conversion to other units is possible. The following units are available and directly convertible:

- dBm
- dBmV
- dBµV
- dBµA
- dBpW
- Volt
- Ampere
- Watt

SCPI command:
`CALCulate<n>:UNIT:POWer` on page 213

Preamp On/Off (option RF Preamplifier, B22/B24)
Switches the preamplifier on or off.

If option R&S FSV-B22 is installed,the preamplifier is only active below 7 GHz.

If option R&S FSV-B24 is installed, the preamplifier is active for all frequencies.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:GAIN:STATe` on page 290

RF Atten Manual/Mech Att Manual
Opens an edit dialog box to enter the attenuation, irrespective of the reference level. If electronic attenuation is activated (option R&S FSV-B25 only; "El Atten Mode Auto" softkey), this setting defines the mechanical attenuation.

The mechanical attenuation can be set in 10 dB steps.

The RF attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). The range is specified in the data sheet. If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

Note: Values under 10 dB can only be entered via the numeric keypad or via remote control command in order to protect the input mixer against overload.

The RF attenuation defines the level at the input mixer according to the formula:

"$level_{mixer}$ = $level_{input}$ – RF attenuation"

The maximum mixer level allowed is -10 dBm. mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display.

SCPI command:
`INPut:ATTenuation` on page 285

RF Atten Auto/Mech Att Auto
Sets the RF attenuation automatically as a function of the selected reference level. This ensures that the optimum RF attenuation is always used. It is the default setting.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:ATTenuation:AUTO` on page 285

El Atten On/Off
This softkey switches the electronic attenuator on or off. This softkey is only available with option R&S FSV-B25.

When the electronic attenuator is activated, the mechanical and electronic attenuation can be defined separately. Note however, that both parts must be defined in the same mode, i.e. either both manually, or both automatically.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

- To define the mechanical attenuation, use the RF Atten Manual/Mech Att Manual or RF Atten Auto/Mech Att Auto softkeys.
- To define the electronic attenuation, use the El Atten Mode (Auto/Man) softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, this function is available again.
When the electronic attenuator is switched off, the corresponding RF attenuation mode (auto/manual) is automatically activated.

SCPI command:
`INPut:EATT:AUTO` on page 290

El Atten Mode (Auto/Man)
This softkey defines whether the electronic attenuator value is to be set automatically or manually. If manual mode is selected, an edit dialog box is opened to enter the value.
This softkey is only available with option R&S FSV-B25, and only if the electronic attenuator has been activated via the El Atten On/Off softkey.

Note: This function is not available for stop frequencies (or center frequencies in zero span) >7 GHz. In this case, the electronic and mechanical attenuation are summarized and the electronic attenuation can no longer be defined individually. As soon as the stop or center frequency is reduced below 7 GHz, electronic attenuation is available again. If the electronic attenuation was defined manually, it must be re-defined.

The attenuation can be varied in 1 dB steps from 0 to 30 dB. Other entries are rounded to the next lower integer value.

To re-open the edit dialog box for manual value definition, select the "Man" mode again.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

SCPI command:
`INPut:EATT:AUTO` on page 290
`INPut:EATT` on page 289

Ref Level Offset
Opens an edit dialog box to enter the arithmetic level offset. This offset is added to the measured level irrespective of the selected unit. The scaling of the y-axis is changed accordingly. The setting range is ±200 dB in 0.1 dB steps.

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 228

Ref Level Position
Opens an edit dialog box to enter the reference level position, i.e. the position of the maximum AD converter value on the level axis. The setting range is from -200 to +200 %, 0 % corresponding to the lower and 100 % to the upper limit of the diagram.

Only available for RF measurements.

Grid Abs/Rel
Switches between absolute and relative scaling of the level axis (not available with "Linear" range).

Only available for RF measurements.

"Abs" Absolute scaling: The labeling of the level lines refers to the absolute value of the reference level. Absolute scaling is the default setting.

"Rel" Relative scaling: The upper line of the grid is always at 0 dB. The scaling is in dB whereas the reference level is always in the set unit (for details on unit settings see the "Unit" softkey).

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 227

Input (AC/DC)

Toggles the RF input of the analyzer between AC and DC coupling.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:

`INPut:COUPling` on page 286

Input 50 Ω/75 Ω

Uses 50 Ω or 75 Ω as reference impedance for the measured levels. Default setting is 50 Ω.

The setting 75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75 Ω/50 Ω).

All levels specified in this Operating Manual refer to the default setting of the instrument (50 Ω).

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:

`INPut:IMPedance` on page 291

4.4.3.5 Softkeys of the Bandwidth Menu

The following table shows all softkeys available in the "Bandwidth" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

For Spurious Emission Measurements, the settings are defined in the "Sweep List" dialog, see the description in the base unit.

Res BW Manual....132
Res BW Auto....132
Video BW Manual....132
Video BW Auto....133
Sweeptime Manual....133
Sweeptime Auto....134
Sweep Type....134
└ Sweep....134
└ FFT....134

└ Auto....135
└ FFT Filter Mode....135
└ Auto....135
└ Narrow....135
Coupling Ratio....135
└ RBW/VBW Sine [1/1]....135
└ RBW/VBW Pulse [.1]....136
└ RBW/VBW Noise [10]....136
└ RBW/VBW Manual....136
└ Span/RBW Auto [100]....136
└ Span/RBW Manual....136
└ Default Coupling....137
Filter Type....137

Res BW Manual
Opens an edit dialog box to enter a value for the resolution bandwidth. The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153.

Numeric input is always rounded to the nearest possible bandwidth. For rotary knob or UP/DNARROW key inputs, the bandwidth is adjusted in steps either upwards or downwards.

The manual input mode of the resolution bandwidth is indicated by a green bullet next to the "RBW" display in the channel bar.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF. It is also available for Power vs Time measurements.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 252
`[SENSe:]BANDwidth|BWIDth[:RESolution]` on page 252

Res BW Auto
Couples the resolution bandwidth to the selected span (for span > 0). If the span is changed, the resolution bandwidth is automatically adjusted.

This setting is recommended, if a favorable setting of the resolution bandwidth in relation to the selected span is desired.

This softkey is available for measuring the Adjacent Channel Power, the Occupied Bandwidth and the CCDF.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 252

Video BW Manual
Opens an edit dialog box to enter the video bandwidth. The available video bandwidths are specified in the data sheet.

Numeric input is always rounded to the nearest possible bandwidth. For rotary knob or UP/DOWN key inputs, the bandwidth is adjusted in steps either upwards or downwards.

The manual input mode of the video bandwidth is indicated by a green bullet next to the "VBW" display in the channel bar.

Note: RMS detector and VBW.
If an RMS detector is used, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves. For details on detectors see chapter 4.4.4.3, "Detector Overview", on page 150.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth.

SCPI command:
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 254
`[SENSe:]BANDwidth|BWIDth:VIDeo` on page 254

Video BW Auto
Couples the video bandwidth to the resolution bandwidth. If the resolution bandwidth is changed, the video bandwidth is automatically adjusted.

This setting is recommended, if a minimum sweep time is required for a selected resolution bandwidth. Narrow video bandwidths require longer sweep times due to the longer settling time. Wide bandwidths reduce the signal/noise ratio.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth.

SCPI command:
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 254

Sweeptime Manual
Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

Numeric input is always rounded to the nearest possible sweep time. For rotary knob or UPARROW/DNARROW key inputs, the sweep time is adjusted in steps either downwards or upwards.

The manual input mode of the sweep time is indicated by a green bullet next to the "SWT" display in the channel bar. If the selected sweep time is too short for the selected bandwidth and span, level measurement errors will occur due to a too short settling time for the resolution or video filters. In this case, the analyzer displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF measurements.

SCPI command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 273
`[SENSe:]SWEep:TIME` on page 273

Sweeptime Auto
Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If the span, resolution bandwidth or video bandwidth is changed, the sweep time is automatically adjusted.

The analyzer always selects the shortest sweep time that is possible without falsifying the signal. The maximum level error is < 0.1 dB, compared to using a longer sweep time.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth.

SCPI command:
`[SENSe:]SWEep:TIME:AUTO` on page 273

Sweep Type
Opens a submenu to define the sweep type.

This softkey is available for measuring the Signal Power, the Adjacent Channel Power and the Occupied Bandwidth.

This function is not available in IQ Analyzer mode or for I/Q Digital Baseband input (option R&S FSV-B17).

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 134
- "FFT" on page 134 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153)
- "Auto" on page 135

Sweep ← Sweep Type
Sets the Sweep Type to standard analog frequency sweep.

In the standard sweep mode, the local oscillator is set to provide the spectrum quasi analog from the start to the stop frequency.

SCPI command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 273

FFT ← Sweep Type
Sets the Sweep Type to FFT mode.

The FFT sweep mode samples on a defined frequency value and transforms it to the spectrum by fast Fourier transformation (FFT).

FFT is not available when using 5-Pole filters, Channel filters or RRC filters.

Note: Not all measurement configurations allow for FFT mode. For instance, the Quasi peak detector does not support FFT. In this case, sweep mode is used. The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active. FFT mode is also available for:

- sweep time

- video bandwidth
- all detectors except Quasi peak
- gated trigger measurements
- signal count

SCPI command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 273

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

SCPI command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 273

FFT Filter Mode ← Sweep Type
Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

Auto ← FFT Filter Mode ← Sweep Type
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 253

Narrow ← FFT Filter Mode ← Sweep Type
For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 253

Coupling Ratio
Opens a submenu to select the coupling ratios for functions coupled to the bandwidth.

This softkey and its submenu is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF.

RBW/VBW Sine [1/1] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth"

This is the default setting for the coupling ratio resolution bandwidth/video bandwidth.

This is the coupling ratio recommended if sinusoidal signals are to be measured.

This setting is only effective for Video BW Auto.

SCPI command:
`BAND:VID:RAT 1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 255

RBW/VBW Pulse [.1] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = 10 × resolution bandwidth or"

"video bandwidth = 10 MHz (= max. VBW)."

This coupling ratio is recommended whenever the amplitudes of pulsed signals are to be measured correctly. The IF filter is exclusively responsible for pulse shaping. No additional evaluation is performed by the video filter.

This setting is only effective for Video BW Auto.

SCPI command:
`BAND:VID:RAT 10`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 255

RBW/VBW Noise [10] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth/10"

At this coupling ratio, noise and pulsed signals are suppressed in the video domain. For noise signals, the average value is displayed.

This setting is only effective for the Video BW Auto selection in the main menu.

SCPI command:
`BAND:VID:RAT 0.1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 255

RBW/VBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

The resolution bandwidth/video bandwidth ratio can be set in the range 0.001 to 1000.

This setting is only effective for the Video BW Auto selection in the main menu.

SCPI command:
`BAND:VID:RAT 10`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 255

Span/RBW Auto [100] ← Coupling Ratio
Sets the following coupling ratio:

"resolution bandwidth = span/100"

This coupling ratio is the default setting of the analyzer.

This setting is only effective for the Res BW Auto selection in the main menu.

SCPI command:
`BAND:VID:RAT 0.001`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 255

Span/RBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

This setting is only effective for the Res BW Auto selection in the main menu.

The span/resolution bandwidth ratio can be set in the range 1 to 10000.

SCPI command:
`BAND:VID:RAT 0.1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 255

Default Coupling ← Coupling Ratio
Sets all coupled functions to the default state ("AUTO"). In addition, the ratio "RBW/VBW" is set to "SINE [1/1]" and the ratio "SPAN/RBW" to *100.*

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 252
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 254
`[SENSe:]SWEep:TIME:AUTO` on page 273

Filter Type
Opens a submenu to select the filter type.

This softkey and its submenu are available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF. Instead of opening a submenu, this softkey opens the "Sweep List" dialog box to select the filter type when measuring the Spectrum Emission Mask.

The submenu contains the following softkeys:

- Normal (3dB)
- EMI (6dB)
- Channel
- RRC
- 5-Pole (not available for sweep type "FFT")

For detailed information on filters see chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153 and chapter 4.4.4.6, "List of Available RRC and Channel Filters", on page 154.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE` on page 253

4.4.3.6 Softkeys of the Sweep Menu

The following table shows all softkeys available in the "Sweep" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

Continuous Sweep....138
Single Sweep....138
Continue Single Sweep....138
Sweeptime Manual....138
Sweeptime Auto....139
Sweep Type....139
└ Sweep....139
└ FFT....139
└ Auto....140

└ FFT Filter Mode....140
└ Auto....140
└ Narrow....140
Sweep Count....140
Sweep Points....141

Continuous Sweep
Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting. The trace averaging is determined by the sweep count value (see the "Sweep Count" softkey, "Sweep Count" on page 81).

SCPI command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 296

Single Sweep
Sets the single sweep mode: after triggering, starts the number of sweeps that are defined by using the Sweep Count softkey. The measurement stops after the defined number of sweeps has been performed.

SCPI command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 296

Continue Single Sweep
Repeats the number of sweeps set by using the Sweep Count softkey, without deleting the trace of the last measurement.

This is particularly of interest when using the trace configurations "Average" or "Max Hold" to take previously recorded measurements into account for averaging/maximum search.

SCPI command:
`INITiate<n>:CONMeas` on page 295

Sweeptime Manual
Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

Numeric input is always rounded to the nearest possible sweep time. For rotary knob or UPARROW/DNARROW key inputs, the sweep time is adjusted in steps either downwards or upwards.

The manual input mode of the sweep time is indicated by a green bullet next to the "SWT" display in the channel bar. If the selected sweep time is too short for the selected bandwidth and span, level measurement errors will occur due to a too short settling time for the resolution or video filters. In this case, the analyzer displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF measurements.

SCPI command:

`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 273

`[SENSe:]SWEep:TIME` on page 273

Sweeptime Auto

Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If the span, resolution bandwidth or video bandwidth is changed, the sweep time is automatically adjusted.

The analyzer always selects the shortest sweep time that is possible without falsifying the signal. The maximum level error is < 0.1 dB, compared to using a longer sweep time.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth.

SCPI command:

`[SENSe:]SWEep:TIME:AUTO` on page 273

Sweep Type

Opens a submenu to define the sweep type.

This softkey is available for measuring the Signal Power, the Adjacent Channel Power and the Occupied Bandwidth.

This function is not available in IQ Analyzer mode or for I/Q Digital Baseband input (option R&S FSV-B17).

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 134
- "FFT" on page 134 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153)
- "Auto" on page 135

Sweep ← Sweep Type

Sets the Sweep Type to standard analog frequency sweep.

In the standard sweep mode, the local oscillator is set to provide the spectrum quasi analog from the start to the stop frequency.

SCPI command:

`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 273

FFT ← Sweep Type

Sets the Sweep Type to FFT mode.

The FFT sweep mode samples on a defined frequency value and transforms it to the spectrum by fast Fourier transformation (FFT).

FFT is not available when using 5-Pole filters, Channel filters or RRC filters.

Note: Not all measurement configurations allow for FFT mode. For instance, the Quasi peak detector does not support FFT. In this case, sweep mode is used. The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active.
FFT mode is also available for:

- sweep time
- video bandwidth
- all detectors except Quasi peak
- gated trigger measurements
- signal count

SCPI command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 273

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

SCPI command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 273

FFT Filter Mode ← Sweep Type
Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

Auto ← FFT Filter Mode ← Sweep Type
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 253

Narrow ← FFT Filter Mode ← Sweep Type
For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 253

Sweep Count
Opens an edit dialog box to enter the number of sweeps to be performed in the single sweep mode. Values from 0 to 32767 are allowed. If the values 0 or 1 are set, one sweep is performed. The sweep count is applied to all the traces in a diagram.

If the trace configurations "Average", "Max Hold" or "Min Hold" are set, the sweep count value also determines the number of averaging or maximum search procedures.

In continuous sweep mode, if sweep count = 0 (default), averaging is performed over 10 sweeps. For sweep count =1, no averaging, maxhold or minhold operations are performed.

SCPI command:
`[SENSe:]SWEep:COUNt` on page 268

Sweep Points
Opens an edit dialog box to enter the number of measured values to be collected during one sweep.

- Entry via rotary knob:
  – In the range from 101 to 1001, the sweep points are increased or decreased in steps of 100 points.
  – In the range from 1001 to 32001, the sweep points are increased or decreased in steps of 1000 points.
- Entry via keypad:
  All values in the defined range can be set.

The default value is 691 sweep points.

This softkey is available for RF measurements.

SCPI command:
`[SENSe:]SWEep:POINts` on page 272

4.4.3.7 Softkeys of the Marker Menu for RF Measurements

The following chapter describes all softkeys available in the ""Marker"" menu in ""CDMA2000 BTS Analysis"" Mode for RF measurements. For CDA measurements, see chapter 4.4.2.7, "Softkeys of the Marker Menu for CDA Measurements", on page 85.

Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta....141
More Markers....142
Marker Norm/Delta....142
Marker to Trace....142
All Marker Off....142
Marker Table....142
Marker Stepsize....143
  └ Stepsize Standard....143
  └ Stepsize Sweep Points....143
Marker Zoom....143
Link Mkr1 and Delta1....144

Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta
The "Marker X" softkey activates the corresponding marker and opens an edit dialog box to enter a value for the marker to be set to. Pressing the softkey again deactivates the selected marker.

If a marker value is changed using the rotary knob, the step size is defined via the Stepsize Standard or Stepsize Sweep Points softkeys.

Marker 1 is always the reference marker for relative measurements. If activated, markers 2 to 16 are delta markers that refer to marker 1. These markers can be converted into markers with absolute value display using the "Marker Norm/Delta" softkey. If marker 1 is the active marker, pressing the "Marker Norm/Delta" softkey switches on an additional delta marker.

SCPI command:

CALCulate<n>:MARKer<m>[:STATe] on page 205
CALCulate<n>:MARKer<m>:X on page 206
CALCulate<n>:MARKer<m>:Y on page 207
CALCulate<n>:DELTamarker<m>[:STATe] on page 188
CALCulate<n>:DELTamarker<m>:X on page 189
CALCulate<n>:DELTamarker<m>:X:RELative on page 189
CALCulate<n>:DELTamarker<m>:Y on page 190

More Markers
Opens a sub-menu to select one of up to 16 available markers. See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 141.

Marker Norm/Delta
Changes the active marker to a normal (norm) or delta marker (with respect to marker 1).

SCPI command:

CALCulate<n>:MARKer<m>[:STATe] on page 205
CALCulate<n>:DELTamarker<m>[:STATe] on page 188

Marker to Trace
Opens an edit dialog box to enter the number of the trace on which the marker is to be placed.

SCPI command:

CALCulate<n>:MARKer<m>:TRACe on page 205

All Marker Off
Switches all markers off. It also switches off all functions and displays that are associated with the markers/delta markers.

SCPI command:

CALCulate<n>:MARKer<m>:AOFF on page 202

Marker Table
Defines how the marker information is displayed.

This softkey is available for RF measurements.

For more information, see "Displayed Marker Information" in the description of the base unit.

"On" Displays the marker information in a table in a separate area beneath the diagram.

"Off" Displays the marker information within the diagram area.

"Aut" (Default) The marker table is displayed automatically if more than 2 markers are active, and removed if only 1 or 2 markers are active. This helps keep the information in the display clear.

SCPI command:
`DISPlay[:WINDow<n>]:MTABle` on page 224

Marker Stepsize
Opens a submenu to set the step size of all markers and delta markers.

Default value for the marker step size is Stepsize Sweep Points.

This softkey is available for RF measurements.

Stepsize Standard ← Marker Stepsize
Moves the marker or delta marker from one measurement point to the next, if the marker or delta marker value is changed via the rotary knob ("Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" softkeys, see "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 141). If more measured values than measurement points exist, it is not possible to read out all measured values. In this case, use the Stepsize Sweep Points softkey.

SCPI command:
`CALC:MARK:X:SSIZ STAN` (see `CALCulate<n>:MARKer<m>:X:SSIZe` on page 206)

Stepsize Sweep Points ← Marker Stepsize
Moves the marker or delta marker from one measured value to the next, if the marker or delta marker value is changed via the rotary knob ("Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" softkeys, see "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 141). If more measured values than measurement points exist, every single measured value is accessible and its value is displayed in the marker field.

The number of measured values is defined in the ""Sweep"" menu via the Sweep Points softkey.

This functionality is available for all base unit measurements with the exception of statistics ("APD" and "CCDF" softkeys in the "Measurement" menu).

SCPI command:
`CALC:MARK:X:SSIZ POIN` (see `CALCulate<n>:MARKer<m>:X:SSIZe` on page 206)

Marker Zoom
Activates or deactivates the zoom for the current active marker. With the zoom function, more details of the measurement signal can be seen. This softkey can only be selected if at least one of the markers is activated.

This softkey is available for RF measurements, except for CCDF measurements.

SCPI command:
`CALCulate<n>:MARKer<m>:FUNCtion:ZOOM` on page 181

Link Mkr1 and Delta1
The delta marker 1 is linked to marker 1, so if the x-axis value of the marker 1 is changed, the delta marker 1 will follow on the same x-position. The link is off by default.

You can set the two markers on different traces to measure the difference (e.g. between a max hold trace and a min hold trace or between a measurement and a reference trace).

This softkey is available for RF measurements.

SCPI command:
`CALCulate<n>:DELTamarker<m>:LINK` on page 185

4.4.3.8 Softkeys of the Input/Output Menu for RF Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for RF measurements. For CDA measurements, see chapter 4.4.2.10, "Softkeys of the Input/Output Menu for CDA Measurements", on page 89.

Input (AC/DC)....144
Noise Source....144
Video Output....144
Power Sensor....144
Trigger Out....145

Input (AC/DC)
Toggles the RF input of the analyzer between AC and DC coupling.

This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:COUPling` on page 286

Noise Source
Switches the supply voltage for an external noise source on or off. For details on connectors refer to the Quick Start Guide, chapter 1 "Front and Rear Panel".

SCPI command:
`DIAGnostic<n>:SERVice:NSOurce` on page 295

Video Output
Sends a video output signal according to the measured level to the connector on the rear panel of the analyzer.

Note: Video output does not return valid values in IQ or FFT mode.

SCPI command:
`OUTP:IF VID`, see `OUTPut:IF[:SOURce]` on page 297

Power Sensor
For precise power measurement a power sensor can be connected to the instrument via the front panel (USB connector) or the rear panel (power sensor, option R&S FSV-B5). The Power Sensor Support firmware option (R&S FSV-K9) provides the power measurement functions for this test setup.

This softkey is only available if the analyzer option Power Sensor (R&S FSV-K9) is installed.

For details see the chapter "Instrument Functions Power Sensor (K9)" in the base unit description.

This softkey is available for RF measurements.

Trigger Out
Sets the Trigger Out port in the Additional Interfaces (option R&S FSV-B5 only) to low or high. Thus, you can trigger an additional device via the external trigger port, for example.

This softkey is available for RF measurements.

SCPI command:
`OUTPut:TRIGger` on page 298

4.4.4 Further Information

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4.4.4.1 Predefined Channel Tables

Predefined channel tables offer access to a quick configuration for the channel search. The CDMA2000 BTS Analysis (R&S FSV-K82) option provides the following set of channel tables compliant with the CDMA2000 specification:

Channel table	Contents
RECENT	Contains the channels that were automatically created during the last measurement with the "Auto Search" option activated (for details refer to "Channel Tables" on page 64).
MPC_RC1 (Base Station Main Path 6 Channels Radio Configuration 1)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
MPC_RC4 (Base Station Main Path 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
TDC_RC4 (Base Station Transmit Diversity Path 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
BPC_RC4 (Base Station Both Paths 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-TDPICH/F-SYNC/F-PCH and 6 data channels This standard does not specify a channel number for the data channels.

The CDMA2000 MS Analysis (R&S FSV-K83) option provides the following set of channel tables compliant with the CDMA2000 specification:

Channel table	Contents
RECENT	Contains the channels that were automatically created during the last measurement with the "Auto Search" option activated (for details refer to "Channel Tables" on page 64).
EACHOP	Channel table for Enhanced Access CHannel OPeration with PICH and EACH
RCCCHOP	Channel table for Reverse Common Control CHannel OPeration with PICH and CCCH
RTCHOP3	Channel table for Reverse Traffic CHannel OPeration with the following 3 channels: PICH/DCCH/FCH
RTCHOP5	Channel table for Reverse Traffic CHannel OPeration with the following 5 channels: PICH/DCCH/FCH/S1CH/S2CH

To use channels other than those in the predefined channel tables, you can copy the original tables and modify the channels in the copy.

Table 4-2: Base station channel table for main branch in radio configuration 1 (MPC_RC1)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	32.64	-

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PCH	1	1.64	-
CHAN	6	9.64 10.64 11.64 15.64 17.64 25.64	1 1 1 1 1 1

Table 4-3: Base station channel table for main branch in radio configuration 4 (MPC_RC4)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128 10.128 11.128 15.128 17.128 25.128	4 4 4 4 4 4

Table 4-4: Base station test model for aggregate signal in radio configuration 4 (TDC_RC4)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	16.128	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128 10.128 11.128 15.128 17.128 25.128	4 4 4 4 4 4

Table 4-5: Base station test model for aggregate signal in radio configuration 4 (BPC_RC4)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	16.128	-
	1	32.64	-

F-PCH	1	1.64	-
CHAN	6	9.128 10.128 11.128 15.128 17.128 25.128	4 4 4 4 4 4

Table 4-6: Channel table for enhanced access channel operation

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
EACH	2.8	Q

Table 4-7: Channel table for reverse commom control channel operation

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
CCCH	2.8	Q

Table 4-8: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 3

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
FCH	4.16	Q
S1CH	2.4	Q

Table 4-9: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 5

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
DCCH	8.16	I
FCH	4.16	Q
S1CH	2.4	Q
S2CH	6.8	I

Relationship Between Channel and Modulation Type

Channel type	Channel	Modulation
F-PICH	Pilot channel	BPSK
F-SYNC	Synchronisation channel	BPSK
F-PCH	Paging channel	BPSK
F-TDPICH	Transmit diversity pilot channel	BPSK

F-APICH	Auxiliary pilot channel	BPSK
F-ATDPICH	Auxiliary transmit diversity channel	BPSK
F-BCH	Broadcast channel	QPSK
F-CPCCH	Common power control channel	QPSK
F-CACH	Common assignment channel	QPSK
F-CCCH	Common control channel	QPSK
F-PDCCH	Packet data control channel	QPSK
F-PDCH	Packet data channel	QPSK, 8PSK or 16QAM
CHAN	Data channel radio configuration 1-2	BPSK
CHAN	Data channel radio configuration 3-5	QPSK

4.4.4.2 Working with Channel Tables

Creating a channel table

1. Select the "Code Domain Analyzer" softkey.
2. Select the "Channel Table Settings" softkey.
   The "Channel Table Settings" dialog box is displayed.
3. Select the "Predef" channel search mode and set a threshold for inactive channels.
4. Press the "New / Copy / Edit" on page 65 softkey to create a new channel table.
   The "New Channel Table" dialog box is displayed. The new channel table contains no data at all.
5. Enter a name for the new channel table, e.g. 'Test Table' in the corresponding field.
   The name you enter in this field is also the name of the table channel file.
6. Enter a description for your new channel table, e.g. 'Channel table created for test purposes' in the "Description" field.
7. Build your channel table by adding the channels with the configuration you need
   or
   Measure the current signal by pressing the "Meas" on page 67 softkey. The analyzer automatically adds the channels of the current signal to the channel table.
   Refer to the "New / Copy / Edit" on page 65 softkey for a description of all parameters relating to a channel.
8. Save your table by pressing the "Save" on page 67 softkey. All data is lost if you just close the dialog box.
   The list of available channel tables in the "Channel Table Settings" dialog box now contains the 'Test Table'.

Editing a channel table

1. Select the "Code Domain Analyzer" softkey.
2. Select the "Channel Table Settings" softkey.
3. Select your recently created channel table. Press the "New / Copy / Edit" on page 65 softkey to open and modify the channel table.
   Each row in the channel table represents one channel.
4. Sort the channels in the channel table by pressing the "Sort" on page 67 softkey. The analyzer sorts the channels according to the rules listed in the "Sort" on page 67 softkey description.
5. Add a new channel by pressing the "Add Channel" on page 66 softkey.
   a) Select a channel type, e.g. a data channel.
   b) In the "Channel Type" field select "CHAN" from the dropdown menu.
   c) Sspecify the channel number (a value between 0 and 127) and spreading factor.
   d) Choose the radio configuration (usually 3-5)
   e) Activate the channel by editing the "State" field.
   The other values (symbol rate and power) are automatically calculated. If there is a conflict with another channel in the table, a red diamond is displayed in the "Domain Conflict" field of the conflicting channels.

1. You can delete a channel with the "Delete Channel" on page 67 softkey. Note that a channel is deleted without further notice.
2. If you want to discard your changes, you can restore the original table with the "Reload" on page 67 softkey. All your changes will be lost.
   You can also restore the default channel tables delivered with the analyzer with the "Restore Default Tables" on page 67. This recovery can be done even if you have saved changes to these tables.

For more information on softkeys, dialog boxes and parameters concerning channel tables refer to the description of the "Channel Table Settings" on page 63 dialog box.

4.4.4.3 Detector Overview

The measurement detector for the individual display modes can be selected directly by the user or set automatically by the analyzer. The detector activated for the specific trace is indicated in the corresponding trace display field by an abbreviation.

The detectors of the analyzer are implemented as pure digital devices. They collect signal power data within each measured point during a sweep. The default number of sweep points is 691. The following detectors are available:

Table 4-10: Detector types

Detector	Indicator	Function
Auto Peak	Ap	Determines the maximum and the minimum value within a measurement point (not available for SEM)
Positive Peak	Pk	Determines the maximum value within a measurement point
Negative Peak (min peak)	Mi	Determines the minimum value within a measurement point
RMS	Rm	Determines the root mean square power within a measurement point
Average	Av	Determines the linear average power within a measurement point
Sample	Sa	Selects the last value within a measurement point
Quasi Peak	QP	Determines the quasipeak power within a measurement point for EMI measurements (not available for SEM)

The result obtained from the selected detector within a measurement point is displayed as the power value at this measurement point.

All detectors work in parallel in the background, which means that the measurement speed is independent of the detector combination used for different traces.

Number of measured values

During a frequency sweep, the analyzer increments the first local oscillator in steps that are smaller than approximately 1/10 of the bandwidth. This ensures that the oscillator step speed is conform to the hardware settling times and does not affect the precision of the measured power.

The number of measured values taken during a sweep is independent of the number of oscillator steps. It is always selected as a multiple or a fraction of 691 (= default number of trace points displayed on the screen). Choosing less then 691 measured values (e.g. 125 or 251) will lead to an interpolated measurement curve, choosing more than 691 points (e.g. 1001, 2001 …) will result in several measured values being overlaid at the same frequency position.

RMS detector and VBW

If the RMS detector is selected, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves.

4.4.4.4 Trace Mode Overview

The traces can be activated individually for a measurement or frozen after completion of a measurement. Traces that are not activated are hidden. Each time the trace mode is changed, the selected trace memory is cleared.

The analyzer offers 6 different trace modes:

Clear Write
Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

All available detectors can be selected.

SCPI command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

Max Hold
The maximum value is determined over several sweeps and displayed. The analyzer saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each sweep until all signal components are detected in a kind of envelope.

This mode is not available for statistics measurements.

SCPI command:
`DISP:TRAC:MODE MAXH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

Min Hold
The minimum value is determined from several measurements and displayed. The analyzer saves for each sweep the smallest of the previously stored/currently measured values in the trace memory.

The detector is automatically set to "Negative Peak".

This mode is useful e.g. for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed whereas a CW signal is recognized by its constant level.

This mode is not available for statistics measurements.

SCPI command:
`DISP:TRAC:MODE MINH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

Average
The average is formed over several sweeps. The "Sweep Count" determines the number of averaging procedures.

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 4.4.4.3, "Detector Overview", on page 150).

This mode is not available for statistics measurements.

For more information see

- "Sweep Count" on page 81

SCPI command:

`DISP:TRAC:MODE AVER`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

View

The current contents of the trace memory are frozen and displayed.

If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the trace and the current instrument setting do not correspond any more is indicated by the icon on the tab label.

If the level range or reference level is changed, the analyzer automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

SCPI command:

`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 225

Blank

Hides the selected trace.

SCPI command:

`DISP:TRAC OFF`, see `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]` on page 226

4.4.4.5 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

The video filters are responsible for smoothing the displayed trace. Using video bandwidths that are small compared to the resolution bandwidth, only the signal average is displayed and noise peaks and pulsed signals are repressed. If pulsed signals are to be measured, it is advisable to use a video bandwidth that is large compared to the resolution bandwidth (VBW * 10 x RBW) for the amplitudes of pulses to be measured correctly.

The following filter types are available:

- Normal (3dB) (Gaussian) filters
  The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.
- EMI (6dB) filters
  The available bandwidths are specified in the data sheet.
- Channel filters
  For details see chapter 4.4.4.6, "List of Available RRC and Channel Filters", on page 154 .
  Channel filters do not support FFT mode.
- RRC filters
  For details see chapter 4.4.4.6, "List of Available RRC and Channel Filters", on page 154 .

RRC filters do not support FFT mode.

- 5-Pole filters
  The available bandwidths are specified in the data sheet.
  5-Pole filters do not support FFT mode.

4.4.4.6 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table).

For filters of type RRC (Root Raised Cosine), the filter bandwidth indicated describes the sampling rate of the filter. For all other filters (CFILter) the filter bandwidth is the 3 dB bandwidth.

Table 4-11: Filter types

Filter Bandwidth	Filter Type	Application
100 Hz 200 Hz 300 Hz 500 Hz	CFILter CFILter CFILter CFILter	A0
1 kHz 1.5 kHz 2 kHz 2.4 kHz 2.7 kHz 3 kHz 3.4 kHz 4 kHz 4.5 kHz 5 kHz 6 kHz 8.5 kHz 9 kHz	CFILter CFILter CFILter CFILter CFILter CFILter CFILter CFILter CFILter CFILter CFILter CFILter CFILter	SSB DAB, Satellite ETS300 113 (12.5 kHz channels) AM Radio
10 kHz 12.5 kHz 14 kHz 15 kHz 16 kHz 18 kHz, α=0.35 20 kHz 21 kHz 24.3 kHz, α=0.35 25 kHz 30 kHz 50 kHz	CFILter CFILter CFILter CFILter CFILter RRC CFILter CFILter RRC CFILter CFILter CFILter	CDMAone ETS300 113 (20 kHz channels) ETS300 113 (25 kHz channels) TETRA PDC IS 136 CDPD, CDMAone

Filter Bandwidth	Filter Type	Application
100 kHz 150 kHz 192 kHz 200 kHz 300 kHz 500 kHz	CFILter CFILter CFILter CFILter CFILter CFILter	FM Radio PHS J.83 (8-VSB DVB, USA)
1 MHz 1.228 MHz 1.28 MHz 1.5 MHz 2 MHz 3 MHz 3.75 MHz 3.84 MHz, α=0.22 4.096 MHz, α=0.22 5 MHz 20 MHz 28 MHz 40 MHz	CFILter CFILter RRC CFILter CFILter CFILter CFILter RRC RRC CFILter CFILter CFILter CFILter	CDMAone CDMAone DAB W-CDMA 3GPP W-CDMA NTT DOCoMo

4.4.4.7 ASCII File Export Format

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

File contents: header and data section	Description
Type;FSV;	Instrument model
Version;1.50;	Firmware version
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display

File contents: header and data section	Description
Demodulator;Offset QPSK;	Demodulation type
ResultMode;Trace;	Result mode
x unit;sym;	Unit of the x axis
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

4.4.4.8 ASCII File Export Format (Spectrum Emission Mask)

The first part of the file lists information about the signal analyzer and the general setup. For a detailed description refer to chapter 4.4.4.7, "ASCII File Export Format", on page 155.

File contents	Description
RefType; CPOWER; TxBandwidth;9540000;Hz Filter State; ON; Alpha;0.22;	reference range setup, for details see "Edit Reference Range" on page 110
PeaksPerRange;1; Values;4;	evaluation list information
0;-22500000;-9270000;1000000;2986455000;-74.762840270996094; -10.576210021972656;-45.762840270996094;PASS; 1;-9270000;-4770000;100000;2991405000;-100.17695617675781; -35.990325927734375;-1.490325927734375;PASS 3;4770000;9270000;100000;3005445000;-100.17695617675781; -35.990325927734375;-1.490325927734375;PASS; 4;9270000;22500000;1000000;3018225000;-74.762840270996094; -10.576210021972656;-45.762840270996094;PASS;	information about each peak: <range number>; <start frequency>; <stop frequency>; <resolution bandwidth of range>; <frequency of peak>; <absolute power in dBm of peak>; <relative power in dBc of peak (related to the channel power)>; <distance to the limit line in dB (positive value means above the limit)>; <limit fail (pass = 0, fail =1)>;

4.4.4.9 Format Description of Spectrum Emission Mask XML Files

The files for importing range settings are in XML format and therefore obey the rules of the XML standard. Below, the child nodes, attributes, and structure defined for the data import is described. Build your own XML files according to these conventions because the analyzer can only interpret XML files of a known structure. For example files look in the "`C:\r_s\instr\sem_std directory`".

Be sure to follow the structure exactly as shown below or else the analyzer is not able to interpret the XML file and error messages are shown on the screen. Therefore, we recommend you make a copy of an existing file (see "Save as Standard" softkey, "Save As Standard" on page 115) and edit the copy of the file. The default files can be found in the `C:\r_s\instr\sem_std` directory.

Alternatively, edit the settings using the "Spectrum Emission Mask" softkey and the Sweep List dialog box and save the XML file with the (Save As Standard) softkey afterwards. This way, no modifications have to be done in the XML file itself.

Basically, the file consists of three elements that can be defined:

- chapter 4.4.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 156
- chapter 4.4.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 156
- chapter 4.4.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 156

The "BaseFormat" element

It carries information about basic settings. In this element only the "ReferencePower" child node has any effects on the measurement itself. The other attributes and child nodes are used to display information about the Spectrum Emission Mask Standard on the measurement screen. The child nodes and attributes of this element are shown in table 4-12.

Spectrum Emission Mask Standard:		W-CDMA 3GPP DL (39,43)dBm				
Tx Power	-70.75 dBm	Tx Bandwidth	3.840 MHz	RBW	1 MHz	
Range [Hz]		RBW [Hz]	Frequency [Hz]	PwrAbs [dBm]	PwrRel [dBc]	ΔLimit [dB]
-12.750 M	-8.000 M	1 M	2.991974 G	-77.89	-7.14	47.36 *
-8.000 M	-4.000 M	1 M	2.995923 G	-93.74	-22.99	-82.24
-4.000 M	-3.515 M	30 k	2.996404 G	-100.18	-29.43	-75.68
-3.515 M	-2.715 M	30 k	2.996512 G	-105.54	-34.78	-81.04
-2.715 M	-2.515 M	30 k	2.997318 G	-105.54	-34.78	-93.04
2.515 M	2.715 M	30 k	3.002548 G	-105.54	-34.78	-93.04
2.715 M	3.515 M	30 k	3.003382 G	-102.45	-31.70	-79.95
3.515 M	4.000 M	30 k	3.003919 G	-100.18	-29.43	-75.68
4.000 M	8.000 M	1 M	3.004026 G	-105.54	-34.78	-81.04
8.000 M	12.750 M	1 M	3.012724 G	-77.89	-7.14	47.36 *

In the example above ("`PowerClass_39_43.xml`" under "`C:\r_s\instr\sem_std\WCDMA\3GPP`"), these attributes are defined as follows:

- Standard="W-CDMA 3GPP"
- LinkDirection="DL"
- PowerClass="(39,43)dBm"

The "PowerClass" element

It is embedded in the "BaseFormat" element and contains settings information about the power classes. Up to four different power classes can be defined. For details refer to the "Sweep List" softkey ("Sweep List" on page 106) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 4-13.

The "Range" element

This element is embedded in the "PowerClass" element. It contains the settings information of the range. There have to be at least three defined ranges: one reference range and at least one range to either side of the reference range. The maximum number of ranges is 20. Note that the analyzer uses the same ranges in each power class. Therefore, the contents of the ranges of each defined power class have to be identical to the first power class. An exception are the Start and Stop values of the two Limit nodes that are used to determine the power class. Note also, that there are two Limit nodes to be defined: one that gives the limit in absolute values and one in relative values. Make sure units for the Start and Stop nodes are identical for each Limit node.

For details refer to the "Sweep List" softkey ("Sweep List" on page 106) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 4-14.

The following tables show the child nodes and attributes of each element and show if a child node or attribute is mandatory for the analyzer to interpret the file or not. Since the hierarchy of the XML can not be seen in the tables, either view one of the default files already stored on the analyzer in the "`C:\r_s\instr\sem_std`" directory or check the structure as shown below.

Below, a basic example of the structure of the file is shown, containing all mandatory attributes and child nodes. Note that the "PowerClass" element and the range element are themselves elements of the "BaseFormat" element and are to be inserted where noted. The separation is done here simply for reasons of a better overview. Also, no example values are given here to allow a quick reference to the tables above. Italic font shows the placeholders for the values.

- The "BaseFormat" element is structured as follows:
  – <RS_SEM_ACP_FileFormat Version=""1.0.0.0"">
  <Name>"Standard"</Name>
  <Instrument>
  <Type>"Instrument Type"</Type>
  <Application>"Application"</Application>
  </Instrument>
  <LinkDirection Name=""Name"">
  <ReferencePower>
  <Method>"Method"</Method>
  </ReferencePower>
  <PowerClass Index=""n"">
  <!-- For contents of the PowerClass node see table 4-13 -->
  <!-- Define up to four PowerClass nodes -->
  </PowerClass>
  </LinkDirection>
  </RS_SEM_ACP_File>
- The PowerClass element is structured as follows:
  – <PowerClass Index=""n"">
  <StartPower Unit=""dBm"" InclusiveFlag=""true"" Value=""StartPowerValue""/>
  <StopPower Unit=""dBm"" InclusiveFlag=""false"" Value=""StopPowerValue""/>
  <DefaultLimitFailMode>"Limit Fail Mode"</DefaultLimitFailMode>

<Range Index=""n"">
<!-- For contents of the Range node see table 4-14 -->
<!-- Define up to twenty Range nodes -->
</Range>
…
</PowerClass>

- The Range element is structured as follows:
  – <Range Index=""n"">
  <Name=""Name"">
  <ChannelType>"Channel Type"</Channel Type>
  <WeightingFilter>
  <Type>"FilterType"</Type>
  <RollOffFactor>"Factor"</RollOffFactor>
  <Bandwith>"Bandwidth"</Bandwidth>
  </WeightingFilter>
  <FrequencyRange>
  <Start>"RangeStart"</Start>
  <Stop>"RangeStop"</Stop>
  </FrequencyRange>
  <Limit>
  <Start Unit=""Unit"" Value=""Value""/>
  <Stop Unit=""Unit"" Value=""Value""/>
  </Limit>
  <Limit>
  <Start Unit=""Unit"" Value=""Value""/>
  <Stop Unit=""Unit"" Value=""Value""/>
  </Limit>
  <RBW Bandwidth=""Bandwidth"" Type=""FilterType""/>
  <VBW Bandwidth=""Bandwidth""/>
  <Detector>"Detector"</Detector>
  <Sweep Mode=""SweepMode"" Time=""SweepTime""/>
  <Amplitude>
  <ReferenceLevel Unit=""dBm"" Value=""Value""/>
  <RFAttenuation Mode=""Auto"" Unit=""dB"" Value=""Value""/>
  <Preamplifier State=""State""/>
  </Amplitude>
  </Range>

Table 4-12: Attributes and child nodes of the BaseFormat element

Child Node	Attribute	Value	Parameter Description	Mand.
	FileFormatVersion	1.0.0.0		Yes
	Date	YYYY-MM-DD HH:MM:SS	Date in ISO 8601 format	No
Name		<string>	Name of the standard	Yes
Instrument	Type	FSL	Name of the instrument	No
	Application	SA | K72 | K82	Name of the application	No

Child Node	Attribute	Value	Parameter Description	Mand.
LinkDirection	Name	Downlink | Uplink | None		Yes
	ShortName	DL | UL		No
Reference-Power				Yes
Method	TX Channel Power | TX Channel Peak Power			Yes
Reference-Channel	<string>			No

Table 4-13: Attributes and child nodes of the PowerClass element

Child Node	Attribute	Value	Parameter Description	Mand.
StartPower	Value	<power in dBm>	The start power must be equal to the stop power of the previous power class. The StartPower value of the first range is -200	Yes
	Unit	dBm		Yes
	InclusiveFlag	true		Yes
StopPower	Value	<power in dBm>	The stop power must be equal to the start power of the next power class. The StopPower value of the last range is 200	Yes
	Unit	dBm		
	InclusiveFlag	false		Yes
DefaultLimitFailMode		Absolute | Relative | Absolute and Relative | Absolute or Relative		Yes

Table 4-14: Attributes and child nodes of the Range element (normal ranges)

Child Node	Attribute	Value	Parameter Description	Mand.
	Index	0…19	Inde XE s are continuous and have to start with 0	Yes
	Name	<string>	Name of the range	Only if ReferenceChannel contains a name and the range is the reference range
	ShortName	<string>	Short name of the range	No
ChannelType		TX | Adjacent		Yes

Child Node	Attribute	Value	Parameter Description	Mand.
WeightingFilter				Only if ReferencePower method is TX Channel Power and the range is the reference range
Type		RRC | CFilter	Type of the weighting filter	Yes
Roll Off Factor		0…1	Excess bandwidth of the filter	Only if the filter type is RRC
Bandwidth		<bandwidth in Hz>	Filter bandwidth	Only if the filter type is RRC
FrequencyRange				Yes
Start		<frequency in Hz>	Start value of the range	Yes
Stop		<frequency in Hz>	Stop value of the range	Yes
Limit		dBm/Hz | dBm | dBc | dBr | dB	A Range must contain exactly two limit nodes; one of the limit nodes has to have a relative unit (e.g. dBc), the other one must have an absolute unit (e.g. dBm)	Yes
Start	Value	<numeric_value>	Power limit at start frequency	Yes
	Unit	dBm/Hz | dBm | dBc | dBr | dB	Sets the unit of the start value	
Stop	Value	<numeric_value>	Power limit at stop frequency	
	Unit	dBm/Hz | dBm | dBc | dBr | dB	Sets the unit of the stop value	
LimitFailMode		Absolute | Relative | Absolute and Relative | Absolute or Relative	If used, it has to be identical to DefaultLimitFailMode	No
RBW	Bandwidth	<bandwidth in Hz>	"RBW" on page 107	Yes
	Type	NORM | PULS | CFIL | RRC		No
VBW	Bandwidth	<bandwidth in Hz>	"VBW" on page 108	Yes
Detector		NEG | POS | SAMP | RMS | AVER | QUAS	If used, it has to be identical in all ranges.	No
Sweep	Mode	Manual | Auto	"Sweep Time Mode" on page 108	Yes
	Time	<time in sec>	"Sweep Time" on page 108	No
Amplitude				No
ReferenceLevel	Value	<power in dBm>	"Ref. Level" on page 108	Yes, if the ReferenceLevel child node is used

Child Node	Attribute	Value	Parameter Description	Mand.
	Unit	dBm	Defines dBm as unit	Yes, if the ReferenceLevel node is used
RFAttenuation	Mode	Manual | Auto	"RF Att. Mode" on page 108	Yes, if the ReferenceLevel child node is used
Preamplifier		ON | OFF	"Preamp" on page 108	Yes

4.4.4.10 Provided XML Files for the Spectrum Emission Mask Measurement

You can change the settings manually or via XML files. The XML files offer a quick way to change the configuration. A set of ready-made XML files for different standards is already provided. For details see table 4-15table 4-15. You can also create and use your own XML files (for details see chapter 4.4.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 156). All XML files are stored under "C:\r_s\instr\sem_std". Use the "Load Standard" softkey for quick access to the available XML files (see "Load Standard" on page 115).

Table 4-15: Provided XML files

Path	XML file name	Displayed standard characteristics*
cdma2000\DL	default0.xml	CDMA2000 BC0 DL
	default1.xml	CDMA2000 BC1 DL
cdma2000\UL	default0.xml	CDMA2000 BC0 UL
	default1.xml	CDMA2000 BC1 UL
WCDMA\3GPP\DL	PowerClass_31_39.xml	W-CDMA 3GPP (31,39)dBm DL
	PowerClass_39_43.xml	W-CDMA 3GPP (39,43)dBm DL
	PowerClass_43_INF.xml	W-CDMA 3GPP (43,INF)dBm DL
	PowerClass_negINF_31.xml	W-CDMA 3GPP (-INF,31)dBm DL
WIBRO\DL	PowerClass_29_40.xml	WiBro TTA (29,40)dBm DL
	PowerClass_40_INF.xml	WiBro TTA (40,INF)dBm DL
	PowerClass_negINF_29.xml	WiBro TTA (-INF,29)dBm DL
WIBRO\UL	PowerClass_23_INF.xml	WiBro TTA (23,INF)dBm UL
	PowerClass_negINF_23.xml	WiBro TTA (23,INF)dBm UL
WIMAX\DL\ETSI\…MHz (1.75 MHz, 2.00 MHz, 3.5 MHz, 7.00 MHz, 14.00 MHz, 28 MHz)	System_Type_E.xml	WIMAX System Type E DL
	System_Type_F.xml	WIMAX System Type F DL
	System_Type_G.xml	WIMAX System Type G DL
WIMAX\DL\IEEE	10MHz.xml	WIMAX 10MHz DL

Path	XML file name	Displayed standard characteristics*
	20MHz.xml	WIMAX 20MHz DL
WIMAX\UL\ETSI…MHz (1.75 MHz, 2.00 MHz, 3.5 MHz, 7.00 MHz, 14.00 MHz, 28 MHz)	System_Type_E.xml	WIMAX System Type E UL
	System_Type_F.xml	WIMAX System Type F UL
	System_Type_G.xml	WIMAX System Type G UL
WIMAX\UL\IEEE	10MHz.xml	WIMAX 10MHz UL
	20MHz.xml	WIMAX 20MHz UL
WLAN\802_11_TURBO	ETSI.xml	IEEE 802.11
	IEEE.xml	IEEE 802.11
WLAN\802_11a	ETSI.xml	IEEE 802.11a
	IEEE.xml	IEEE 802.11a
WLAN\802_11b	IEEE.xml	IEEE 802.11b
WLAN\802_11j_10MHz	ETSI.xml	IEEE.802.11j
	IEEE.xml	IEEE.802.11j
WLAN\802_11j_20MHz	ETSI.xml	IEEE 802.11j
	IEEE.xml	IEEE 802.11j
EUTRA-LTE\DL\CategoryA\	BW_01_4_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_01_4_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_03_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_03_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_05_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_05_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_10_0_MHz__Cfhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_10_0_MHz__Cflower1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_15_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_15_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_20_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_20_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_01_4_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL

Path	XML file name	Displayed standard characteristics*
EUTRA-LTE\DL\CategoryB\	BW_01_4_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_03_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_03_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_05_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_05_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_10_0_MHz__Cfhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_10_0_MHz__Cflower1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_15_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_15_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_20_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_20_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\UL\Standard\	BW_05_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_10_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_15_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_20_0_MHz.xml	LTE UL

*Used abbreviations:

BC: band class

UL: uplink

DL: downlink

TTA: Telecommunications Technology Association

4.4.4.11 Ranges and Range Settings

In the Spectrum Emission Mask measurements, a range defines a segment for which you can define the following parameters separately: start and stop frequency, RBW, VBW, sweep time, sweep points, reference level, attenuator settings, and limit values. Via the sweep list, you define the ranges and their settings (for details on settings refer to "Sweep List dialog box" on page 106).

The following rules apply to ranges:

- The minimum span of a range is 20 Hz.
- The individual ranges must not overlap (but need not directly follow one another).
- The maximum number of ranges is 20.
- A minimum of three ranges is mandatory.

- The reference range cannot be deleted (it is marked in blue color).

In order to change the start/stop frequency of the first/last range, select the appropriate span with the SPAN key. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last ranges are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Frequency values for each range have to be defined relative to the center frequency. The reference range has to be centered on the center frequency. The minimum span of the reference range is given by the current TX Bandwidth.

4.4.4.12 Fast Spectrum Emission Mask Measurements

In order to improve the performance of the FSV for spectrum emission mask measurements, a "Fast SEM" mode is available. If this mode is activated, several consecutive ranges with identical sweep settings are combined to one sweep internally, which makes the measurement considerably more efficient. The displayed results remain unchanged and still consist of several ranges. Thus, measurement settings that apply only to the results, such as limits or transducer factors, can nevertheless be defined individually for each range.

Prerequisites

Fast SEM mode is available if the following criteria apply:

- The frequency ranges are consecutive, without frequency gaps
- The following sweep settings are identical:
  - "Filter Type", see "Filter Type" on page 107
  - "RBW", see "RBW" on page 107
  - "VBW", see "VBW" on page 108
  - "Sweep Time Mode", see "Sweep Time Mode" on page 108
  - "Ref Level", see "Ref. Level" on page 108
  - "Rf Att. Mode", see "RF Att. Mode" on page 108
  - "RF Attenuator", see "RF Att. Mode" on page 108
  - "Preamp", see "Preamp" on page 108

Activating Fast SEM mode

Fast SEM mode is activated in the sweep list (see "Fast SEM" on page 107) or using a remote command. Activating the mode for one range automatically activates it for all ranges in the sweep list.

In the provided XML files for the Spectrum Emission Mask measurement, Fast SEM mode is activated by default.

SCPI command:

`[SENSe:]ESPectrum:HighSPeed` on page 242

Consequences

When the Fast SEM mode is activated, the ranges for which these criteria apply are displayed as one single range. The sweep time is defined as the sum of the individual sweep times, initially, but can be changed. When the Fast SEM mode is deactivated, the originally defined individual sweep times are reset.

Any other changes to the sweep settings of the combined range are applied to each included range and remain changed even after deactivating Fast SEM mode.

Example

Sweep List

	Range 1	Range 2	Range 3	Range 4	Range 5
Range Start	-12.75 MHz	-8 MHz	-4 MHz	-3.515 MHz	-2.715 MHz
Range Stop	-8 MHz	-4 MHz	-3.515 MHz	-2.715 MHz	-2.515 MHz
Fast SEM	On	On	On	On	On
Filter Type	Channel	---	Gaussian	---	---
RBW	1 MHz	---	30 kHz	---	---
VBW	10 MHz	---	10 MHz	---	---
Sweep Time Mode	---	---	---	---	---
Sweep Time	10 ms	---	30 ms	---	---
Ref. Level	-10 dBm	---	-10 dBm	---	---
RF Att. Mode	Auto	---	Auto	---	---
RF Attenuator	10 dB	---	10 dB	---	---
Preamp	Off	---	Off	---	---
Transd. Factor	None	None	None	None	None
Limit Check 1	Absolute	Absolute	Absolute	Absolute	Absolute
Abs Limit Start 1	-23.5 dBm	-19.5 dBm	-32.5 dBm	-32.5 dBm	-20.5 dBm
Abs Limit Stop 1	-23.5 dBm	-19.5 dBm	-32.5 dBm	-20.5 dBm	-20.5 dBm
Rel Limit Start 1	-50 dBc	-50 dBc	-50 dBc	-50 dBc	-50 dBc
Rel Limit Stop 1	-50 dBc	-50 dBc	-50 dBc	-50 dBc	-50 dBc
Limit Check 2	Relative	Relative	Relative	Relative	Relative

Fig. 4-17: Sweep list using Fast SEM mode

In figure 4-17, a sweep list is shown for which Fast SEM is activated. The formerly 5 separately defined ranges are combined to 2 sweep ranges internally.

4.4.4.13 Predefined CP/ACLR Standards

When using predefined standards for ACLR measurement, the test parameters for the channel and adjacent-channel measurements are configured automatically. The available standards are listed below.

Parameter	Standard
W-CDMA 3GPP FWD	W-CDMA 3.84 MHz forward
W-CDMA 3GPP REV	W-CDMA 3.84 MHz reverse

Parameter	Standard
CDMA IS95A FWD	CDMA IS95A forward
EUTRa	EUTRA/LTE Square
REUTRa	EUTRA/LTE Square/RRC
CDMA IS95A REV	CDMA IS95A reverse
CDMA IS95C Class 0 FWD *)	CDMA IS95C Class 0 forward
CDMA IS95C Class 0 REV *)	CDMA IS95C Class 0 reverse
CDMA J-STD008 FWD	CDMA J-STD008 forward
CDMA J-STD008 REV	CDMA J-STD008 reverse
CDMA IS95C Class 1 FWD *)	CDMA IS95C Class 1 forward
CDMA IS95C Class 1 REV *)	CDMA IS95C Class 1 reverse
CDMA 2000	CDMA 2000
TD SCDMA FWD	TD-SCDMA forward
TD SCDMA REV	TD-SCDMA reverse
WLAN 802.11A	WLAN 802.11A
WLAN 802.11B	WLAN 802.11B
WiMAX	WiMAX
WIBRO	WIBRO
RFID 14443	RFID 14443
TETRA	TETRA
PDC	PDC
PHS	PHS
CDPD	CDPD
GSM	GSM

For the analyzer, the channel spacing is defined as the distance between the center frequency of the adjacent channel and the center frequency of the transmission channel. The definition of the adjacent-channel spacing in standards IS95C and CDMA 2000 is different. These standards define the adjacent-channel spacing from the center of the transmission channel to the closest border of the adjacent channel. This definition is also used for the analyzer if the standards marked with an asterisk *) are selected.

4.4.4.14 Optimized Settings for CP/ACLR Test Parameters

The "Adjust Settings" softkey (see "Adjust Settings" on page 104) automatically optimizes all instrument settings for the selected channel configuration, as described in the following:

- **Frequency span**
  The frequency span must at least cover the channels to be measured plus a measurement margin of approx. 10 %.
  If the frequency span is large in comparison to the channel bandwidth (or the adjacent-channel bandwidths) being examined, only a few points on the trace are available per channel. This reduces the accuracy of the waveform calculation for the channel filter used, which has a negative effect on the measurement accuracy. It is therefore strongly recommended that the formulas mentioned be taken into consideration when selecting the frequency span.
  For channel power measurements the Adjust Settings softkey sets the frequency span as follows:
  "(No. of transmission channels – 1) x transmission channel spacing + 2 x transmission channel bandwidth + measurement margin"
  For adjacent-channel power measurements, the Adjust Settings softkey sets the frequency span as a function of the number of transmission channels, the transmission channel spacing, the adjacent-channel spacing, and the bandwidth of one of adjacent-channels ADJ, ALT1 or ALT2, whichever is furthest away from the transmission channels:
  "(No. of transmission channels – 1) x transmission channel spacing + 2 x (adjacent-channel spacing + adjacent-channel bandwidth) + measurement margin"
  The measurement margin is approx. 10 % of the value obtained by adding the channel spacing and the channel bandwidth.
- **Resolution bandwidth (RBW)**
  To ensure both, acceptable measurement speed and required selection (to suppress spectral components outside the channel to be measured, especially of the adjacent channels), the resolution bandwidth must not be selected too small or too large. As a general approach, the resolution bandwidth is to be set to values between 1% and 4% of the channel bandwidth.
  A larger resolution bandwidth can be selected if the spectrum within the channel to be measured and around it has a flat characteristic. In the standard setting, e.g. for standard IS95A REV at an adjacent channel bandwidth of 30 kHz, a resolution bandwidth of 30 kHz is used. This yields correct results since the spectrum in the neighborhood of the adjacent channels normally has a constant level.
  With the exception of the IS95 CDMA standards, the Adjust Settings softkey sets the resolution bandwidth (RBW) as a function of the channel bandwidth:
  "RBW ≤ 1/40 of channel bandwidth"
  The maximum possible resolution bandwidth (with respect to the requirement RBW ≤ 1/40) resulting from the available RBW steps (1, 3) is selected.
- **Video bandwidth (VBW)**
  For a correct power measurement, the video signal must not be limited in bandwidth. A restricted bandwidth of the logarithmic video signal would cause signal averaging and thus result in a too low indication of the power (-2.51 dB at very low video bandwidths). The video bandwidth should therefore be selected at least three times the resolution bandwidth:
  "VBW ≥ 3 x RBW"
  The Adjust Settings softkey sets the video bandwidth (VBW) as a function of the channel bandwidth (see formula above) and the smallest possible VBW with regard to the available step size will be selected.
- **Detector**

The Adjust Settings softkey selects the RMS detector. This detector is selected since it correctly indicates the power irrespective of the characteristics of the signal to be measured. The whole IF envelope is used to calculate the power for each measurement point. The IF envelope is digitized using a sampling frequency which is at least five times the resolution bandwidth which has been selected. Based on the sample values, the power is calculated for each measurement point using the following formula:

$$P_{RMS} = \sqrt{\frac{1}{N} \cdot \sum_{i=1}^{N} s_i^2}$$

where:
"s_i = linear digitized video voltage at the output of the A/D converter"
"N = number of A/D converter values per measurement point"
"P_{RMS} = power represented by a measurement point"
When the power has been calculated, the power units are converted into decibels and the value is displayed as a measurement point.
In principle, the sample detector would be possible as well. Due to the limited number of measurement points used to calculate the power in the channel, the sample detector would yield less stable results.

- **Trace averaging**
  The Adjust Settings softkey switches off this function. Averaging, which is often performed to stabilize the measurement results, leads to a too low level indication and should therefore be avoided. The reduction in the displayed power depends on the number of averages and the signal characteristics in the channel to be measured.
- **Reference level**
  The Adjust Settings softkey does not influence the reference level. It can be adjusted separately using the "Adjust Ref Lvl" softkey (see "Adjust Ref Lvl" on page 97).

4.5 Remote Commands of the CDMA2000 BTS Analysis

This chapter describes the remote commands specific to the CDMA2000 Analysis options (R&S FSV-K82/-K83). The abbreviation CDMA stands for the operating mode of this option. For details on conventions used in this chapter refer to chapter 4.5.1, "Notation", on page 170.

For further information on analyzer or basic settings commands, refer to the corresponding subsystem in the base unit description.

In particular, the following subsystems are identical to the base unit; refer to the base unit description:

- CALCulate:DELTamarker
- CALCulate:MARKer (except for the specific commands described in chapter 4.5.2, "CALCulate Subsystem", on page 173)
- DISPlay subsystem
- FORMat subsystem
- INITiate subsystem

- INPut subsystem
- MMEM subsystem
- OUTput subsystem
- SENSe subsystem (except for the specific commands described in chapter 4.5.6, "SENSe Subsystem", on page 231)
- TRIGger subsystem

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4.5.1 Notation

In the following sections, all commands implemented in the instrument are first listed and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

Individual Description

The individual description contains the complete notation of the command. An example for each command, the *RST value and the SCPI information are included as well.

The options and operating modes for which a command can be used are indicated by the following abbreviations:

Abbreviation	Description
A	signal analysis
A-F	signal analysis – span > 0 only (frequency mode)
A-T	signal analysis – zero span only (time mode)
ADEMOD	analog demodulation (option R&S FSV-K7)
BT	Bluetooth (option R&S FSV-K8)
CDMA	CDMA 2000 base station measurements (option R&S FSV-K82)
EVDO	1xEV-DO base station analysis (option R&S FSV-K84)
GSM	GSM/Edge measurements (option R&S FSV-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSV-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSV-K93)
NF	Noise Figure measurements (R&S FSV-K30)
PHN	Phase Noise measurements (R&S FSV-K40)
PSM	Power Sensor measurements (option R&S FSV-K9)
SFM	Stereo FM measurements (optionR&S FSV-K7S)
SPECM	Spectogram mode (option R&S FSV-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSV-K76/K77)
VSA	Vector Signal Analysis (option R&S FSV-K70)
WCDMA	3GPP Base Station measurements (option R&S FSV-K72), 3GPP UE measurements (option R&S FSV-K73)
WLAN	WLAN TX measurements (option R&S FSV-K91)

The signal analysis (spectrum) mode is implemented in the basic unit. For the other modes, the corresponding options are required.

Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description (see chapter 5 "Remote Control – Basics"). The instrument itself does not distinguish between upper and lower case letters.

Special Characters

|	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.

Example:

```
SENSe:FREQuency:CW|:FIXed
```

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

```
SENSe:FREQuency:CW 1E3
```

```
SENSe:FREQuency:FIXed 1E3
```

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example: Selection of the parameters for the command

```
[SENSe<1…4>:]AVERage<1…4>:TYPE VIDeo | LINear
```

[]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards. Parameters in square brackets can be incorporated optionally in the command or omitted as well.

{}	Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.

Description of Parameters

Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<…>) and is briefly explained in the following (see also chapter 5 "Remote Control – Basics", section "Parameters").

<Boolean>

This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword OFF or by the numeric value 0, the "on" state is indicated by ON or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value> <num>

These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data). The following keywords given below are permitted:

- MAXimum: This keyword sets the parameter to the largest possible value.
- MINimum: This keyword sets the parameter to the smallest possible value.
- DEFault: This keyword is used to reset the parameter to its default value.
- UP: This keyword increments the parameter value.
- DOWN: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

SENSe:FREQuency:CENTer? MAXimum

Returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

4.5.2 CALCulate Subsystem

The CALCulate subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquisition, i.e. following the SENSe subsystem.

Note that most commands in the `CALCulate` subsystem are identical to the base unit; only the commands specific to this option are described here.

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4.5.2.1 CALCulate:FEED Subsystem

The `CALCulate:FEED` subsystem selects the result display for the measurement data. This corresponds to the result display selection in manual operation.

CALCulate<n>:FEED....173

CALCulate<n>:FEED <result display>

This command selects the result display for the measured data.

In MS mode, the results are displayed for the branch selected by `[SENSe:]CDPower:MAPPing`.

Suffix:

<n> 1...4
screen

Parameters:

<result display> XPOW:CDP | XPOW:CDP:RAT | XPOW:CDEP | XTIM:CDP:ERR:CTABle | XTIM:CDP:PVSLot | XTIM:CDP:ERR:SUMMary | XTIM:CDP:MACCuracy | XTIM:CDP:ERR:PCDomain | XTIM:CDP:SYMB:CONStellation | XTIM:CDP:SYMB:EVM | XTIM:CDP:BSTReam | XTIM:CDP:COMP:CONStellation | XTIM:CDP:PVSYmbol

XPOW:CDP
Code Domain Power (CDP) result display (absolute)

XPOW:CDP:RAT
Code Domain Power (CDP) result display (relative)

XTIM:CDP:BSTReam
Channel Bitstream result display

XTIM:CDP:COMP:CONStellation
Composite Constellation result display

XPOW:CDEP
Code Domain Error Power (CDEP) result display

XTIM:CDP:ERR:CTABle
Channel Table result display

XTIM:CDP:ERR:PCDomain
Peak Code Domain Error result display

XTIM:CDP:ERR:SUMMary
Result Summary result display

XTIM:CDP:MACCuracy
Composite EVM result display

XTIM:CDP:PVSLot
Power versus Power Control Group (PCG) result display

XTIM:CDP:PVSYmbol
Power versus Symbol result display

XTIM:CDP:SYMB:CONStellation
Channel Constellation result display

XTIM:CDP:SYMB:EVM
Symbol Error Vector Magnitude result display

*RST: 'XPOW:CDP:RAT' (screen A),
‘XTIM:CDP:ERR:SUMM’ (screen B)

Example: `CALC2:FEED 'XTIM:CDP:MACC'`
Selects the Composite EVM result display for measurement screen 2

Usage: SCPI conform

Mode: CDMA

4.5.2.2 CALCulate:MARKer:FUNCtion Subsystem

The CALCulate:MARKer:FUNCtion subsystem checks the marker functions in the instrument.

CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult....175
CALCulate<n>:MARKer<m>:FUNCtion:CENTer....177
CALCulate<n>:MARKer<m>:FUNCtion:PICH....177
CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE....178
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult....178
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ....179
CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect....180
CALCulate<n>:MARKer<m>:FUNCtion:TDPIch....181
CALCulate<n>:MARKer<m>:FUNCtion:ZOOM....181

CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?

This command queries the results of the code domain measurement for the selected channel. The channel is selected via the `[SENSe:]CDPower:CODE` command.

For a description of the result types refer to chapter 4.4.1.3, "Code Domain Analysis Results", on page 40.

Suffix:

<n>	1...4 window
<m>	irrelevant

Parameters:

<Result> SLOT | PTOTal | PPICh | RHO | MACCuracy | PCDerror | ACTive | FERRor | FERPpm | CERRor | TFRame I IQOFfset | IQIMbalance | SRATe | CHANnel | SFACtor | TOFFset | POFFset | CDPabsolute | CDPRelative | EVMRms | EVMPeak | DMType

SLOT
PCG number

PTOTal
Total power in dBm

PPICh
Pilot power in dBm

RHO
RHO

MACCuracy
Composite EVM in %

PCDerror
Peak code domain error in dB

ACTive
Number of active channels

FERRor
Frequency error in Hz

FERPpm
Frequency error in ppm

CERRor
Chip rate error in ppm

TFRame I
Trigger to frame

IQOFfset
IQ offset in %

IQIMbalance
IQ imbalance in %

SRATe
Symbol rate in ksps

CHANnel
Channel number

SFACtor
Spreading factor of channel

TOFFset
Timing offset in s

POFFset
Phase offset in rad

CDPabsolute
Channel power absolute in dBm

CDPRelative

Channel power relative in dB (relative to total or PICH power, refer to `CDP:PREF` command)

EVMRms
Error vector magnitude RMS in %

EVMPeak
Error vector mag. peak in %

DMType
Domain type

Example:
```
CALC:MARK:FUNC:CDP:RES? PTOT
```
Reads out total power.
```
CDP:SLOT 2
```
Selects power control group 2.
```
CDP:CODE 11
```
Selects code number 11.
```
CALC:MARK:FUNC:CDP:RES? EVMR
```
Reads out Composite EVM of the code with number 11 in PCG 2.

Usage: Query only

Mode: CDMA

CALCulate<n>:MARKer<m>:FUNCtion:CENTer

This command sets the center frequency to the frequency of the indicated marker in the specified window.

If a marker other than 1 is selected and used as delta marker, the marker is switched to the marker mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example:
```
CALC:MARK2:FUNC:CENT
```
Sets the center frequency to the frequency of marker 2.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:PICH

This command sets the marker to channel 0.64.

Suffix:

<n> 1...4
window

<m> 1...4
marker to be set to the pilot channel

Example: `CALC:MARK:FUNC:PICH`
Activates marker and positions it at pilot 0.64.
`CALC:MARK:Y?`
Queries value of the relative Code Domain Power of the pilot channel.

Usage: Event

Mode: CDMA

CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE <Mode>

This commands defines the method by which the channel power values are calculated from the current trace in the window specified by the suffix <n>.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<Mode> WRITe | MAXHold

WRITe
The channel power and the adjacent channel powers are calculated directly from the current trace

MAXHold
The power values are calculated from the current trace and compared with the previous power value using a maximum algorithm.

Example: `CALC:MARK:FUNC:POW:MODE MAXH`
Sets the Maxhold channel power mode.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? <ResultType>

This command queries the result of the performed power measurement in the window specified by the suffix <n>. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the SENSe:POWer subsystem.

To obtain a correct result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single sweep mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<ResultType> ACPower | CPOWer

ACPower
Adjacent-channel power measurement
Results are output in the following sequence, separated by commas:
Power of transmission channel
Power of lower adjacent channel
Power of upper adjacent channel
Power of lower alternate channel 1
Power of upper alternate channel 1
Power of lower alternate channel 2
Power of upper alternate channel 2
The number of measured values returned depends on the number of adjacent/alternate channels selected with `[SENSe:]POWer:ACHannel:ACPairs`.
With logarithmic scaling (RANGE LOG), the power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the power is output in W. If `[SENSe:]POWer:ACHannel:MODE` is set to REL, the adjacent/alternate-channel power is output in dB.

CPOWer
Channel power measurement
In a Spectrum Emission Mask measurement, the query returns the power result for the reference range, if this power reference type is selected.
With logarithmic scaling (RANGE LOG), the channel power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the channel power is output in W.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ <State>

This command switches the query response of the power measurement results in the window specified by the suffix <n> between output of absolute values and output referred to the measurement bandwith.

The measurement results are output with the `CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` command.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<State> ON | OFF

ON
Results output: channel power density in dBm/Hz

OFF
Results output: channel power is displayed in dBm

*RST: OFF

Example: `CALC:MARK:FUNC:POW:RES:PHZ ON`
Output of results referred to the channel bandwidth.
For details on a complete measurement example refer to `CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` on page 178.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect <MeasType>

This command selects – and switches on – the specified power measurement type in the window specified by the suffix <n>.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer` subsystem.

Note: If CPOWer is selected, the number of adjacent channels (`[SENSe:]POWer:ACHannel:ACPairs`) is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.

The channel/adjacent-channel power measurement is performed for the trace selected with `[SENSe:]POWer:TRACe`.

The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of `CALCulate<n>:MARKer<m>:TRACe`.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<MeasType> ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CNO

ACPower
Adjacent-channel power measurement with a single carrier signal

CPOWer
Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with "NO. OF ADJ CHAN" = 0)

MCACpower
Channel/adjacent-channel power measurement with several carrier signals

OBANdwidth | OBWidth
Measurement of occupied bandwidth

CN
Measurement of carrier-to-noise ratio

CN0
Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth

Example: `CALC:MARK:FUNC:POW:SEL ACP`
Switches on adjacent-channel power measurement.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:TDPIch

This command sets the marker to channel 16.128.

Suffix:

<n> 1...4
window

<m> 1...4
marker

Example: `CALC:MARK:FUNC:TDPI`
Activates marker and positions it at TDPICH 16.128.
`CALC:MARK:Y?`
Queries value of the relative Code Domain Power of the transmit diversity pilot channel.

Usage: Event

Mode: CDMA

CALCulate<n>:MARKer<m>:FUNCtion:ZOOM <State>

If marker zoom is activated, the number of channels displayed on the screen in code domain power and code domain error power result diagram is reduced to 64.

The currently selected marker defines the center of the displayed range.

Suffix:

<n> irrelevant

<m> 1...4
marker number

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:FUNC:ZOOM ON`

Mode: CDMA, EVDO, PHN, TDS, WCDMA

4.5.2.3 Other CALCulate Commands Referenced in this Manual

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CALCulate:DELTamarker subsystem

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X....183
CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y....183
CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe]....184
CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO....184
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CALCulate<n>:DELTamarker<m>:TRACe....189
CALCulate<n>:DELTamarker<m>:X....189
CALCulate<n>:DELTamarker<m>:X:RELative....189
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CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X <Reference>

For a measurement with a fixed reference value (see `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe]` on page 184), this command defines a new frequency reference (span > 0) or time (span = 0) for all delta markers in the window specified by the suffix <n>.

For phase-noise measurements (see `CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO` on page 184), the command defines a new frequency reference or time for delta marker 2.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<Reference> **<numeric_value>**

*RST: ("CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed" is set to OFF)

Example: `CALC:DELT:FUNC:FIX:RPO:X 128 MHz`

Sets the frequency reference to 128 MHz.

Mode: A, ADEMOD, EVDO, TDS, WCDMA

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y <RefPointLevel>

For a measurement with a fixed reference point (`CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe]`), this command defines a new reference point level for all delta markers in the window specified by the suffix <n>.

For phase-noise measurements (`CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe]` on page 185), the command defines a new reference point level for delta marker 2.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<RefPointLevel> **<numeric_value>**

*RST: ("CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed" is set to OFF)

Example: `CALC:DELT:FUNC:FIX:RPO:Y -10dBm`

Sets the reference point level for delta markers to -10 dBm.

Mode: A, ADEMOD, EVDO, TDS, WCDMA

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe] <State>

This command switches the relative measurement to a fixed reference value on or off. Marker 1 is activated previously and a peak search is performed, if necessary. If marker 1 is activated, its position becomes the reference point for the measurement. The reference point can then be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` commands and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` independently of the position of marker 1 and of a trace. It applies to all delta markers in the window specified by the suffix <n> as long as the function is active.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
CALC:DELT:FUNC:FIX ON
```
Switches on the measurement with fixed reference value for all delta markers.
```
CALC:DELT:FUNC:FIX:RPO:X 128 MHZ
```
Sets the frequency reference to 128 MHz.
```
CALC:DELT:FUNC:FIX:RPO:Y 30 DBM
```
Sets the reference level to +30 dBm.

Mode: A, ADEMOD, EVDO, TDS, WCDMA

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO <State>

This command activates an automatic peak search for the reference fixed marker 1 at the end of each particular sweep in the window specified by the suffix <n>.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
CALC:DELT:FUNC:PNO:AUTO ON
```
Activates an automatic peak search for the reference marker in a phase-noise measurement.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>

This command switches on or off the phase-noise measurement with all active delta markers in the window specified by the suffix <n>. The correction values for the bandwidth and the log amplifier are taken into account in the measurement.

Marker 1 is activated, if necessary, and a peak search is performed. If marker 1 is activated, its position becomes the reference point for the measurement.

The reference point can then be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` commands independently of the position of marker 1 and of a trace (the same commands used for the measurement with fixed reference point).

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> irrelevant
Note: marker 2 is always the deltamarker for phase noise measurement results.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
CALC:DELT:FUNC:PNO ON
```
Switches on the phase-noise measurement with all delta markers.
```
CALC:DELT:FUNC:FIX:RPO:X 128 MHZ
```
Sets the frequency reference to 128 MHz.
```
CALC:DELT:FUNC:FIX:RPO:Y 30 DBM
```
Sets the reference level to +30 dBm

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM

CALCulate<n>:DELTamarker<m>:LINK <State>

This command links delta marker 1 to marker 1. If you change the horizontal position of the marker, so does the delta marker.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> 1
irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
CALC:DELT:LINK ON
```

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM VSA

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command positions the delta marker to the next smaller maximum value to the left of the current value (i.e. descending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT:MAX:LEFT`
Sets delta marker 1 to the next smaller maximum value to the left of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command positions the delta marker to the next smaller maximum value on the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT2:MAX:NEXT`
Sets delta marker 2 to the next smaller maximum value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command positions the delta marker to the current maximum value on the measured curve in the window specified by the suffix <n>. If necessary, the corresponding delta marker is activated first.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT3:MAX`
Sets delta marker 3 to the maximum value of the associated trace.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command positions the delta marker to the next smaller maximum value to the right of the current value (i.e. ascending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT:MAX:RIGH`
Sets delta marker 1 to the next smaller maximum value to the right of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command positions the delta marker to the next higher minimum value to the left of the current value (i.e. descending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT:MIN:LEFT`
Sets delta marker 1 to the next higher minimum to the left of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command positions the delta marker to the next higher minimum value of the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT2:MIN:NEXT`
Sets delta marker 2 to the next higher minimum value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command positions the delta marker to the current minimum value on the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT3:MIN`
Sets delta marker 3 to the minimum value of the associated trace.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command positions the delta marker to the next higher minimum value to the right of the current value (i.e. ascending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT:MIN:RIGH`
Sets delta marker 1 to the next higher minimum value to the right of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command defines the marker specified by the suffix <m> as a delta marker for the window specified by the suffix <n>. If the corresponding marker was not already active, it is activated and positioned on the maximum of the measurement curve.

If no suffix is given for DELTamarker, delta marker 1 is selected automatically.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT1 ON`
Switches marker 1 to delta marker mode.

Mode: All

CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>

This command assigns the selected delta marker to the indicated trace in the window specified by the suffix <n>. The selected trace must be active, i.e. its state must be different from "BLANK".

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<TraceNumber> **1 to 6**
Selects trace 1 through 6.

Example: `CALC:DELT3:TRAC 2`
Assigns delta marker 3 to trace 2.

Mode: A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, SPECM, RT, VSA

CALCulate<n>:DELTamarker<m>:X <Position>

This command positions the selected delta marker to the indicated value in the window specified by the suffix <n>. The input is in absolute values.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<Position> 0 to maximum frequency or sweep time

Example: `CALC:DELT:X?`
Outputs the absolute frequency/time of delta marker 1.

Mode: A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, VSA

CALCulate<n>:DELTamarker<m>:X:RELative

This command queries the x-value of the selected delta marker relative to marker 1 or to the reference position (for `CALC:DELT:FUNC:FIX:STAT ON`) in the window specified by the suffix <n>. The command activates the corresponding delta marker, if necessary.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: CALC:DELT3:X:REL?
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:DELTamarker<m>:Y

This command queries the measured value of the selected delta marker in the specified window. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with CALC:NIT:POW or on the activated measuring functions, the query result is output in the units below:

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: INIT:CONT OFF
Switches to single sweep mode.
INIT;*WAI
Starts a sweep and waits for its end.
CALC:DELT2 ON
Switches on delta marker 2.
CALC:DELT2:Y?
Outputs measurement value of delta marker 2.

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, VSA

CALCulate:LIMit subsystem

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute....190
CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe....191
CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]....192
CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult....193
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CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute....194
CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]....195
CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe....195
CALCulate<n>:LIMit<k>:ACPower[:STATe]....196
CALCulate<n>:LIMit<k>:FAIL....197

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper adjacent channel during adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value has no effect on the limit check as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Parameters:

<LowerLimit>, <UpperLimit> first value: -200DBM to 200DBM; limit for the lower and the upper adjacent channel

*RST: -200DBM

Example:
```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe <State>

This command activates the limit check for the adjacent channel when adjacent-channel power measurement (Adjacent Channel Power) is performed. Before the command, the limit check for the channel/adjacent-channel measurement must be globally switched on using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent-channel measurement.
`CALC:LIM:ACP:ACH:REL:STAT ON`
Switches on the check of the relative limit values for adjacent channels.
`CALC:LIM:ACP:ACH:ABS:STAT ON`
Switches on the check of absolute limit values for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative] <LowerLimit>, <UpperLimit>

This command defines the relative limit of the upper/lower adjacent channel for adjacent-channel power measurements. The reference value for the relative limit value is the measured channel power.

It should be noted that the relative limit value has no effect on the limit check as soon as it is below the absolute limit value defined with the `CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute` command. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Parameters:

<LowerLimit>, <UpperLimit> 0 to 100dB; the value for the lower limit must be lower than the value for the upper limit

*RST: 0 dB

Example: `CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult

This command queries the result of the limit check for the upper/lower adjacent channel when adjacent channel power measurement is performed.

If the power measurement of the adjacent channel is switched off, the command produces a query error.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Return values:

Result The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Example:

```
CALC:LIM:ACP:ACH 30DB, 30DB
```

Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```

Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dB.

```
CALC:LIM:ACP ON
```

Switches on globally the limit check for the channel/adjacent channel measurement.

```
CALC:LIM:ACP:ACH:STAT ON
```

Switches on the limit check for the adjacent channels.

```
INIT;*WAI
```

Starts a new measurement and waits for the sweep end.

```
CALC:LIM:ACP:ACH:RES?
```

Queries the limit check result in the adjacent channels.

Mode: A, CDMA, EVDO, TDS, WLAN, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe <State>

This command activates the limit check for the relative limit value of the adjacent channel when adjacent-channel power measurement is performed. Before this command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ACH:STAT ON`
Switches on the check of the relative limit values for adjacent channels.
`CALC:LIM:ACP:ACH:ABS:STAT ON`
Switches on the check of absolute limit values for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper alternate adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value for the limit check has no effect as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values defined in mobile radio standards for the power in adjacent channels.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<LowerLimit>, <UpperLimit> first value: -200DBM to 200DBM; limit for the lower and the upper alternate adjacent channel

*RST: -200DBM

Example: `CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative] <LowerLimit>, <UpperLimit>

This command defines the limit for the alternate adjacent channels for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

Note that the relative limit value has no effect on the limit check as soon as it is below the absolute limit defined with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<LowerLimit>, <UpperLimit> first value: 0 to 100dB; limit for the lower and the upper alternate adjacent channel

*RST: 0 DB

Example: `CALC:LIM:ACP:ALT2 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.

Mode: A, CDMA, EVDO, TDS, WLAN, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe <State>

This command activates the limit check for the alternate adjacent channels for adjacent channel power measurements. Before the command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are obtained.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:LIM:ACP:ALT2 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ALT2:STAT ON`
Switches on the check of the relative limit values for the lower and upper second alternate adjacent channel.
`CALC:LIM:ACP:ALT2:ABS:STAT ON`
Switches on the check of absolute limit values for the lower and upper second alternate adjacent channel.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ALT2:RES?`
Queries the limit check result in the second alternate adjacent channels.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower[:STATe] <State>

This command switches on and off the limit check for adjacent-channel power measurements. The commands `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe` or `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe` must be used in addition to specify whether the limit check is to be performed for the upper/lower adjacent channel or for the alternate adjacent channels.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:LIM:ACP ON`
Switches on the ACLR limit check.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:FAIL

This command queries the result of the limit check of the indicated limit line. It should be noted that a complete sweep must have been performed for obtaining a correct result. A synchronization with *OPC, *OPC? or *WAI should therefore be provided. The result of the limit check is given with 0 for PASS, 1 for FAIL, and 2 for MARGIN.

Suffix:

<n> irrelevant

<k> limit line

Return values:

Return values 0 for pass, 1 for fail

Example: `INIT;*WAI`
Starts a new sweep and waits for its end.
`CALC:LIM3:FAIL?`
Queries the result of the check for limit line 3.

Mode: A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WLAN, WCDMA

CALCulate:LIMit:ESPectrum subsystem

The `CALCulate:LIMit:ESPectrum` subsystem defines the limit check for the Spectrum Emission Mask.

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CALCulate<n>:LIMit<k>:ESPectrum:MODE....198
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive]....198
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNt....199
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe]....199
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum....200
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CALCulate<n>:LIMit<k>:ESPectrum:RESTore....200
CALCulate<n>:LIMit<k>:ESPectrum:VALue....201

CALCulate<n>:LIMit<k>:ESPectrum:LIMits <Limits>

This command sets or queries up to 4 power classes in one step.

Suffix:

<n> irrelevant

<k> irrelevant

Parameters:

<Limits> 1–3 numeric values between -200 and 200, separated by commas

-200, <0-3 numeric values between -200 and 200, in ascending order, separated by commas>, 200

Example: `CALC:LIM:ESP:LIM -50,50,70`
Defines the following power classes:
`<-200, -50>`
`<-50, 50>`
`<50, 70>`
`<70, 200>`
Query:
`CALC:LIM:ESP:LIM?`
Response:
`-200,-50,50,70,200`

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:MODE <Mode>

This command activates or deactivates the automatic selection of the limit line in the Spectrum Emission Mask measurement.

Suffix:

<n> 1...4
window

<k> irrelevant

Parameters:

<Mode> AUTO | MANUAL

AUTO
The limit line depends on the measured channel power.

MANUAL
One of the three specified limit lines is set. The selection is made with the "CALCulate:LIMit:ESPectrum subsystem", on page 197 command.

*RST: AUTO

Example: `CALC:LIM:ESP:MODE AUTO`
Activates automatic selection of the limit line.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] <State>

This command sets the power classes used in the spectrum emission mask measurement. It is only possible to use power classes for which limits are defined. Also, either only one power class at a time or all power classes together can be selected.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:LIM:ESP:PCL1 ON`
Activates the first defined power class.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNt <NoPowerClasses>

This command sets the number of power classes to be defined.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> irrelevant

Parameters:

<NoPowerClasses> 1 to 4

*RST: 1

Example: `CALC:LIM:ESP:PCL:COUN 2`
Two power classes can be defined.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe] <State>

This command defines which limits are evaluated in the measurement.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<State> ABSolute | RELative | AND | OR

ABSolute
Evaluates only limit lines with absolute power values

RELative
Evaluates only limit lines with relative power values

AND
Evaluates limit lines with relative and absolute power values. A negative result is returned if both limits fail.

OR
Evaluates limit lines with relative and absolute power values. A negative result is returned if at least one limit failed.

*RST: REL

Example: `CALC:LIM:ESP:PCL:LIM ABS`

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum <Level>

This command sets the upper limit level for one power class. The unit is dBm. The limit always ends at + 200 dBm, i.e. the upper limit of the last power class can not be set. If more than one power class is in use, the upper limit must equal the lower limit of the next power class.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<Level> **<numeric value>**

*RST: +200

Example: `CALC:LIM:ESP:PCL1:MAX -40 dBm`
Sets the maximum power value of the first power class to -40 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum <Level>

This command sets the minimum lower level limit for one power class. The unit is dBm. The limit always start at – 200 dBm, i.e. the first lower limit can not be set. If more than one power class is in use, the lower limit must equal the upper limit of the previous power class.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<Level> **<numeric_value>**

*RST: -200 for class1, otherwise +200

Example: `CALC:LIM:ESP:PCL2:MIN -40 dBm`
Sets the minimum power value of the second power class to -40 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:RESTore

This command restores the predefined limit lines for the Spectrum Emission Mask

measurement. All modifications made to the predefined limit lines are lost and the factory-set values are restored.

Suffix:
<n> 1...4
window
<k> irrelevant

Example: CALC:LIM:ESP:REST
Resets the limit lines for the Spectrum Emission Mask to the default setting.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:VALue <Power>

This command activates the manual limit line selection and specifies the expected power as a value. Depending on the entered value, one of the predefined limit lines is selected.

Suffix:
<n> 1...4
window
<k> irrelevant

Parameters:
<Power> 33 | 28 | 0

33
P ≥ 33

28
28 < P < 33

0
P < 28

*RST: 0

Example: CALC:LIM:ESP:VAL 33
Activates manual selection of the limit line and selects the limit line for P = 33.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate:MARKer subsystem

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CALCulate<n>:MARKer<m>:MAXimum:LEFT....202
CALCulate<n>:MARKer<m>:MAXimum:NEXT....202
CALCulate<n>:MARKer<m>:MAXimum[:PEAK]....203
CALCulate<n>:MARKer<m>:MAXimum:RIGHt....203
CALCulate<n>:MARKer<m>:MINimum:LEFT....203
CALCulate<n>:MARKer<m>:MINimum:NEXT....204
CALCulate<n>:MARKer<m>:MINimum[:PEAK]....204
CALCulate<n>:MARKer<m>:MINimum:RIGHt....204
CALCulate<n>:MARKer<m>[:STATe]....205
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CALCulate<n>:MARKer<m>:X....206
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CALCulate<n>:MARKer<m>:X:SSIZe....206
CALCulate<n>:MARKer<m>:Y....207

CALCulate<n>:MARKer<m>:AOFF

This command switches off all active markers, delta markers, and marker measurement functions in the specified window.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
irrelevant

Example: `CALC:MARK:AOFF`
Switches off all markers.

Mode: all

CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command positions the marker to the next smaller maximum value to the left of the current value (i.e. in descending X values) on the trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:MARK2:MAX:LEFT`
Positions marker 2 to the next lower maximum value to the left of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command positions the marker to the next smaller maximum value of the corresponding trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:MARK2:MAX:NEXT`
Positions marker 2 to the next lower maximum value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command positions the marker to the current maximum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Example: `CALC:MARK2:MAX`
Positions marker 2 to the maximum value of the trace.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF

CALCulate<n>:MARKer<m>:MAXimum:RIGHt

This command positions the marker to the next smaller maximum value to the right of the current value (i.e. in ascending X values) on the corresponding trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:MARK2:MAX:RIGH`
Positions marker 2 to the next lower maximum value to the right of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:MARKer<m>:MINimum:LEFT

This command positions the marker to the next higher minimum value to the left of the current value (i.e. in descending X direction) on the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: CALC:MARK2:MIN
Positions marker 2 to the minimum value of the trace.
CALC:MARK2:MIN:LEFT
Positions marker 2 to the next higher minimum value to the left of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:MARKer<m>:MINimum:NEXT

This command positions the marker to the next higher minimum value of the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: CALC:MARK2:MIN
Positions marker 2 to the minimum value of the trace.
CALC:MARK2:MIN:NEXT
Positions marker 2 to the next higher maximum value.

Mode: A, ADEMOD, CDMA, EVDO, SPECM, TDS, VSA, WCDMA

CALCulate<n>:MARKer<m>:MINimum[:PEAK]

This command positions the marker to the current minimum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Example: CALC:MARK2:MIN
Positions marker 2 to the minimum value of the trace.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF

CALCulate<n>:MARKer<m>:MINimum:RIGHt

This command positions the marker to the next higher minimum value to the right of the current value (i.e. in ascending X direction) on the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:RIGH`
Positions marker 2 to the next higher minimum value to the right of the current value.

Mode: A, ADEMOD, CDMA, EVDO, SPECM, TDS, VSA, WCDMA

CALCulate<n>:MARKer<m>[:STATe] <State>

This command activates a marker in the specified window. If no indication is made, marker 1 is selected automatically. If activate, the marker is switched to normal mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK3 ON`
Switches on marker 3 or switches to marker mode.

Mode: all

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command assigns the selected marker to the indicated measurement curve in the specified window. The corresponding trace must be active, i.e. its status must not be "BLANK".

If necessary, the corresponding marker is switched on prior to the assignment.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Parameters:

<Trace> **1 to 6**
Selects trace 1 through 6.

Example: `CALC:MARK3:TRAC 2`
Assigns marker 3 to trace 2.

Mode: all

CALCulate<n>:MARKer<m>:X <Position>

This command positions the selected marker to the indicated x-value in the window specified by the suffix <n>.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<Position> 0 to MAX (frequency | sweep time | level)

Example: `CALC:MARK2:X 10.7MHz`
Positions marker 2 to frequency 10.7 MHz.

Mode: ALL

CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] <State>

This command switches between a limited (ON) and unlimited (OFF) search range.

If the power measurement in zero span is active, this command limits the evaluation range on the trace.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:X:SLIM ON`
Switches on search limitation.

Mode: all

CALCulate<n>:MARKer<m>:X:SSIZe <StepSize>

This command defines the step size of the rotary knob for marker or delta marker value changes. It only takes effect in manual operation. It is available for all base unit measurements with the exception of statistics.

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:

<StepSize> STANdard | POINts

STANdard
step size corresponds to space between two pixels

POINts
step size corresponds to space between two measured values (number of measured values is defined via the `[SENSe<n>:]SWEep:POINts` command, see `[SENSe:]SWEep:POINts` on page 272)

*RST: POINts

Example: `CALC:MARK:X:SSIZ STAN`
Sets the measured value step size.

Mode: all

CALCulate<n>:MARKer<m>:Y?

This command queries the measured value of the selected marker in the window specified by the suffix <n>. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed after the change of a parameter and before the query of the Y value. This is only possible in single sweep mode.

In the default setting, the output is made depending on the unit determined with `CALCulate<n>:UNIT:POWer`; only with linear level scaling the output is in %.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Return values:

<Result> The measured value of the selected marker is returned.
In I/Q Analyzer mode, if the result display configuration "Real/Imag (I/Q)" is selected, this query returns the Real (Q) value of the marker first, then the Imag (I) value.

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`CALC:MARK2 ON`
Switches marker 2.
`INIT;*WAI`
Starts a sweep and waits for the end.
`CALC:MARK2:Y?`
Outputs the measured value of marker 2.
In I/Q Analyzer mode, for "Real/Imag (I/Q)", for example:
`1.852719887E-011,0`

Usage: Query only

Mode: ALL

CALCulate:PSE subsystem

CALCulate<n>:PSEarch|PEAKsearch[:IMMediate] 208
CALCulate<n>:PSEarch|PEAKsearch:AUTO 208
CALCulate<n>:PSEarch|PEAKsearch:MARGin 208
CALCulate<n>:PSEarch|PEAKsearch:PSHow 209
CALCulate<n>:PSEarch|PEAKsearch:SUBRanges 209

CALCulate<n>:PSEarch|PEAKsearch[:IMMediate]

This command determines the list of the subrange maximums from the existing sweep results.

Suffix:

<n> irrelevant

Example: `CALC:PSE`
Starts to determine the list.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:AUTO <State>

This command activates or deactivates the list evaluation.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<State> ON | OFF

*RST: ON

Example: `CALC:ESP:PSE:AUTO OFF`
Deactivates the list evaluation.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:MARGin

This command sets the margin used for the limit check/peak search.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<Margin> -200 to 200 dB

*RST: 200 dB

Example: `CALC:ESP:PSE:MARG 100`
Sets the margin to 100 dB.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:PSHow

This command marks all peaks with blue squares in the diagram.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:ESP:PSE:PSH ON`
Marks all peaks with blue squares.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:SUBRanges <NumberPeaks>

This command sets the number of peaks per range that are stored in the list. Once the selected number of peaks has been reached, the peak search is stopped in the current range and continued in the next range.

Suffix:

<n> irrelevant

Parameters:

<NumberPeaks> 1 to 50

*RST: 25

Example: `CALC:PSE:SUBR 10`
Sets 10 peaks per range to be stored in the list.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate:STATistics subsystem

CALCulate<n>:STATistics:CCDF[:STATe] 209
CALCulate<n>:STATistics:NSAMples 210
CALCulate<n>:STATistics:PRESet 210
CALCulate<n>:STATistics:RESult<Trace> 210
CALCulate<n>:STATistics:SCALe:AUTO ONCE 211
CALCulate<n>:STATistics:SCALe:X:RANGe 211
CALCulate<n>:STATistics:SCALe:X:RLEVel 212
CALCulate<n>:STATistics:SCALe:Y:LOWer 212
CALCulate<n>:STATistics:SCALe:Y:UNIT 212
CALCulate<n>:STATistics:SCALe:Y:UPPer 213

CALCulate<n>:STATistics:CCDF[:STATe] <State>

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF). On activating this function, the APD measurement is switched off.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:STAT:CCDF ON`
Switches on the CCDF measurement.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:NSAMples <NoMeasPoints>

This command sets the number of measurement points to be acquired for the statistical measurement functions.

Suffix:

<n> irrelevant

Parameters:

<NoMeasPoints> 100 to 1E9

*RST: 100000

Example: `CALC:STAT:NSAM 500`
Sets the number of measurement points to be acquired to 500.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:PRESet

This command resets the scaling of the X and Y axes in a statistical measurement. The following values are set:

x-axis ref level:	-20 dBm
x-axis range APD:	100 dB
x-axis range CCDF:	20 dB
y-axis upper limit:	1.0
y-axis lower limit:	1E-6

Suffix:

<n> irrelevant

Example: `CALC:STAT:PRES`
Resets the scaling for statistical functions

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:RESult<Trace> <ResultType>

This command reads out the results of statistical measurements of a recorded trace.

Suffix:

<n> irrelevant

<Trace> 1...6
trace

Parameters:

<ResultType> MEAN | PEAK | CFACtor | ALL

MEAN
Average (=RMS) power in dBm measured during the measurement time.

PEAK
Peak power in dBm measured during the measurement time.

CFACtor
Determined CREST factor (= ratio of peak power to average power) in dB.

ALL
Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

The required result is selected via the following parameters:

Example: `CALC:STAT:RES2? ALL`
Reads out the three measurement results of trace 2. Example of answer string: 5.56,19.25,13.69 i.e. mean power: 5.56 dBm, peak power 19.25 dBm, CREST factor 13.69 dB

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:AUTO ONCE

This command optimizes the level setting of the instrument depending on the measured peak power, in order to obtain maximum instrument sensitivity.

To obtain maximum resolution, the level range is set as a function of the measured spacing between peak power and the minimum power for the APD measurement and of the spacing between peak power and mean power for the CCDF measurement. In addition, the probability scale for the number of test points is adapted.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Suffix:

<n> irrelevant

Example: `CALC:STAT:SCAL:AUTO ONCE;*WAI`
Adapts the level setting for statistical measurements.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:X:RANGe <Value>

This command defines the level range for the x-axis of the measurement diagram. The setting is identical to the level range setting defined with the `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` command.

Suffix:

<n> irrelevant

Parameters:
<Value> 10dB to 200dB

*RST: 100dB
Example: `CALC:STAT:SCAL:X:RANG 20dB`
Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:X:RLEVel <Value>

This command defines the reference level for the x-axis of the measurement diagram. The setting is identical to the reference level setting using the `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` command.

With the reference level offset <> 0 the indicated value range of the reference level is modified by the offset.

The unit depends on the setting performed with `CALCulate<n>:UNIT:POWer`.
Suffix:
<n> irrelevant

Parameters:
<Value> -120dBm to 20dBm

*RST: -20dBm
Example: `CALC:STAT:SCAL:X:RLEV -60dBm`
Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:Y:LOWer <Value>

This command defines the lower limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.
Suffix:
<n> selects the screen

Parameters:
<Value> 1E-9 to 0.1

*RST: 1E-6
Example: `CALC:STAT:SCAL:Y:LOW 0.001`
Mode: A, CDMA, EVDO, TDS, VSA, WCDMA

CALCulate<n>:STATistics:SCALe:Y:UNIT <Unit>

This command defines the scaling type of the y-axis.
Suffix:
<n> selects the screen

Parameters:
<Unit> PCT | ABS

*RST: ABS

Example: `CALC:STAT:SCAL:Y:UNIT PCT`
Sets the percentage scale.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:Y:UPPer <Value>

This command defines the upper limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

Suffix:
<n> irrelevant

Parameters:
<Value> 1E-8 to 1.0

*RST: 1.0

Example: `CALC:STAT:Y:UPP 0.01`

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

Other Referenced CALCulate Commands

CALCulate<n>:THReshold....213
CALCulate<n>:UNIT:POWer....213

CALCulate<n>:THReshold <Mode>

This command defines the threshold value for the maximum/minimum search of markers with marker search functions. The associated display line is automatically switched on.

Suffix:
<n> irrelevant

Parameters:
<Mode> MINimum to MAXimum (depending on current unit)

*RST: (STATe to OFF)

Example: `CALC:THR -82DBM`
Sets the threshold value to -82 dBm.

Mode: A, ADEMOD, EVDO, SPECM, CDMA, TDS

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit for power.

The unit is defined globally for all windows.

Suffix:
<n> irrelevant

Parameters:
<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere

*RST: dBm

Example: `CALC:UNIT:POW DBM`
Sets the power unit to dBm.

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

4.5.3 CONFigure Subsystem

The CONFigure subsystem contains commands for configuring the measurements.

4.5.3.1 CONFigure:CDPower Subsystem (K82/K84)

This subsystem contains the commands for measurement selection and configuration.

Further setting commands for the spectrum emission mask measurement are described in the `CALCulate:ESPectrum` subsystem.

CONFigure:CDPower[:BTS]:BANDclass....214
CONFigure:CDPower[:BTS]:BCLass....214
CONFigure:CDPower[:BTS]:CTABle[:STATe]....216
CONFigure:CDPower[:BTS]:CTABle:CATalog....216
CONFigure:CDPower[:BTS]:CTABle:COMMent....216
CONFigure:CDPower[:BTS]:CTABle:COPY....217
CONFigure:CDPower[:BTS]:CTABle:DATA....217
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CONFigure:CDPower[:BTS]:MEASurement....222

CONFigure:CDPower[:BTS]:BANDclass
CONFigure:CDPower[:BTS]:BCLass <Bandclass>

This command selects the bandclass for the measurement.

Parameters:

<Bandclass> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 21 | 22

0
800 MHz band

1
1900 MHz PCS

2
TACS band

3
(3A) JTACS band, see "Bandclass" on page 97.

4
Korean PCS band

5
450 MHz NMT

6
2 GHz IMT-2000

7
700 MHz band

8
1800 MHz band

9
900 MHz band

10
Secondary 800 MHz band

11
400 MHz European PAMR band

12
800 MHz PAMR band

13
2.5 GHz IMT2000 Extension

14
US PCS 1.9GHz Band

15
AWS Band

16
US 2.5 GHz

17
US 2.5 GHz

21
(3B) JTACS band, see "Bandclass" on page 97.

22

(3C) JTACS band, see "Bandclass" on page 97.

*RST: 0

Example: `CONF:CDP:BCL 1`
Selects band class 1, 1900 MHz

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle[:STATe] <State>

This command activates or deactivates the "RECENT" channel table. To select another channel table, use the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CONF:CDP:CTAB OFF`
Deactivates the RECENT channel table and activates a predefined channel table.
`CONF:CDP:CTAB:SEL 'CTAB_1'`
Selects channel table 'CTAB_1'.

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:CATalog?

This command queries the names of all the channel tables stored on the flash disk for the current application (CDMA/1xEVDO).

Parameters:

<sum of file sizes of all subsequent files>, <spare storage space on hard disk>, <1st file name>, <1st file size>, <2nd file name>, <2nd file size>, …, <nth file name>, <nth file size>, …

Example: `CONF:CDP:CTAB:CAT?`
Queries catalog.

Usage: Query only

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:COMMent <Comment>

This command defines a comment on the selected channel table.

Parameters:

<Comment> <'string'> = comment on the channel table

Example: `CONF:CDP:CTAB:NAME 'NEW_TAB'`
Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created.
`CONF:CDP:CTAB:DATA 0,6,0,0,0,0,1,0.0,10,5,3,4,0,0,1,0.0`
Defines a table with the following channels: PICH 0.64 and data channel with RC4/Walsh code 3.32.
`CONF:CDP:CTAB:COMM 'Comment for NEW_TAB'`
Specifies 'Comment for NEW_TAB' as comment.

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:COPY <TargetFileName>

This command copies one channel table to another. Select the channel table you want to copy using the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Parameters:
<TargetFileName> <'string'> = name of the new channel table.

Example: `CONF:CDP:CTAB:NAME 'CTAB_1'`
Selects channel table CTAB_1 for copying.
`CONF:CDP:CTAB:COPY 'CTAB_2'`
Copies CTAB_1 to CTAB_2.

Usage: Event

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:DATA <ChannelType>, <CodeClass>, <CodeNumber>, <Modulation>, <Reserved1>, <Reserved2>, <Status>, <CDPRelative>

This command defines a channel table. The following description applies to EVDO BTS mode (K84) only.

For MS mode, see `CONFigure:CDPower[:BTS]:CTABle:DATA` on page 218.

Before using this command, you must set the name of the channel table using the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Parameters:
<ChannelType> The channel type is numerically coded as follows:
0 = PILOT
1 = MAC
2 = PREAMBLE with 64 chip length
3 = PREAMBLE with 128 chip length
4 = PREAMBLE with 256 chip length
5 = PREAMBLE with 512 chip length
6 = PREAMBLE with 1024 chip length
7 = DATA

<CodeClass> Depending on channel type, the following values are allowed:
PILOT: 5
MAC: 6
PREAMBLE: 5
DATA: 4 (spreading factor = $2^{\text{code class}}$)

<CodeNumber> 0…spreading factor-1

<Modulation> Modulation type including mapping:
0 = BPSK-I
1 = BPSK-Q
2 = QPSK
3 = 8-PSK
4 = 16-QAM
Modulation types QPSK/8-PSK/16-QAM have complex values.

<Reserved1> Always 0 (reserved)

<Reserved2> Always 0 (reserved)

<Status> 0: inactive, 1: active
Can be used in a setting command to disable a channel temporarily

<CDPRelative> Power value in dB.

Example: `CONF:CDP:CTAB:NAME 'NEW_TAB'`
Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created.
`CONF:CDP:CTAB:DATA`
`0,6,0,0,0,0,1,0.0,10,5,3,4,0,0,1,0.0`
Defines a table with the following channels: PICH 0.64 and data channel with RC4/Walsh code 3.32.

Mode: EVDO BTS

CONFigure:CDPower[:BTS]:CTABle:DATA <ChannelType>, <CodeClass>, <CodeNumber>, <Mapping>, <Activity>, <Reserved1>, <Status>, <Reserved2>

This command defines a channel table. The following description applies to EVDO MS mode (K85) only. For BTS mode, see `CONFigure:CDPower[:BTS]:CTABle:DATA` on page 217.

Before using this command, you must set the name of the channel table using the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Parameters:

<ChannelType> The channel type is numerically coded as follows:
0 = PICH
1 = RRI
2 = DATA
3 = ACK
4 = DRC
5 = INACTIVE

<CodeClass> 2 to 4

<CodeNumber> 0…15

<Mapping> 0 = I branch
1 = Q branch

<Activity> 0..65535 (decimal)
The decimal number - interpreted as a binary number in 16 bits - determines the half slot in which the channel is active (value 1) or inactive (value 0). See table 4-16.

<Reserved1> Always 0 (reserved)

<Status> 0: inactive, 1: active
Can be used in a setting command to disable a channel temporarily

<Reserved2> Always 0 (reserved)

Example:
```
"INST:SEL MDO"
```
'Activate 1xEV–DO MS
```
"CONF:CDP:CTAB:NAME 'NEW_TAB'"
```
'Select table to edit
```
"CONF:CDP:CTAB:DATA 0,4,0,0,65535,0,1,0,
1,4,0,0,43690,0,1,0,
2,2,2,1,65535,0,1,0"
```
'Selects PICH 0.16 on I with full activity, RRI 0.16 on I in each even–numbered half slot, and DATA 2.4 on Q with full activity.

Mode: EVDO MS

Table 4-16: Examples for <Activity> parameter settings

Dec.	Binary	Description
65535	1111 1111 1111 1111	Channel is active in each half slot(e.g. DATA)
43690	1010 1010 1010 1010	Channel is active in half slot 0, 2, 4 etc(e.g. RRI)
24576	0110 0000 0000 0000	Channel is active in half slot 1 and 2(e.g. DRC)

CONFigure:CDPower[:BTS]:CTABle:DELete

This command deletes the selected channel table. Select the channel table you want to delete using the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Example:
```
CONF:CDP:CTAB:NAME 'CTAB_1'
```
Selects channel table CTAB_2 for deleting.
```
CONF:CDP:CTAB:DEL
```
Deletes channel table CTAB_2.

Usage: Event

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:NAME <ChannelTable>

This command selects a channel table for editing or creating. To select a command for analysis, use the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Parameters:

<ChanTableName> <'string'> = name of the channel table

Example: `CONF:CDP:CTAB:NAME 'NEW_TAB'`
Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created.

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:RESTore

This command restores the predefined channel tables to their factory-set values. In this way, you can undo unintentional overwriting.

Example: `CONF:CDP:CTAB:REST`
Restores the channel table.

Usage: Event

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:SELect <ChannelTable>

This command selects a predefined channel table.

Parameters:

<ChanTableName> <'string'> = name of the channel table

*RST: "RECENT"

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:MCARrier [:STATe] <State>

This command activates or deactivates the multi-carrier mode.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CONF:CDP:MCAR ON`
Activates the multi-carrier settings.

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:MCARrier:FILTer [:STATe] <State>

This command activates or deactivates the usage of a filter for multi-carrier measurements.

Parameters:
<State> ON | OFF

*RST: OFF

Example: `CONF:CDP:MCAR ON`
Activates multi-carrier mode
`CONF:CDP:MCAR:FILT OFF`
Activates an additional filter for multi-carrier measurements

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency <Frequency>

This command sets the cut-off frequency for the RRC filter.

Parameters:
<Frequency>

Range: 0.1 MHz to 2.4 MHz
*RST: 1.25

Example: `CONF:CDP:MCAR ON`
Activates multi-carrier mode
`CONF:CDP:MCAR:FILT ON`
Activates an additional filter for multi-carrier measurements
`CONF:CDP:MCAR:FILT:TYPE RRC`
Activates the RRC filter
`CONF:CDP:MCAR:FILT:COFR 1.5MHZ`
Sets the cut-off frequency to 1.5 MHz

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF <RollOffFactor>

This command sets the roll-off factor for the RRC filter.

Parameters:
<RollOffFactor>

Range: 0.01 to 0.99
*RST: 0.02

Example: `CONF:CDP:MCAR ON`
Activates multi-carrier mode
`CONF:CDP:MCAR:FILT ON`
Activates an additional filter for multi-carrier measurements
`CONF:CDP:MCAR:FILT:TYPE RRC`
Activates the RRC filter
`CONF:CDP:MCAR:FILT:ROFF 0.05`
Sets the roll-off factor to 0.05

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE <Type>

This command sets the filter type to be used in multi-carrier mode.

You can set the parameters for the RRC filter with the CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF on page 221 and CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency on page 221 commands.

Parameters:

<Type> LPASs | RCC

*RST: LPAS

Example:
```
CONF:CDP:MCAR ON
```
Activates multi-carrier mode
```
CONF:CDP:MCAR:FILT ON
```
Activates an additional filter for multi-carrier measurements
```
CONF:CDP:MCAR:FILT:TYPE RRC
```
Activates the RRC filter

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:MCARrier:MALGo <State>

This command activates or deactivates the enhanced algorithm for the filters in multi-carrier mode.

Parameters:

<State> ON | OFF

*RST: ON

Example:
```
CONF:CDP:MCAR ON
```
Activates multi-carrier mode
```
CONF:CDP:MCAR:FILT ON
```
Activates an additional filter for multi-carrier measurements
```
CONF:CDP:MCAR:MALG OFF
```
Deactivates the enhanced algorithm

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:MEASurement <Measurement>

This command selects the measurement type.

Parameters:

<Measurement> ACLR | CCDF | CDPower | ESPectrum | OBWidth | POWer

ACLR
Adjacent-Channel Power measurement
(with predefined settings according to the CDMA2000 standard)

CCDF
measurement of the complementary cumulative distribution function (signal statistics)

CDPower
Code Domain Analyzer measurement.

ESPectrum
check of signal power (Spectrum Emission Mask)

OBWidth
measurement of the occupied bandwidth

POWer
Signal Channel Power measurement
(with predefined settings according to the CDMA2000 standard)

*RST: CDPower

Example: `CONF:CDP:MEAS POW`
Selects Signal Channel Power measurement.

Mode: CDMA, EVDO

4.5.4 DISPlay Subsystem

The DISPLay subsystem controls the selection and presentation of textual and graphic information as well as of measurement data on the display.

DISPlay[:WINDow<n>]:MTABle....224
DISPlay[:WINDow<n>]:SIZE....224
DISPlay[:WINDow<n>]:SSELect....224
DISPlay[:WINDow<n>]:STATe....225
DISPlay[:WINDow<n>]:TRACe<t>:MODE....225
DISPlay[:WINDow<n>]:TRACe<t>[:STATe]....226
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]....226
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO....226
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DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel....228
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet....228
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition....228
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue....229
DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing....229
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MAXimum....229
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MINimum....230

DISPlay[:WINDow<n>]:MTABle <DisplayMode>

This command toggles the display of the marker table. With automatic display, the table is displayed if 2 or more markers are active.

Suffix:

<n> irrelevant

Parameters:

<DisplayMode> ON | OFF | AUTO

ON
Marker table is displayed.

OFF
Marker table is not displayed.

AUTO
Marker table is only displayed if 2 or more markers are active.

*RST: AUTO

Example: To activate the table display:

```
DISP:MTAB ON
```

To query the current state of the marker table display:

```
DISP:MTAB?
```

Mode: All

DISPlay[:WINDow<n>]:SIZE <Size>

This command enlargens the measurement window indicated by the suffix to full screen. The result display of the screen is, by default, the same as that of the first measurement screen.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<Size> SMALl | LARGe

*RST: SMALl

Example:

```
DISP:WIND2:SIZE LARG
```

Maximizes the second measurement screen

Mode: CDMA, EVDO

DISPlay[:WINDow<n>]:SSELect

This command selects which window (screen) is active.

Suffix:

<n> 1...4
window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

*RST: 1

Example: `DISP:WIND1:SSEL`
Sets the window 1 active.

Mode: CDMA, EVDO

DISPlay[:WINDow<n>]:STATe <State>

Activates/deactivates the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background:

Suffix:
<n> window

Parameters:
<State> ON | OFF

*RST: OFF

Example: `DISP:WIND3:STAT ON`
Turns on a third measurement screen.

Mode: CDMA, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command defines the type of display and the evaluation of the traces in the window specified by the suffix <n>. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]`.

The number of measurements for AVERage, MAXHold and MINHold is defined with the `[SENSe:]AVERage<n>:COUNt` or `[SENSe:]SWEep:COUNt` commands. It should be noted that synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:
<Mode> WRITe | VIEW | AVERage | MAXHold | MINHold | BLANk

*RST: WRITe for TRACe1, STATe OFF for TRACe2/3/4/5/6
For details on trace modes refer to chapter 4.4.4.4, "Trace Mode Overview", on page 152.

Example: `INIT:CONT OFF`
Switching to single sweep mode.
`SWE:COUN 16`
Sets the number of measurements to 16.
`DISP:TRAC3:MODE MAXH`
Switches on the calculation of the maximum peak for trace 3.
`INIT;*WAI`
Starts the measurement and waits for the end of the 16 sweeps.

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command switches on or off the display of the corresponding trace in the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:

<State> ON | OFF

*RST: ON for TRACe1, OFF for TRACe2 to 6

Example: `DISP:TRAC3 ON`

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis (level axis) with logarithmic scaling (`DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 229) in the window specified by the suffix <n>.

For linear scaling, the display range is fixed and cannot be modified.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Range> 10 dB to 200 dB or value in Hz

*RST: 100dB

Example: `DISP:TRAC:Y 110dB`

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO <Mode>

This command switches on or off automatic scaling of the Y-axis for the specified trace display. Automatic scaling sets the Y-axis to automatically scale to best fit the measurement results.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> only 1
trace

Parameters:

<Mode> ON | OFF | ONCE

ON
Automatic scaling is on.

OFF
Automatic scaling is off.

ONCE
Automatic scaling is performed once, then switched off again.

*RST: OFF

Example: `DISP:WIND2:TRAC:Y:SCAL:AUTO ONCE`
Activates automatic scaling of the Y-axis for the active trace

Mode: CDMA, EVDO, OFDM, OFDMA/WiBro, PHN

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>

This command defines the scale type of the y-axis (absolute or relative) in the window specified by the suffix <n>.

When `SYSTem:DISPlay:UPDate` is set to OFF, this command has no immediate effect on the screen (see `SYSTem:DISPlay:UPDate` on page 298).

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Mode> ABSolute | RELative

*RST: ABS

Example: `DISP:TRAC:Y:MODE REL`

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision <Value>

This remote command determines the grid spacing on the Y axis for all diagrams, where possible.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> numeric value; the unit depends on the result display

*RST: depends on the result display

Example: `DISP:TRAC:Y:PDIV 10`
Sets the grid spacing to 10 units (for example 10 dB in the Code Domain Power result display).

Mode: CDMA, BT, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <Value>

This command sets the reference level.

With the reference level offset <> 0, the indicated value range of the reference level is modified by the offset.

Suffix:

<n> irrelevant.

<t> irrelevant

Parameters:

<Value> <numeric_value>, range specified in data sheet

*RST: -10dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, VSA, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command sets the reference level offset.

Suffix:

<n> irrelevant.

<t> irrelevant

Parameters:

<Value> -200dB to 200dB

*RST: 0dB

Example: `DISP:TRAC:Y:RLEV:OFFS -10dB`

Mode: ALL

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This remote command defines the position of the reference value on the Y axis (1 – 100 %) in the window specified by the suffix <n>.

When using a tracking generator (only with option R&S FSV-B9 or -B10, requires active normalization), and in Bluetooth mode (option R&S FSV-K8) this command defines the position of the reference value for all windows.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Position> 0 to 100PCT

*RST: 100 PCT = "Spectrum" mode, AF spectrum display; 50 PCT = Tracking Generator mode or time display

Example: `DISP:TRAC:Y:RPOS 50PCT`

Mode: A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD, VSA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator (only with option R&S FSV-B9 or -B10), this command requires active normalization.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> <numeric_value>

*RST: 0 dB, coupled to reference level

Example:
```
DISP:TRAC:Y:RVAL -20dBm
```
(Analyzer)
```
DISP:TRAC:Y:RVAL 0
```
Sets the power value assigned to the reference position to 0 dB (tracking generator)

Mode: A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling for the level display range in the window specified by the suffix <n>.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<ScalingType> LOGarithmic | LINear | LDB

LOGarithmic
Selects logarithmic scaling.

LINear
Selects linear scaling in %.

LDB
Selects linear scaling in dB.

*RST: LOGarithmic

Example:
```
DISP:TRAC:Y:SPAC LIN
```

Mode: A, ADEMOD, BT, VSA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MAXimum <Value>

This command defines the maximum value of the y-axis for the selected result display.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Value> <numeric value>

*RST: depends on the result display
The unit and range depend on the result display.

Example:
```
DISP:TRAC:Y:MIN -60
DISP:TRAC:Y:MAX 0
```
Defines the y-axis with a minimum value of -60 and maximum value of 0.

Mode: CDMA, EVDO

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MINimum <Value>

This command defines the minimum value of the y-axis for the selected result display.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Value> <numeric value>

*RST: depends on the result display
The unit and range depend on the result display.

Example:
```
DISP:TRAC:Y:MIN -60
DISP:TRAC:Y:MAX 0
```
Defines the y-axis with a minimum value of -60 and maximum value of 0.

Mode: CDMA, EVDO

4.5.5 INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

INSTrument[:SELect]....230
INSTrument:NSELect....230

INSTrument[:SELect] <Mode>

Parameters:

<Mode> BC2K

This command switches to the CDMA2000 BTS Analysis mode (R&S FSV-K82 option)

INSTrument:NSELect <Mode>

Parameters:

<Mode> 10

This command switches to the CDMA2000 BTS Analysis mode (R&S FSV-K82 option)

4.5.6 SENSe Subsystem

The SENSe subsystem controls the essential parameters of the analyzer. In accordance with the SCPI standard, the keyword SENSe is optional, which means that it is not necessary to include the SENSe node in command sequences.

Note that most commands in the SENSe subsystem are identical to the base unit; only the commands specific to this option are described here.

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4.5.6.1 SENSe:CDPower Subsystem

This subsystem sets the parameters for the code domain measurements mode.

[SENSe:]CDPower:ANTenna....232
[SENSe:]CDPower:CODE....232
[SENSe:]CDPower:ICThreshold....232
[SENSe:]CDPower:IQLength....233
[SENSe:]CDPower:LEVel:ADJust....233
[SENSe:]CDPower:MAPPing....233
[SENSe:]CDPower:LCODe:MASK....233
[SENSe:]CDPower:LCODe:OFFSet....234
[SENSe:]CDPower:LCODe:MODE....235
[SENSe:]CDPower:NORMalize....235
[SENSe:]CDPower:ORDer....235
[SENSe:]CDPower:OVERview....236
[SENSe:]CDPower:PNOFfset....236
[SENSe:]CDPower:PPReference....236
[SENSe:]CDPower:PREFerence....236
[SENSe:]CDPower:QINVert....237
[SENSe:]CDPower:SBANd....237

[SENSe:]CDPower:SET:COUNt....237
[SENSe:]CDPower:SET....238
[SENSe:]CDPower:SFACtor....238
[SENSe:]CDPower:SLOT....238
[SENSe:]CDPower:TPMeas....239

[SENSe:]CDPower:ANTenna <AntennaState>

This command deactivates the orthogonal transmit diversity (two-antenna system) or defines the antenna for which the result display evaluated.

Parameters:

<AntennaState> OFF | 1 | 2

OFF
The aggregate signal from both antennas is fed in.

1
The signal of antenna 1 is fed in.

2
The signal of antenna 2 is fed in.

*RST: OFF
For further details refer to "Antenna Diversity" on page 70.

Example: `CDP:ANT 2`
Selects antenna 2.

Mode: CDMA

[SENSe:]CDPower:CODE <CodeNo>

This command selects the code number.

For further details refer to "Channel (Code) Number" on page 73.

Parameters:

<CodeNo> <numeric value>

Range: 0 to base spreading factor - 1
Increment: 1
*RST: 0

Example: `CDP:CODE 8`
Selects the eighth channel.

Mode: CDMA

[SENSe:]CDPower:ICThreshold <ThresholdLevel>

This command defines the minimum power that a single channel must have compared to the total signal in order to be regarded as an active channel. Channels below the specified threshold are regarded as "inactive".

Parameters:
<ThresholdLevel>
Range: -100 dB to 0 dB
*RST: -60 dB
Example: `CDP:ICT -50`
Sets the Inactice Channel Threshold to -50 dB.
Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:IQLength <CaptureLength>

This command sets the capture length in multiples of the power control group.

Parameters:
<CaptureLength>
Range: 2 to 64
*RST: 3
Example: `SENS:CDP:IQLength 3`
Mode: CDMA

[SENSe:]CDPower:LEVel:ADJust

This command adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the analyzer or limiting the dynamic range by an S/N ratio that is too small.

Example: `CDP:LEV:ADJ`
Adjusts the reference level.
Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:MAPPing <SignalComponent>

This command switches between I and Q component of the signal.

Parameters:
<SignalComponent> I | Q
*RST: Q
Example: `CDP:MAPP Q`
Mode: CDMA, WCDMA

[SENSe:]CDPower:LCODe:MASK <Mask>

Defines the long code mask of the mobile in hexadecimal form.

Note: For the default mask value of 0 the long code offset (see) is not taken into consideration.

Parameters:
<Mask>
Range: #H0 to #H4FFFFFFFFF
*RST: #H0

Example:
```
INST:SEL MC2K
```
'Activate cdma2000 MS; by default, "CDP relative" is displayed in screen A and "Result Summary" in screen B.
```
INIT:CONT OFF
```
'Select single sweep
```
TRIG:SOUR:EXT
```
'Select external trigger source
```
CDP:LCOD:MASK '#HF'
```
'Define long code mask
```
INIT;*WAI
```
'Start measurement with synchronization

Mode: CDMA

[SENSe:]CDPower:LCODe:OFFSet <CodeOffset>

Defines the long code offset, including the PN offset. This offset is applied at the next trigger pulse (which cannot occur until a setup time of 300 ms has elapsed).

This command is ignored if `[SENSe:]CDPower:LCODe:MASK` is set to 0.

Parameters:
<CodeOffset> **Offset in chips in hexadecimal format with a 52-bit resolution. The chips offset is calculated as follows: tSinceStartGPS * 1.2288 MChips/s, where tSinceStartGPS is defined in seconds.**
This value corresponds to the GPS timing since 6.1.1980 00:00:00 UTC.

*RST: #H0

Example: The hexadecimal offset of 258000 h chips is set for the first even second clock trigger:
```
INST:SEL MC2K
```
'Activate cdma2000 MS; by default, "CDP relative" is displayed in screen A and "Result Summary" in screen B.
```
INIT:CONT OFF
```
'Select single sweep
```
TRIG:SOUR:EXT
```
'Select external trigger source
```
CDP:LCOD:MASK '#H2'
```
'Define long code mask
```
CDP:LCOD:OFFS '#H258000'
```
'Define long code offset
```
INIT;*WAI
```
'Start measurement with synchronization

Mode: CDMA

[SENSe:]CDPower:LCODe:MODE <Mode>

This command selects the mode of the long code generation.

Parameters:

<Mode>

STANdard
The cdma2000 standard long code generator is used.

ESG101
The Agilent ESG option 101 long code is used; in this case, only signals from that generator can be analysed.

*RST: STANdard

Mode: CDMA

[SENSe:]CDPower:NORMalize <boolean>

This command activates or deactivates the elimination of the IQ offset from the signal.

Parameters:

<ON | OFF>

*RST: OFF

Example: `CDP:NORM ON`
Activates normalization.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:ORDer <SortOrder>

This command sets the channel sorting for the Code Domain Power and Code Domain Error Power result displays.

Parameters:

<SortOrder> HADamard | BITReverse

*RST: HADamard
For further details refer to "Code Order" on page 73.

Example: `CDP:ORD HAD`
Sets Hadamard order.
`TRAC? TRACE2`
Reads out the results in Hadamard order.
`CDP:ORD BITR`
Sets BitReverse order.
`TRAC? TRACE2`
Reads out the results in BitReverse order.

Mode: CDMA

[SENSe:]CDPower:OVERview <State>

This command switches to an overview display of a code domain measurement (CDP rel./CDP abs./ CDEP). If enabled, the I branch of the code power is displayed in screen A and the Q branch in screen B. Both results can be read using `TRACE:DATA? TRACE1` and `TRACE:DATA? TRACE2`; respectively. If disabled, screen A displays the I branch and screen B provides the result summary display.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CDP:OVER OFF`

Mode: CDMA, EVDO, WCDMA

[SENSe:]CDPower:PNOFfset <Offset>

This command sets the PN offset of the base station in multiples of 64 chips.

Parameters:

<Offset>

Range: 0 to 511

*RST: 0

Example: `CDP:PNOF 45`

Sets PN offset.

Mode: CDMA

[SENSe:]CDPower:PPReference <Mode>

This command defines how the pilot channel power is displayed in the absolute summary. In relative mode, the reference power is the total power.

Parameters:

<Mode> ABS | REL

*RST: ABS

Example: `CDP:PPR REL`

Pilot channel power is displayed in relation to the total power.

Mode: CDMA

[SENSe:]CDPower:PREFerence <Power>

This command specifies the reference power for the relative power result displays (e.g. Code Domain Power, Power vs PCG).

Parameters:

<Power> PICH | TOTal

PICH
The reference power is the power of the pilot channel. Which pilot channel is used as reference depends on the antenna diversity (for details see `[SENSe:]CDPower:ANTenna` on page 232 command).

TOTal
The reference power is the total power of the signal referred per PCG to the corresponding PCG.

*RST: PICH
For further information refer to "Power Reference" on page 74

Example: `CDP:PREF TOT`
Sets total power as reference power.

Mode: CDMA

[SENSe:]CDPower:QINVert <State>

This command inverts the Q component of the signal.

Parameters:

ON | OFF

*RST: OFF

Example: `CDP:QINV ON`
Activates inversion of Q component.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:SBANd <NORMal | INVers>

This command is used to swap the left and right sideband.

Parameters:

<NORMal | INVers>

*RST: NORM

Example: `CDP:SBAN INV`
Switches the right and left sideband.

Mode: CDMA, EVDO, TDS

[SENSe:]CDPower:SET:COUNt <NoOfSets>

This command sets the number of sets to be captured and stored in the instrument's memory.

Refer to "Set Count" on page 62 for more information.

Parameters:
<NoOfSets>
Range: 1 to TDS: 99; CDMA: 490
Increment: 1
*RST: 1
Example: `CDP:SET:COUN 12`
Sets the number of sets to 12.
Mode: TDS

[SENSe:]CDPower:SET <SetNo>

This command selects a specific set for further analysis. The number of sets has to be defined with the `[SENSe:]CDPower:SET` command before using this command.

Parameters:
<SetNo>
Range: 0 to SET COUNT -1
Increment: 1
*RST: 0
Example: `CDP:SET:COUN 10`
Selects the 10th set for further analysis.
Mode: CDMA, EVDO, TDS

[SENSe:]CDPower:SFACtor <SpreadingFactor>

This command defines the base spreading factor. If the base spreading factor of 64 is used for channels with a spreading factor of 128 (code class 7), an alias power is displayed in the Code Domain Power and Code Domain Error Power diagrams.

Parameters:
<SpreadingFactor> 64 | 128
*RST: 64
Example: `CDP:SFAC 128`
Selects base spreading factor 128.
Mode: CDMA

[SENSe:]CDPower:SLOT <numeric value>

This command selects the slot/Power Control Group (PCG) to be analyzed.

Parameters:
<numeric value>
Range: 0 to TDS: 62; CDMA: (capture length-1); WCDMA. 14
Increment: 1
*RST: 0
The capture length is defined via the `[SENSe:]CDPower:IQLength` on page 233 command.

Example: `CDP:SLOT 7`
Selects slot number 7 for analysis.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:TPMeas <State>

This command actives or deactivates the timing and phase offset evaluation of the channels to the pilot.

The results are queried using the `TRACe<n>[:DATA]` on page 277 command and the `CALCulate<1…4>:MARKer<1…4>:FUNCtion:CDPower[:BTS]:RESult?` command.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CDP:TPM ON`
Activates timing and phase offset.
`CDP:SLOT 2`
Selects power control group 2.
`CDP:CODE 11`
Selects code number 11.
`CALC:MARK:FUNC:CDP:RES? TOFF`
Reads out timing offset of the code with number 11 in PCG 2.
`CALC:MARK:FUNC:CDP:RES? POFF`
Reads out the phase offset of the code with number 11 in PCG 2.

Mode: CDMA

4.5.6.2 Other SENSe Commands Referenced in this Manual

SENSe:ADJust Subsystem

[SENSe:]ADJust:ALL....239
[SENSe:]ADJust:CONFigure:LEVel:DURation....240
[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE....240
[SENSe:]ADJust:FREQuency....240
[SENSe:]ADJust:LEVel....240

[SENSe:]ADJust:ALL

Activates all automatic settings:

- Frequency
- Level

Example: `ADJ:ALL`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

[SENSe:]ADJust:CONFigure:LEVel:DURation <Duration>

Defines the duration of the level measurement used to determine the optimal reference level automatically (for `SENS:ADJ:LEV ON`).

Parameters:

<Duration> <numeric value> in seconds

Range: 0.001 to 16000.0
*RST: 0.001
Default unit: s

Example: `ADJ:CONF:LEV:DUR:5`

Mode: A, ADEMOD, CDMA, EVDO, TDS, VSA, WCDMA

[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE <Mode>

Defines whether the duration of the level measurement used to determine the optimal reference level (for `SENS:ADJ:LEV`) is determined automatically or if the value defined via `[SENSe:]ADJust:CONFigure:LEVel:DURation` is used.

Parameters:

<Mode> AUTO | MANual

*RST: AUTO

Example: `ADJ:CONF:LEV:DUR:MODE MAN`
Specifies manual definition of the measurement duration.
`ADJ:CONF:LEV:DUR:5`
Specifies the duration manually.

Mode: A, CDMA, EVDO, TDS, VSA, WCDMA

[SENSe:]ADJust:FREQuency

Defines the center frequency automatically by determining the highest level in the frequency span.

Example: `ADJ:FREQ`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

[SENSe:]ADJust:LEVel

This command automatically sets the optimal reference level for the current measurement.

Example: `ADJ:LEV`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

SENSe:ESPectrum Subsystem

This subsystem sets the parameters for the code domain measurements mode.

[SENSe:]ESPectrum:BWID.....241

[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa....242
[SENSe:]ESPectrum:FILTer[:RRC][:STATe]....242
[SENSe:]ESPectrum:HighSPeed....242
[SENSe:]ESPectrum:PRESet[:STANdard]....243
[SENSe:]ESPectrum:PRESet:RESTore....243
[SENSe:]ESPectrum:PRESet:STORe....243
[SENSe:]ESPectrum:RANGe<range>:BANDwidth....244
[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo....244
[SENSe:]ESPectrum:RANGe<range>:COUNt....244
[SENSe:]ESPectrum:RANGe<range>:DELete....245
[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE....245
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt....245
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP....246
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation....246
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO....247
[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe....247
[SENSe:]ESPectrum:RANGe<range>:INSert....247
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt....248
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP....248
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt....248
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP....249
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe....249
[SENSe:]ESPectrum:RANGe<range>:RLEVel....250
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME....250
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO....250
[SENSe:]ESPectrum:RANGe<range>:TRANsducer....251
[SENSe:]ESPectrum:RRANge....251
[SENSe:]ESPectrum:RTYPe....251

[SENSe:]ESPectrum:BWID <Bandwidth>

This command defines the bandwidth used for measuring the channel power (reference range). This setting takes only effect if channel power is selected as power reference type (see `[SENSe:]ESPectrum:RTYPe` on page 251).

Parameters:

<Bandwidth> minimum span ≤ value ≤ span of reference range

*RST: 3.84 MHz

Example:
```
ESP:RTYP CPOW
```
Sets the power reference type to channel power.
```
ESP:BWID 1 MHZ
```
Sets the Tx bandwidth to 1 MHz.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa <Value>

This command sets the alpha value of the RRC filter. This setting takes only effect if channel power is selected as power reference type (`[SENSe:]ESPectrum:RTYPe` command) and if the RRC filter is activated (`[SENSe:]ESPectrum:FILTer[:RRC][:STATe]` command).

Parameters:

<Value> 0 to 1

*RST: 0.22

Example: `ESP:RTYP CPOW`
Sets the power reference type to channel power.
`ESP:FILT ON`
Activates the use of an RRC filter.
`ESP:FILT:ALPH 0.5`
Sets the alpha value of the RRC filter to 0.5.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:FILTer[:RRC][:STATe] <State>

This command activates or deactivates the use of an RRC filter. This setting only takes effect if channel power is selected as power reference type (see `[SENSe:]ESPectrum:RTYPe` on page 251).

Parameters:

<State> ON | OFF

*RST: ON

Example: `ESP:RTYP CPOW`
Sets the power reference type to channel power.
`ESP:FILT OFF`
Deactivates the use of an RRC filter.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:HighSPeed <State>

Activates Fast SEM mode to accelerate spurious emission mask measurements. For details see chapter 4.4.4.12, "Fast Spectrum Emission Mask Measurements", on page 165.

Note that in Fast SEM mode, the following parameters cannot be changed in all ranges:

- Filter type, see `[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE` on page 245
- RBW, see `[SENSe:]ESPectrum:RANGe<range>:BANDwidth` on page 244
- VBW, see `[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo` on page 244
- Sweep Time Mode, see `[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO` on page 250

- Sweep Time, see [SENSe:]ESPectrum:RANGe<range>:SWEep:TIME on page 250
- Reference level, see [SENSe:]ESPectrum:RANGe<range>:RLEVel on page 250
- RF Att Mode, see [SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO on page 247
- Rf Attenuation, see [SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation on page 246
- Preamp, see [SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe on page 247

Parameters:

<State> ON | OFF

*RST: OFF

Example: ESP:HSP ON

Mode: A, EVDO, TDS, WCDMA

[SENSe:]ESPectrum:PRESet[:STANdard]

This command selects the specified XML file under C:\r_s\instr\sem_std. If the file is stored in a subdirectory, include the relative path.

Example: ESP:PRES 'WCDMA\3GPP\DL\PowerClass_31_39.xml'
Selects the PowerClass_31_39.xml XML file in the C:\R_S\instr\sem_std\WCDMA\3GPP\DL directory.
ESP:PRES?
W-CDMA 3GPP DL (31,39)dBm
The query returns information about the selected standard, the link direction and the power class. If no standard has been selected, the query returns None.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:PRESet:RESTore

This command copies the XML files from the C:\R_S\instr\sem_backup folder to the C:\R_S\instr\sem_std folder. Files of the same name are overwritten.

Example: ESP:PRES:REST
Restores the originally provided XML files.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:PRESet:STORe <FileName>

This command stores the current settings as presettings in the specified XML file under C:\r_s\instr\sem_backup.

Parameters:

<FileName> <string>; specifies the file in which the presettings are stored.

Example: `ESP:PRES:STOR 'WCDMA\3GPP\DL\PowerClass_31_39.xml'`
Stores the settins in the `PowerClass_31_39.xml` file in the `C:\R_S\instr\sem_std\WCDMA\3GPP\DL` directory.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:BANDwidth <Value>

Both commands are identical and set the RBW value for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:

<range> 1...20
range

Parameters:

<Value> Refer to the data sheet.

*RST: 30.0 kHz

Example: `ESP:RANG2:BAND:RES 5000`
Sets the RBW for range 2 to 5 kHz.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo <Value>

This command sets the VBW value for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:

<range> 1...20
range

Parameters:

<Value> Refer to the data sheet.

*RST: 10.0 MHz

Example: `ESP:RANG1:BAND:VID 5000000`
Sets the VBW for range 1 to 5 MHz.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:COUNt

This command returns the number of defined ranges.

Suffix:

<range> 1...20
range

Example: `ESP:RANG:COUNt?`
Returns the number of defined ranges.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:DELete

This command deletes the specified range. The range numbers are updated accordingly. The reference range cannot be deleted. A minimum of three ranges is mandatory.

Suffix:

<range> 1...20
range

Example: `ESP:RANG4:DEL`
Deletes range 4.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE <Type>

This command sets the filter type for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:

<range> 1...20
range

Parameters:

<Type>

NORMal
Gaussian filters

CFILter
channel filters

RRC
RRC filters

PULSe
EMI (6dB) filters

P5
5 Pole filters

*RST: NORM
The available bandwidths of the filters are specified in the data sheet.

Example: `ESP:RANG1:FILT:TYPE RRC`
Sets the RRC filter type for range 1.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt <Frequency>

This command sets the start frequency for the specified range.

In order to change the start/stop frequency of the first/last range, select the appropriate span. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last range are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Suffix:
<range> 1...20
range

Parameters:
<Frequency> see rules in chapter 4, "Ranges and settings"

*RST: -250.0 MHz (range 1), -2.52 MHz (range 2), 2.52 MHz (range 3)

Example: `ESP:RANG1:STAR 100000000`
Sets the start frequency for range 1 to 100 MHz.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP <Frequency>

This command sets the stop frequency for the specified range. For further details refer to the `[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt` command.

Suffix:
<range> 1...20
range

Parameters:
<Frequency> see rules in chapter 4, "Ranges and settings"

*RST: -2.52 MHz (range 1), 2.52 MHz (range 2), 250.0 MHz (range 3)

Example: `ESP:RANG3:STOP 10000000`
Sets the stop frequency for range 2 to 10 MHz.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation <Value>

This command sets the attenuation for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:
<range> 1...20
range

Parameters:
<Value> Refer to the data sheet.

*RST: 0 dB

Example: `ESP:RANG3:INP:ATT 10`
Sets the attenuation of range 3 to 10 dB.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO <State>

This command activates or deactivates the automatic RF attenuation setting for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:
<range> 1...20
range

Parameters:
<State> ON | OFF

*RST: ON

Example: `ESP:RANG2:INP:ATT:AUTO OFF`
Deactivates the RF attenuation auto mode for range 2.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe <State>

This command switches the preamplifier on or off for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:
<range> 1...20
range

Parameters:
<State> ON | OFF

*RST: OFF

Example: `ESP:RANG3:INP:GAIN:STATe ON`
Switches the preamplifier for range 3 on or off.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:INSert <Mode>

This command inserts a new range before or after the specified range. The range numbers are updated accordingly.

Suffix:
<range> 1...20
range

Parameters:
<Mode> AFTer | BEFore

Example: `ESP:RANG3:INS BEF`
Inserts a new range before range 3.
`ESP:RANG1:INS AFT`
Inserts a new range after range 1.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt <Level>

This command sets an absolute limit value at the start frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

Suffix:
<range> 1...20
range

Parameters:
<Level> -400 to in 400 dBm

*RST: 13 dBm

Example: `ESP:RANG1:LIM:ABS:STAR 10`
Sets an absolute limit of 10 dBm at the start frequency of the range.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP <Level>

This command sets an absolute limit value at the stop frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

Suffix:
<range> 1...20
range

Parameters:
<Level> -400 to in 400 dBm

*RST: 13 dBm

Example: `ESP:RANG1:LIM:ABS:STOP 20`
Sets an absolute limit of 20 dBm at the stop frequency of the range.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt <Limit>

This command sets a relative limit value at the start frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

Suffix:
<range> 1...20
range

Parameters:

<Limit> -400 to in 400 dBc

*RST: -50 dBc

Example: `ESP:RANG3:LIM:REL:STAR -20`
Sets a relative limit of -20 dBc at the start frequency of the range.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP <Limit>

This command sets a relative limit value at the stop frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

Suffix:

<range> 1...20
range

Parameters:

<Limit> -400 to in 400 dBc

*RST: -50 dBc

Example: `ESP:RANG3:LIM:REL:STOP 20`
Sets a relative limit of 20 dBc at the stop frequency of the range.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe <State>

This command sets the type of limit check for all ranges.

Suffix:

<range> irrelevant

Parameters:

<State> ABSolute | RELative | AND | OR

ABSolute
Checks only the absolute limits defined.

RELative
Checks only the relative limits. Relative limits are defined as relative to the measured power in the reference range.

AND
Combines the absolute and relative limit. The limit check fails when both limits are violated.

OR
Combines the absolute and relative limit. The limit check fails when one of the limits is violated.

*RST: REL

Example: `ESP:RANG3:LIM:STAT AND`
Sets for all ranges the combined absolute/relative limit check.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:RLEVel <Value>

This command sets the reference level for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:

<range> 1...20
range

Parameters:

<Value> Refer to the data sheet.

*RST: -20 dBm

Example: `ESP:RANG2:RLEV 0`
Sets the reference level of range 2 to 0 dBm.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME <SweepTime>

This command sets the sweep time for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:

<range> 1...20
range

Parameters:

<SweepTime> Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

*RST: 0.27 s

Example: `ESP:RANG1:SWE:TIME 1`
Sets the sweep time for range 1 to 1 s.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO <State>

This command activates or deactivates the automatic sweep time setting for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 242).

Suffix:

<range> 1...20
range

Parameters:

<State> ON | OFF

*RST: ON

Example: `ESP:RANG3:SWE:TIME:AUTO OFF`
Deactivates the sweep time auto mode for range 3.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RANGe<range>:TRANsducer <TransducerName>

This command sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

- The transducer overlaps or equals the span of the range.
- The x-axis is linear.
- The unit is dB.

Suffix:
<range> 1...20
range

Parameters:
<TransducerName> 'string' = name of the transducer

Example: `ESP:RANG1:TRAN 'test'`
Sets the transducer called test for range 1.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RRANge

This command returns the current position (number) of the reference range.

Example: `ESP:RRAN?`
Returns the current position (number) of the reference range.

Mode: A, CDMA, EVDO, TDS

[SENSe:]ESPectrum:RTYPe <Type>

This command sets the power reference type.

Parameters:
<Type> PEAK | CPOWer

PEAK
Measures the highest peak within the reference range.

CPOWer
Measures the channel power within the reference range (integral bandwidth method).

*RST: CPOWer

Example: `ESP:RTYP PEAK`
Sets the peak power reference type.

Mode: A, CDMA, EVDO, TDS

SENSe:BANDwidth subsystem

[SENSe:]BANDwidth|BWIDth[:RESolution] 252
[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO 252
[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT 253
[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio 253
[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE 253
[SENSe:]BANDwidth|BWIDth:VIDeo 254
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO 254
[SENSe:]BANDwidth|BWIDth:VIDeo:RATio 255
[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE 255

[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153.

If the resolution bandwidth is modified, the coupling to the span is automatically switched off.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example:
```
BAND 1 MHz
```
Sets the resolution bandwidth to 1 MHz

Mode: all, except ADEMOD

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command either automatically couples the resolution bandwidth of the instrument to the span or cancels the coupling.

The automatic coupling adapts the resolution bandwidth to the currently set frequency span according to the relationship between frequency span and resolution bandwidth. The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

The ratio resolution bandwidth/span can be modified with the `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` command.

Parameters:

<State> ON | OFF

*RST: ON

Example:
```
BAND:AUTO OFF
```
Switches off the coupling of the resolution bandwidth to the span.

Mode: A-F, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>

Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

This command is only available when using the sweep type "FFT".

Parameters:

<FilterMode> WIDE | AUTO | NARRow

WIDE
The FFT filters with the wider partial span are used.

AUTO
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

NARRow
The FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

*RST: AUTO

Example: `BAND:TYPE FFT`
Select FFT filter.

Example: `BAND:FFT NARR`
Select narrow partial span for FFT filter.

Mode: all, except ADEMOD

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio resolution bandwidth (Hz)/span (Hz). The ratio to be entered is reciprocal to the ratio span/RBW used in manual operation.

Parameters:

<Ratio> 0.0001 to 1

*RST: 0.01

Example: `BAND:RAT 0.1`

Mode: A, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command switches the filter type for the resolution bandwidth.

For detailed information on filters see chapter 4.4.4.5, "Selecting the Appropriate Filter Type", on page 153 and chapter 4.4.4.6, "List of Available RRC and Channel Filters", on page 154.

When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.

5 Pole filters are not available when using the sweep type "FFT".

Parameters:

<FilterType>

NORMal
Gaussian filters

FFT
FFT filters

CFILter
channel filters

RRC
RRC filters

PULSe
EMI (6dB) filters

P5
5 Pole filters

*RST: NORMal

Example:
```
BAND:TYPE NORM
```

Mode: all, except ADEMOD

[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>

This command defines the instruments video bandwidth. The available video bandwidths are specified in the data sheet.

The command is not available if FFT filtering is switched on and the set bandwidth is ≤ 30 kHz or if the quasi-peak detector is switched on.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example:
```
BAND:VID 10 kHz
```

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>

This command either automatically couples the instruments video bandwidth to the resolution bandwidth or cancels the coupling.

The ratio video bandwidth/resolution bandwidth can be modified with the `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` command.

Parameters:

<State> ON | OFF

*RST: ON

Example:
```
BAND:VID:AUTO OFF
```

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>

This command defines the ratio video bandwidth (Hz)/resolution bandwidth (Hz).The ratio to be entered is reciprocal to the ratio RBW/VBW used in manual operation.

Parameters:

<Ratio> 0.01 to 1000

*RST: 3

Example: `BAND:VID:RAT 3`
Sets the coupling of video bandwidth to video bandwidth = 3*resolution bandwidth

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>

This command selects the position of the video filter in the signal path, provided that the resolution bandwidth is ≤100 kHz.

The essential difference between the two modes is the transient response at falling signal edges: If LINear is selected, the measurement with logarithmic level scaling yields a much "flatter" falling edge than LOGarithmic. This behavior is due to the conversion of linear power into logarithmic level. If the linear power is halved, the level decreases by only 3 dB.

Parameters:

<Mode> LOGarithmic | LINear

LINear
The video filter is connected ahead of the logarithmic amplifier (default).

LOGarithmic
The video filter follows the logarithmic amplifier

*RST: LIN

Example: `BAND:VID:TYPE LIN`
Video filter ahead of the logarithmic amplifier

Mode: A, CDMA, EVDO, TDS, WCDMA

SENSe:FREQuency subsystem

[SENSe:]FREQuency:CENTer....256
[SENSe:]FREQuency:CENTer:STEP[:VALue]....256
[SENSe:]FREQuency:CENTer:STEP:AUTO....256
[SENSe:]FREQuency:CENTer:STEP:LINK....256
[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor....257
[SENSe:]FREQuency:OFFSet....257
[SENSe:]FREQuency:SPAN....257
[SENSe:]FREQuency:SPAN:FULL....258
[SENSe:]FREQuency:STARt....258
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[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency of the analyzer or the measuring frequency for span = 0.

Parameters:

<Frequency> <numeric_value>

Range: 0 to fmax
*RST: fmax/2
Default unit: Hz
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:CENT 100 MHz`

Mode: all

[SENSe:]FREQuency:CENTer:STEP[:VALue] <StepSize>

This command defines the step size of the center frequency.

Parameters:

<StepSize> <numeric_value>

Range: 1 to 1000000000
*RST: - (AUTO 0.1 × SPAN is switched on)
Default unit: Hz

Example: `FREQ:CENT:STEP 120 MHz`

Mode: all

[SENSe:]FREQuency:CENTer:STEP:AUTO <State>

This command couples the step size of the center frequency to the span (ON) or sets the value of the center frequency entered via `[SENSe:]FREQuency:CENTer` (OFF).

Parameters:

<State> ON | OFF

*RST: ON

Example: `FREQ:CENT:STEP:AUTO ON`
Activates the coupling of the step size to the span.

Mode: all

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples the step size of the center frequency to span (span >0) or to the resolution bandwidth (span = 0) or cancels the couplings.

Parameters:

<CouplingType> OFF | SPAN | RBW

SPAN
coupling to frequency display range (for span > 0)

RBW
coupling to resolution bandwidth (for span = 0)

OFF
manual input, no coupling

*RST: SPAN

Example: `FREQ:CENT:STEP:LINK SPAN`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Value>

This command couples the step size of the center frequency with a factor to the span (span >0) or to the resolution bandwidth (span = 0).

Parameters:

<Value> 1 to 100 PCT

*RST: (AUTO 0.1 × SPAN is switched on)

Example: `FREQ:CENT:STEP:LINK:FACT 20PCT`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

[SENSe:]FREQuency:OFFSet <Offset>

This command defines the frequency offset of the instrument.

Parameters:

<Offset> <numeric_value>

Range: -100 GHz to 100 GHz
*RST: 0 Hz

Example: `FREQ:OFFS 1GHZ`

Mode: all

[SENSe:]FREQuency:SPAN <Span>

This command defines the frequency span.

Parameters:

<Span> min span to fmax

*RST: fmax
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:SPAN 10MHz`

Mode: A, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]FREQuency:SPAN:FULL

This command sets the frequency span to its maximum.

Example: `FREQ:SPAN:FULL`

Mode: A, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]FREQuency:STARt <Frequency>

This command defines the start frequency of the analyzer. This command is only available with span > 0.

Parameters:

<Frequency> 0 to (fmax - min span)

*RST: 0
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STAR 20MHz`

Mode: A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

[SENSe:]FREQuency:STOP <Frequency>

This command defines the stop frequency of the analyzer. This command is only available with span > 0.

Parameters:

<Frequency> min span to fmax

*RST: fmax
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STOP 2000 MHz`

Mode: A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

SENSe:POWer subsystem

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[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]....259
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel....259
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>....260
[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel....260
[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel>....260
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[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE....264
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO....264
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual....265
[SENSe:]POWer:ACHannel:SPACing[:ACHannel]....265
[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel>....266
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[SENSe:]POWer:ACHannel:ACPairs <Value>

This command sets the number of adjacent channels (upper and lower channel in pairs).The figure 0 stands for pure channel power measurement.

Parameters:

<Value> 0 to 12 (WCDMA: 0 to 3)

*RST: 1

Example: `POW:ACH:ACP 3`

Sets the number of adjacent channels to 3, i.e. the adjacent channel and alternate adjacent channels 1 and 2 are switched on.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>] <Bandwidth>

This command sets the channel bandwidth of the specified TX channel in the radio communication system. The bandwidths of adjacent channels are not influenced by this modification.

With `[SENSe<source>:]POWer:HSPeed` set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 4.4.4.6, "List of Available RRC and Channel Filters", on page 154.

Parameters:

<Bandwidth> 100 Hz to 1000 MHz

*RST: 14 kHz

Example: `POW:ACH:BWID:CHAN2 30 kHz`

Sets the bandwidth of the TX channel 2 to 30 kHz.

Mode: A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <Bandwidth>

This command defines the channel bandwidth of the adjacent channel of the radio transmission system. If the bandwidth of the adjacent channel is changed, the bandwidths of all alternate adjacent channels are automatically set to the same value.

With `[SENSe<source>:]POWer:HSPeed` set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 4.4.4.6, "List of Available RRC and Channel Filters", on page 154 .

Parameters:

<Bandwidth> 100 Hz to 1000 MHz

*RST: 14 kHz

Example: `POW:ACH:BWID:ACH 30 kHz`
Sets the bandwidth of all adjacent channels to 30 kHz.

Mode: A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>
<Bandwidth>

This command defines the channel bandwidth of the specified alternate adjacent channels of the radio transmission system. If the channel bandwidth of one alternate adjacent channel is changed (e.g. channel 3), the bandwidth of all subsequent alternate adjacent channels (e.g. 4–11) is automatically set to the same value.

With `[SENSe<source>:]POWer:HSPeed` set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 4.4.4.6, "List of Available RRC and Channel Filters", on page 154 .

Suffix:

<channel> 1...11
the alternate adjacent channel

Parameters:

<Bandwidth> 100 Hz to 1000 MHz

*RST: 14 kHz

Example: `POW:ACH:BWID:ALT2 30 kHz`

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel <Value>

This command defines the alpha value for the weighting filter for the adjacent channel.

Parameters:

<Value> <numeric value>

*RST: 0,22

Example: `POW:ACH:FILT:ALPH:ACH 0,35`

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel> <Value>

This command defines the alpha value for the weighting filter for the specified alternate channel.

Suffix:
<channel> 1...11
the alternate channel

Parameters:
<Value> <numeric value>

*RST: 0,22

Example: `POW:ACH:FILT:ALPH:ALT3 0,35`
Sets the alpha value for the weighting filter for the alternate channel 3 to 0,35.

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel> <Value>

This command defines the alpha value for the weighting filter for the specified TX channel.

Suffix:
<channel> 1...11
the TX channel

Parameters:
<Value> <numeric value>

*RST: 0,22

Example: `POW:ACH:FILT:ALPH:CHAN3 0,35`
Sets the alpha value for the weighting filter for the TX channel 3 to 0,35.

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel <State>

This command activates the weighting filter for the adjacent channel.

Parameters:
<State> ON | OFF

*RST: OFF

Example: `POW:ACH:FILT:ACH ON`

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTernate<channel> <State>

This command activates the weighting filter for the specified alternate channel.

Suffix:
<channel> 1...11
the alternate adjacent channel

Parameters:
<State> ON | OFF

*RST: OFF

Example: `POW:ACH:FILT:ALT3 ON`
Activates the weighting filter for alternate channel 3.

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel> <State>

This command activates the weighting filter for the specified TX channel.

Suffix:
<channel> 1...18
the TX channel

Parameters:
<State> ON | OFF

*RST: OFF

Example: `POW:ACH:FILT:CHA3 ON`
Activates the weighting filter for TX channel 3.

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:MODE <Mode>

This command switches between absolute and relative adjacent channel measurement. The command is only available with span > 0 and if the number of adjacent channels is greater than 0.

For the relative measurement the reference value is set to the currently measured channel power using the command `[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE`.

Parameters:
<Mode> ABSolute | RELative

ABSolute
absolute adjacent channel measurement

RELative
relative adjacent channel measurement

*RST: RELative

Example: `POW:ACH:MODE REL`
Sets the adjacent channel measurement mode to relative.

Mode: A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, WCDMA, TDS

[SENSe:]POWer:ACHannel:NAME:ACHannel <Name>

This command defines a name for the adjacent channel. The name is displayed in the result diagram and the result table.

Parameters:
<Name> '<string>'

*RST: TX<1...12>

Example: `POW:ACH:NAME:ACH 'XYZ'`
Defines the name of the adjacent channel as 'XYZ'.

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:NAME:ALTernate<channel> <Name>

This command defines a name for the specified alternate channel. The name is displayed in the result diagram and the result table.

Suffix:
<channel> 1...11
the alternate channel

Parameters:
<Name> '<string>'

*RST: ALT<1...11>

Example: `POW:ACH:NAME:ALT3 'XYZ'`
Defines the name of the third alternate channel as 'XYZ'.

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:NAME:CHANnel<channel> <Name>

This command defines a name for the specified TX channel. The name is displayed in the result diagram and the result table.

Suffix:
<channel> 1...12
the TX channel

Parameters:
<Name> '<string>'

*RST: TX<1...12>

Example: `POW:ACH:NAME:CHAN3 'XYZ'`
Defines the name of the third transmission channel as 'XYZ'.

Mode: A-F, EVDO, TDS

[SENSe:]POWer:ACHannel:PRESet <Setting>

This command adjusts the frequency span, the measurement bandwidths and the detector as required for the number of channels, the channel bandwidths and the channel spacings selected in the active power measurement. If necessary, adjacent-channel power measurement is switched on prior to the adjustment.

To obtain correct results, a complete sweep with synchronization to the end of the sweep must be performed after the adjustment. Synchronization is possible only in the single sweep mode.

The result is queried with the `CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` command.

Parameters:

<Setting> ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

Example: `POW:ACH:PRES ACP`
Sets the frequency span, the measurement bandwidths and the detector as required for the ACLR measurement.
`INIT:CONT OFF`
Switches over to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for the end of the sweep.
`CALC:MARK:FUNC:POW:RES? ACP`
Queries the result of the adjacent-channel power measurement.

Mode: A-F, CDMA, EVDO, TDS

[SENSe:]POWer:ACHannel:PRESet:RLEVel

This command adapts the reference level to the measured channel power and – if required – switches on previously the adjacent channel power measurement. This ensures that the signal path of the instrument is not overloaded. Since the measurement bandwidth is significantly smaller than the signal bandwidth in channel power measurements, the signal path can be overloaded although the trace is still significantly below the reference level. If the measured channel power equals the reference level, the signal path is not overloaded.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Example: `POW:ACH:PRES:RLEV;*WAI`
Adapts the reference level to the measured channel power.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE

This command sets the reference value to the currently measured channel power for the relative measurement.

Example: `POW:ACH:REF:AUTO ONCE`

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO <Channel>

This command activates the automatic selection of a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The transmission channel with the highest power, the transmission channel with the lowest power, or the transmission channel nearest to the adjacent channels can be defined as a reference channel.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect on page 180).

Parameters:

<Channel> MINimum | MAXimum | LHIGhest

MINimum
Transmission channel with the lowest power

MAXimum
Transmission channel with the highest power

LHIGhest
Lowermost transmission channel for the lower adjacent channels, uppermost transmission channel for the upper adjacent channels

Example: POW:ACH:REF:TXCH:AUTO MAX
The transmission channel with the highest power is used as a reference channel.

Mode: A-F, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual <ChannelNumber>

This command selects a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect on page 180).

Parameters:

<ChannelNumber> 1 to 18 (WCDMA: number of TX channels)

*RST: 1

Example: POW:ACH:REF:TXCH:MAN 3
Transmission channel 3 is used as a reference channel.

Mode: A-F, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:SPACing[:ACHannel] <Value>

This command defines the spacing between the carrier signal and the adjacent channel (ADJ). The modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, ...): they are all multiplied by the same factor (new spacing value/old spacing value).

Parameters:

<Value> 100 Hz to 2000 MHz

*RST: 14 kHz

Example: POW:ACH:SPAC 33kHz
Sets the spacing between the carrier signal and the adjacent channel to 33 kHz, the alternate adjacent channel 1 to 66 kHz, the alternate adjacent channel 2 to 99 kHz, and so on.

Mode: A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel> <Spacing>

This command defines the spacing between the alternate adjacent channels and the TX channel (ALT1, ALT2, ...). A modification of a higher adjacent-channel spacing causes a change by the same factor (new spacing value/old spacing value) in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.

Suffix:

<channel> 1...11
the alternate adjacent channel

Parameters:

<Spacing> 100 Hz to 2000 MHz

*RST: 40 kHz (ALT1), 60 kHz (ALT2), 80 kHz (ALT3), ...

Example: `POW:ACH:SPAC:ALT1 100 kHz`
Sets the spacing between TX channel and alternate adjacent channel 1 (ALT1) from 40 kHz to 100 kHz. In consequence, the spacing between the TX channel and all higher alternate adjacent channels is increased by the factor 100/40 = 2.5: ALT2 = 150 kHz, ALT3 = 200 kHz, ALT4 = 250 kHz.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel> <Value>

This command defines the channel spacing for the carrier signals.

Suffix:

<channel> 1...11
the TX channel

Parameters:

<Value> 14 kHz to 2000 MHz

*RST: 20 kHz

Example: `POW:ACH:SPAC:CHAN 25kHz`

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:TXCHannel:COUNt <Number>

This command selects the number of carrier signals.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (see `CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect` on page 180).

Parameters:

<Number> 1 to 18

*RST: 1

Example: `POW:ACH:TXCH:COUN 3`

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:BANDwidth|BWIDth <Percentage>

This command defines the percentage of the power with respect to the total power.

This value is the basis for the occupied bandwidth measurement (see `[SENSe:]POWer:ACHannel:PRESet` on page 263).

Parameters:

<Percentage> 10 to 99.9PCT

*RST: 99PCT

Example:
```
POW:BWID 95PCT
```

Mode: A-F, CDMA, EVDO, TDS

[SENSe:]POWer:HSPeed <State>

This command switches on or off the high-speed channel/adjacent channel power measurement. The measurement itself is performed in zero span on the center frequencies of the individual channels. The command automatically switches to zero span and back.

Depending on the selected mobile radio standard, weighting filters with characteristic or very steep-sided channel filters are used for band limitation.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
POW:HSP ON
```

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:NCORrection

When the function is switched on, a reference measurement of the instrument's inherent noise is carried out. The noise power measured is then subtracted from the power in the channel that is being examined.

Parameters:

*RST: OFF

Example:
```
POW:NCOR ON
```

Mode: A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

[SENSe:]POWer:TRACe <TraceNumber>

This command assigns the channel/adjacent channel power measurement to the indicated trace. The corresponding trace must be active, i.e. its state must be different from blank.

Note: The measurement of the occupied bandwidth (OBW) is performed on the trace on which marker 1 is positioned. To evaluate another trace, marker 1 must be positioned to another trace with `CALCulate<n>:MARKer<m>:TRACe`.

Parameters:
<TraceNumber> 1 to 6

Example: `POW:TRAC 2`
Assigns the measurement to trace 2.

Mode: A, CDMA, EVDO, TDS, WCDMA

SENSe:SWEep subsystem

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[SENSe:]SWEep:COUNt <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameters:
<NumberSweeps> 0 to 32767

*RST: 0 (GSM: 200)

Example: `SWE:COUN 64`
Sets the number of sweeps to 64.
`INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, GSM, NF

[SENSe:]SWEep:EGATe <State>

This command switches on/off the sweep control by an external gate signal. If the external gate is selected the trigger source is automatically switched to EXTernal as well.

In case of measurement with external gate, the measured values are recorded as long as the gate is opened. During a sweep the gate can be opened and closed several times. The synchronization mechanisms with *OPC, *OPC? and *WAI remain completely unaffected.

The sweep end is detected when the required number of measurement points (691 in "Spectrum" mode) has been recorded.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
SWE:EGAT ON
```
Switches on the external gate mode.
```
SWE:EGAT:TYPE EDGE
```
Switches on the edge-triggered mode.
```
SWE:EGAT:HOLD 100US
```
Sets the gate delay to 100 µs.
```
SWE:EGAT:LEN 500US
```
Sets the gate opening time to 500 µs.
```
INIT;*WAI
```
Starts a sweep and waits for its end.

Mode: A, BT, EVDO, TDS, WLAN, OFDM, OFDMA/WiBro

[SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

This command defines the delay time between the external gate signal and the continuation of the sweep.

Note: Using gate mode "level" (see `[SENSe:]SWEep:EGATe:TYPE` on page 271) and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 294), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

Parameters:

<DelayTime> 0 s to 30 s

*RST: 0s

Example:
```
SWE:EGAT:HOLD 100us
```

Mode: A, ADEMOD, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:LENGth <TimeInterval>

In case of edge triggering, this command determines the time interval during which the instrument sweeps.

Parameters:
<TimeInterval> 125 ns to 30 s

*RST: 400µs
Example: SWE:EGAT:LENG 10ms
Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:
<Polarity> POSitive | NEGative

*RST: POSitive
Example: SWE:EGAT:POL POS
Mode: A, ADEMOD, BT, EVDO, TDS, WCDMA

[SENSe:]SWEep:EGATe:SOURce <Source>

This command toggles between the available signal sources for the gate mode. If an IF power signal is used, the gate is opened as soon as a signal at > -20 dBm is detected within the IF path bandwidth (10 MHz).

Parameters:
<Source> EXTernal | IFPower | VIDeo | RFPower

*RST: IFPower
Example: SWE:EGAT:SOUR IFP
Switches the gate source to IF power.
Mode: A, ADEMOD, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:TRACe<k>:COMMent <Comment>

Defines a comment for one of the traces for gated triggering.
Suffix:
<k> 1...6
trace

Parameters:
<Comment> <string>

Example: SWE:EGAT:TRAC1:COMM "SlotA"
Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:TRACe<k>: PERiod <Value>

This command defines the length of the period to be traced using gated triggering.

Suffix:
<k> 1...6
trace

Parameters:
<Value> <numeric value>

*RST: 0 s

Example: `SWE:EGAT:TRAC1:PER 5ms`
Defines the period for gated triggering to 5 ms.

Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range> <Value>

This command defines the starting point for the range to be traced using gated triggering.

Suffix:
<k> 1...6
trace

<range> 1...3
range

Parameters:
<Value> <numeric value>

*RST: OFF

Example: `SWE:EGAT:TRAC1:STAR1 3ms`
Sets the Starting point for range 1 on trace 1 at 3 ms.

Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>] <State>

This command activates or deactivates tracing for a specific range using gated triggering.

Suffix:
<k> 1...6
trace

<range> 1...3
range

Parameters:
<State> ON | OFF

*RST: OFF

Example: `SWE:EGAT:TRAC1:STAT1 ON`
Activates tracing for range 1 of trace 1.

Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:TYPE <Type>

This command sets the type of triggering by the external gate signal.

A delay between applying the gate signal and the start of recording measured values can be defined, see [SENSe:]SWEep:EGATe:HOLDoff on page 269.

Parameters:

<Type> LEVel | EDGE

LEVel
The gate is level-triggered:
After detection of the gate signal, the gate remains open until the gate signal disappears. The gate opening time cannot be defined with the command [SENSe:]SWEep:EGATe:HOLDoff.
Note: Using gating with gate mode "level" and an IFP trigger (see TRIGger<n>[:SEQuence]:SOURce on page 294), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

EDGE
The gate is edge-triggered:
After detection of the set gate signal edge, the gate remains open until the gate delay ([SENSe:]SWEep:EGATe:HOLDoff) has expired.

*RST: EDGE

Example:
```
SWE:EGAT:TYPE EDGE
```

Mode: A, ADEMOD, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:TRACe<k>: STOP<range> <Value>

This command defines the stopping point for the range to be traced using gated triggering

Suffix:

<k> 1...6
trace

<range> 1...3
range

Parameters:

<Value> <numeric value>

*RST: 1 µs

Example:
```
SWE:EGAT:TRAC1:STOP1 5ms
```
Sets the stopping point for range 1 on trace 1 at 5 ms.

Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:POINts <NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

Parameters:

<NumberPoints> 101 to 32001

*RST: 691 (NF: 11)

Example: `SWE:POIN 251`

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, NF, PHN, WCDMA

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

If this command is used in analyzer mode, automatic coupling to resolution bandwidth and video bandwidth is switched off.

Parameters:

<Time> refer to data sheet

*RST: (AUTO is set to ON)

Example: `SWE:TIME 10s`

Mode: ALL

[SENSe:]SWEep:TIME:AUTO <State>

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If `[SENSe:]SWEep:TIME` is used, automatic coupling is switched off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `SWE:TIME:AUTO ON`

Activates automatic sweep time.

Mode: A, BT, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]SWEep:TYPE <Type>

Parameters:

<Type> SWE | AUTO | FFT

SWE
Sweep list

AUTO
Automatic selection of the sweep type.

FFT
FFT mode

*RST: AUTO
Sets the sweep type.

Example: `SWE:TYPE FFT`

Mode: all

Other Commands in the SENSe Subsystem

[SENSe:]AVERage<n>:COUNt <NoMeasurements>

This command defines the number of measurements which contribute to the average value in the window specified by the AVERage<n> suffix.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the `[SENSe<source>:]SWEep:COUNt` command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<NoMeasurements> 0 to 32767

*RST: 0

Example: `SWE:CONT OFF`
Switching to single sweep mode.
`AVER:COUN 16`
Sets the number of measurements to 16.
`AVER:STAT ON`
Switches on the calculation of average.
`INIT;*WAI`
Starts the measurement and waits for the end of the 16 sweeps.

Mode: all

[SENSe:]AVERage<n>[:STATe<Trace>] <State>

This command switches on or off the average calculation for the selected trace in the window specified by the AVERage<n> suffix.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<Trace> 1...6
trace

Parameters:

<State> ON | OFF

*RST: OFF

Example: `AVER OFF`
Switches off the average calculation for trace 1.
`AVER:STAT3 ON`
Switches on the average calculation for trace 3.

Mode: all

4.5.7 STATus subsystem

STATus:QUEStionable:SYNC:CONDition....275
STATus:QUEStionable:SYNC[:EVENt]....275

STATus:QUEStionable:SYNC:CONDition?

This command reads the information on the error situation in the code domain power analysis.

Return values:

<Result> If the result is ON, an error occurred. Details can be obtained using `STAT:QUES:SYNC:EVEN`.

*RST: OFF

Example: `STAT:QUES:SYNC:COND?`

Usage: Query only

Mode: WCDMA, CDMA, EVDO

STATus:QUEStionable:SYNC[:EVENt]?

This command reads the information on the error situation in the code domain power analysis. The value can only be read once.

Return values:

<Result> 0 | 1 | 2 | 3 to 4 | 5 | 6 to 14 | 15

Bit No.
Definition

0
Not used.

1
Frame Sync failed
This bit is set when synchronization is not possible within the application.
Possible reasons:
Incorrectly set frequency
Incorrectly set level
Incorrectly set scrambling code
Incorrectly set values for Q-INVERT or SIDE BAND INVERT
Invalid signal at input

2
Not used.

3 to 4
Not used.

5
Incorrect Pilot Symbol
This bit is set when one or more of the received pilot symbols are not equal to the specified pilot symbols of the 3GPP standard.
Possible reasons:
Incorrectly sent pilot symbols in the received frame.
Low signal to noise ratio (SNR) of the WCDMA signal.
One or more code channels has a significantly lower power level compared to the total power. The incorrect pilots are detected in these channels because of low channel SNR.
One or more channels are sent with high power ramping. In slots with low relative power to total power, the pilot symbols might be detected incorrectly (check the signal quality by using the symbol constellation display).

6 to 14
Not used.

15
This bit is always 0.

Example: `STAT:QUES:SYNC[:EVEN]?`

Usage: Query only

Mode: WCDMA, CDMA, EVDO

4.5.8 TRACe Subsystem

The TRACe subsystem controls access to the instrument's internal trace memory.

TRACe<n>[:DATA]....277

TRACe<n>[:DATA]? <ResultType>

This command reads trace data from the analyzer.

For details on reading trace data for other than code domain measurements refer to the `TRACe:DATA` command in the base unit description.

Suffix:

<n> 1...4
irrelevant

Return values:

<Return values> The measurement results are explained separately for each measurement and illustrated by a short example at the end of this command description.

Code Domain Power

Code Domain Error Power

Channel Table

Result Summary

Power vs PCG

Peak Code Domain Error

Composite EVM

EVM vs Symbol

Channel Constellation

Composite Constellation

Channel Bitstream

Query parameters:

<ResultType> TRACE1 | TRACE2 | TRACE3 | TRACE4 | CTABle

TRACE1 | TRACE2 | TRACE3 | TRACE4
Reads out the trace data of measurement window 1 to 4.

CTABle
For the Channel Table result display, reads out the maximum values of the timing/phase offset between every assigned channel and the pilot channel (see also `[SENSe:]CDPower:TPMeas` on page 239 command).

Usage: Query only
SCPI conform

Mode: CDMA

Code Domain Power

The command returns four values for each channel:

<code class>, <code number>, <signal level>, <power ID>, …

Value	Description	Range	Unit
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (4, symbol rate 307.2 ksps), 7 corresponds to the highest spreading factor (128, symbol rate 9.6 ksps)	{2...7}	
<code number>	code number of the channel	{0...127}	
<signal level>	absolute or relative power, depending on the setting (see Power Reference) Hadamard order: power values for each code BitReverse order: power values for combined channels	{-∞...∞}	dB or dBm
<power ID>	power detection 0 - inactive channel, 1 - power of own antenna, 2 - alias power of own antenna, 3 - alias power of other antenna, 4 - alias power of own and other antenna to avoid alias power, set the base spreading factor correctly		

Note: To avoid alias power, set the base spreading factor correctly

The number of displayed data depends on the spreading factor. In addition, the structure of the output differs whether Hadamard or BitReverse code sorting order was selected.

In Hadamard order, the different codes are output in ascending order together with their code power. The number of output codes corresponds to the base spreading factor.

In BitReverse order, codes belonging to a channel are next to one another and are therefore output in the class of the channel together with the consolidated channel power. The maximum number of output codes or channels cannot be higher than the base spreading factor, but decreases with every concentrated channel.

For further information refer to "Base Spreading Factor" on page 68 and "Code Order" on page 73.

Example:

The example shows the results of the query for five channels having the following configuration:

channel type	channel spreading code	code class	signal level
PICH	0.64	6	-7.0 dB
PCH	1.64	6	-7.3 dB
CHAN	8.32	5	-8.0 dB

channel type	channel spreading code	code class	signal level
CHAN	24.128	7	-9.0 dB (alias with 24.64)
SYNC	32.64	6	-13.3 dB

`TRAC? TRACE1`

Reads out the result.

Channel 8.32 is distributed to 8.64 and 40.64, in each case with half power -8 dB -3 dB = -11.0 dB

6	0	-7.0	1		6	1	-7.3	1	6
6	2	-54.6	0		6	3	-55.3	0	6
	...				6	7	-58.2	0	6
6	**8**	**-11.0**	**1**		6	9	-53.4	0	6
	...				6	24	-9.0	2	6
	...				6	32	-13.3	1	6
	...				**6**	**40**	**-11.0**	**1**	**6**
	...				6	63	-54.7	0	6

Code Domain Error Power

The command returns four values for each channel:

<code class>, <code number>, <error power>, <power ID>, …

Value	Description	Range	Unit
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (4, symbol rate 307.2 ksps), 7 corresponds to the highest spreading factor (128, symbol rate 9.6 ksps)	{2...7}	
<code number>	code number of the channel	{0...127}	
<signal level>	error power	{-∞...∞}	dB
<power ID>	power detection 0 - inactive channel, 1 - power of own antenna, 2 - alias power of own antenna, 3 - alias power of other antenna, 4 - alias power of own and other antenna		

Note: To avoid alias power, set the base spreading factor correctly

The number of displayed data depends on the spreading factor. In addition, the structure of the output differs whether Hadamard or BitReverse code sorting order was selected.

In Hadamard order, the different codes are output in ascending order.

In BitReverse order, codes belonging to a channel are next to one another. Because an error power is output with the code domain error power, a consolidation of the power values is not sensible.

For further information refer to "Base Spreading Factor" on page 68 and "Code Order" on page 73.

Channel Table

`TRACE1 | TRACE2 | TRACE3 | TRACE4` parameter

The command returns 8 values for each channel in the following order:

<channel type>, <code class>, <code number>, <radio configuration>, <absolute level>, <relative level>, <timing offset>, <phase offset>

Value	Description	Range	Unit
<channel type>	channel type: 0 - PICH, 1 - SYNC, 2 - PCH, 3 - TDPICH, 4 - APICH, 5 - ATDPICH, 6 - BCH, 7 - CPCCH, 8 - CACH, 9 - CCCH, 10 - CHAN, 11 - INACTIVE, 12 - PDCCH, 13 - PDCH	{2...13}	
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (=4, symbol rate 307.2 ksps), 7 corresponds to the highest spreading factor (=128, symbol rate 9.6 ksps)	{2...7}	
<radio config>	radio configuration For deactivated Auto Search: 0 - special channels, 1 to 5 - data channels, 10 - QPSK, 20 - 8PSK, 30 - 16QAM For activated Auto Search: 1 - RC 1 and 2, 3 - RCs 3 to 5 and 10 - PDCH		
<absolute level>	absolute power level of the channel	{-∞...∞}	dBm
<relative level>	relative power level of the channel, referred to either Total or Pilot power	{-∞...∞}	dB
<timing offset>	referred to the pilot channel		s
<phase offset>	referred to the pilot channel		rad

The sorting of the channels is according to these rules:

1. All detected special channels

2. Data channels, in ascending order by code class and within the code class in ascending order by code number.

3. Unassigned codes, with the code class of the base spreading factor

`CTABle` parameter

The command returns 7 values for each channel in the following order:

<max. time offset in s>, <code number for max. time>, <code class for max. time>, <max. phase offset in rad>, <code number for max. phase>, <code class for max. phase>, <reserved 1>, …, <reserved 6>

Value	Description	Range	Unit
<time offset>	maximum time offset		s
<code number>	code number of the channel with maximum time offset	{0...127}	
<code class>	code class of the channel with maximum time offset	{2...7}	
<phase offset>	maximum phase offset		rad
<code number>	code number of the channel with maximum phase offset	{0...127}	
<code class>	code class of the channel with maximum phase offset	{2...7}	
<reserved 1...6>	reserved		

Result Summary

The command returns 22 values for each channel in the following order:

<SLOT>, <PTOTal>, <PPICh>, <RHO>, <MACCuracy>, <PCDerror>, <ACTive>, <FERRor>, <FERPpm>, <TFRame>, <CERRor>, <IQOFfset>, <IQIMbalance>, <SRATe>, <CHANnel>, <SFACtor>, <TOFFset>, <POFFset>, <CDPRelative>, <CDPabsolute>, <EVMRms>, <EVMPeak>

Value	Description	Range	Unit
<SLOT>	Number of the PCG		
<PTOTal>	Total power	{-∞...∞}	dBm
<PPICh>	Pilot power	{-∞...∞}	dBm
<RHO>	RHO	{0...1}	
<MACCuracy>	Composite EVM		%
<PCDerror>	Peak Code Domain Error		dB
<ACTive>	Number of active channels		
<FERRor>	Frequency error		Hz
<FERPpm>	Frequency error		ppm
<TFRame>	Trigger to Frame Returns a '9' if the trigger is set to Free Run		
<CERRor>	Chip rate error		ppm
<IQOFfset>	IQ offset		%
<IQIMbalance>	IQ imbalance		%
<SRATe>	Symbol rate		ksps
<CHANnel>	Channel number		
<SFACtor>	Spreading factor of the channel		
<TOFFset>	Timing offset returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50		s

Value	Description	Range	Unit
<POFFset>	Phase offset returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50		rad
<CDPRelative>	Relative (to total or pilot power) channel power	{-∞...∞}	dBm
<CDPabsolute>	Absolute channel power	{-∞...∞}	dB
<EVMRms>	Error vector magnitude (RMS)		%
<EVMPeak>	Error vector magnitude peak		%

Tip: Read out the modulation type with the command: `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult` on page 175

Power vs PCG

The command returns 2 values for each channel in the following order:

<slot number>, <level value in dB>, <slot number>, <level value in dB>, …

The number of displayed value pairs corresponds to the Capture Length.

Peak Code Domain Error

The command returns 2 values for each channel in the following order:

<slot number>, <level value in dB>, <slot number>, <level value in dB>, …

The number of displayed value pairs corresponds to the Capture Length.

Composite EVM

The command returns 2 values for each channel in the following order:

<slot number>, <level value in %>, <slot number>, <level value in %>, …

The number of displayed value pairs corresponds to the Capture Length.

EVM vs Symbol

The command returns one value for every symbol in the following order:

<value in % symbol 0>, <value in % symbol 1>,…

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

Power vs Symbol

The command returns one value for every symbol in the following order:

<value in dBm symbol 0>, <value in dBm symbol 1>,…

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

Channel Constellation

The command returns two values, the real and imaginary parts, for every symbol in the following order:

<re 0>,<im 0>,<re 1>,<im 1>,…,<re n>, <im n>, …

The number of value pairs depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of pairs is reduced to the half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

Composite Constellation

The command returns two values, the real and imaginary parts, for every chip in the following order:

<re chip 0>,<im chip 0>,<re chip 1>,<im chip 1>,…

The number of value pairs corresponds to the chip number of 1536 chips in a power control group.

Channel Bitstream

The command returns the bitstream of one slot, i.e. it returns one value for every bit (either 0 or 1) in a symbol in the following order:

<bit 1>, <bit 2>,…, <bit n>,…

The number of returned bits depends on the symbol rate and therefore the spreading factor of the channel. A PCG can contain a minimum of 12 and a maximum of 384 symbols.

BPSK modulation:

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

QPSK modulation:

Spreading factor	Number of values
128	24
64	48
32	96
16	192
8	384
4	768

8PSK modulation:

Spreading factor	Number of values
32	144

16QAM modulation:

Spreading factor	Number of values
32	192

Depending on the modulation type, a symbol consists of a different number of bits. For BPSK modulated signals there is one bit per symbol, for QPSK modulated signals there are 2 bits per symbol, for 8-PSK modulated signals there are 3 bits per symbol and for 16QAM modulated signal there are 4 bits per symbol.

With transmit diversity activated the values reduce to the half.

4.5.9 Other Commands Referenced in this Manual

The following commands are identical to those in the base unit and are included in this manual only because they are specifically referenced to here.

See also chapter 4.5.6.2, "Other SENSe Commands Referenced in this Manual", on page 239 and chapter 4.5.2.3, "Other CALCulate Commands Referenced in this Manual", on page 182

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4.5.9.3 Other Referenced Commands....294

4.5.9.1 INPut commands

INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

The attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<Value> <numeric_value> in dB; range specified in data sheet

*RST: 10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`
Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Mode: all

INPut:ATTenuation:AUTO <State>

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP:ATT:AUTO ON`
Couples the attenuation set on the attenuator to the reference level.

Mode: All

INPut:COUPling <CouplingType>

Toggles the RF input of the analyzer between AC and DC coupling.

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<CouplingType> AC | DC

*RST: AC

Example: `INP:COUP:DC`

Mode: A, ADEMOD, BTS, CDMA, EVDO, TDS, VSA, WCDMA

INPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital baseband input from the optional Digital Baseband interface (option R&S FSV-B17).

For details see the section "Interface Status Information" for the Digital Baseband Interface (R&S FSV-B17) in the description of the base unit.

Return values:

<ConnState> Defines whether a device is connected or not.
0
No device is connected.
1
A device is connected.

<DeviceName> Device ID of the connected device

<SerialNumber> Serial number of the connected device

<PortName> Port name used by the connected device

<SampleRate> Maximum or currently used sampling rate of the connected device in Hz (depends on the used connection protocol version; indicated by <SampleRateType> parameter)

<MaxTransferRate> Maximum data transfer rate of the connected device in Hz

<ConnProtState> State of the connection protocol which is used to identify the connected device.
Not Started
Has to be Started
Started
Passed
Failed
Done

<PRBSTestState> State of the PRBS test.
Not Started
Has to be Started
Started
Passed
Failed
Done

<SampleRateType> **0**
Maximum sampling rate is displayed
1
Current sampling rate is displayed

<Placeholder> for future use; currently "0"

Example:
```
INP:DIQ:CDEV?
```
Result:
```
1,SMU200A,103634,Out
A,70000000,100000000,Passed,Not Started,0,0
```

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:AUTO <State>

If enabled, the digital input fullscale level is automatically set to the value provided by the connected device (if available).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:
<State> ON | OFF

*RST: OFF

Example:
```
INP:DIQ:RANG:AUTO ON
```

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:COUPling <State>

If enabled, the reference level for digital input is adjusted to the full scale level automatically if the fullscale level changes.

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:DIQ:RANG:COUP OFF`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe[:UPPer] <Level>

Defines the level that should correspond to an I/Q sample with the magnitude "1".

It can be defined either in dBm or Volt (see "Full Scale Level" on page 91).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level> <numeric value>

Range: 70.711 nV to 7.071 V
*RST: 1 V

Example: `INP:DIQ:RANG 1V`

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

INPut:DIQ:RANGe[:UPPer]:UNIT <Unit>

Defines the unit of the full scale level (see "Level Unit" on page 91). The availability of units depends on the measurement application you are using.

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level> V | dBm | dBpW | W | dBmV | dBuV | dBuA | A

*RST: Volt

Example: `INP:DIQ:RANG:UNIT A`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:SRATe <SampleRate>

This command specifies the sample rate of the digital baseband IQ input signal (see "Input Sample Rate" on page 91).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:
<SampleRate>
Range: 1 Hz to 10 GHz
*RST: 32 MHz
Example: INP:DIQ:SRAT 200 MHz
Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

INPut:DIQ:SRATe:AUTO <State>

If enabled, the sample rate of the digital baseband IQ input signal is set automatically by the connected device, if the currently used sample rate is provided (indicated by the <SampleRateType> parameter in the result of the `INPut:DIQ:CDEVice` command.

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (B17) description of the base unit.

Parameters:
<State> ON | OFF

*RST: OFF
Example:
```
INP:DIQ:SRAT:AUTO ON
```
Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:EATT <Attenuation>

Requires option R&S FSV-B25.

Switches the electronic attenuator on (if not already active) and allows the attenuation of the electronic attenuator to be set.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

The attenuation can be varied in 1 dB steps from 0 to 25 dB. Other entries are rounded to the next lower integer value.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

Parameters:

<Attenuation> 0...25

*RST: 0 dB (OFF)

Example: `INP1:EATT 10 dB`

Mode: all

INPut:EATT:AUTO <State>

Switches the automatic behaviour of the electronic attenuator on or off. If activated, electronic attenuation is used to reduce the operation of the mechanical attenuation whenever possible.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP1:EATT:AUTO OFF`

Mode: all

INPut:EATT:STATe <State>

Switches the electronic attenuator on or off.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:EATT:STAT ON`

Switches the electronic attenuator into the signal path.

Mode: all

INPut:GAIN:STATe <State>

This command switches the preamplifier on or off (only for option RF Preamplifier, R&S FSV-B22/B24).

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:GAIN:STAT ON`
Switches on 20 dB preamplification.

Mode: A, ADEMOD, BT, CDMA, EVDO, NF, PHN, WCDMA, GSM, VSA, TDS

INPut:IMPedance <Value>

This command sets the nominal input impedance of the instrument. The set impedance is taken into account in all level indications of results.

The setting 75 Ω should be selected, if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω/50Ω).

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<Value> 50 | 75

*RST: 50 Ω

Example: `INP:IMP 75`

Mode: all

INPut:SELect <Source>

This command selects the signal source for measurements.

Parameters:

<Source> RF | DIQ

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Baseband Digital (IQ) (only available with Digital Baseband Interface, option R&S FSV-B17)

*RST: RF

Example: INP:SEL RF

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

4.5.9.2 TRIGger Commands

TRIGger<n>[:SEQuence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger source (for digital input via the Digital Baseband Interface, R&S FSV-B17).

Suffix:
<n> irrelevant

Parameters:
<Level>
Range: -50 dBm to +20 dBm
*RST: -20 DBM

Example: `TRIG:LEV:BB -30DBM`

Mode: All

TRIGger<n>[:SEQuence]:BBPower:HOLDoff <Value>

This command sets the holding time before the next BB power trigger event (for digital input via the Digital Baseband Interface, R&S FSV-B17).

Suffix:
<n> irrelevant

Parameters:
<Value> <numeric_value> in s: 150 ns to 1000 s

*RST: 150 ns

Example: `TRIG:SOUR BBP`
Sets the baseband power trigger source.
`TRIG:BBP:HOLD 200 ns`
Sets the holding time to 200 ns.

Mode: all

TRIGger<n>[:SEQuence]:IFPower:HOLDoff <Value>

This command sets the holding time before the next IF power trigger event.

Suffix:
<n> irrelevant

Parameters:
<Value> <numeric_value> in s: 150 ns to 1000 s

*RST: 150 ns

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HOLD 200 ns`
Sets the holding time to 200 ns.

Mode: A-F, ADEMOD, CDMA, EVDO, GSM, VSA, OFDM, OFDMA/ WiBro, TDS, WCDMA

TRIGger<n>[:SEQuence]:IFPower:HYSTeresis <Value>

This command sets the limit that the hysteresis value for the IF power trigger has to fall below in order to trigger the next measurement.

Suffix:
<n> irrelevant

Parameters:
<Value> <numeric_value> in dB: 3 dB to 50 dB

*RST: 3 dB

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HYST 10DB`
Sets the hysteresis limit value.

Mode: ALL

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

Suffix:
<n> irrelevant

Parameters:
<Delay>

Range: zero span: -sweeptime (see data sheet) to 30 s; span: 0 to 30 s
*RST: 0 s

Example: `TRIG:HOLD 500us`

Mode: All

TRIGger<n>[:SEQuence]:LEVel[:EXTernal] <TriggerLevel>

This command sets the level of the external trigger source in Volt.

Suffix:
<n> irrelevant

Parameters:
<TriggerLevel>

Range: 0.5 V to 3.5 V
*RST: 1.4 V

Example: `TRIG:LEV 2V`

Mode: All

TRIGger<n>[:SEQuence]:SLOPe <Type>

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Suffix:
<n> irrelevant

Parameters:
<Type> POSitive | NEGative

*RST: POSitive

Example: `TRIG:SLOP NEG`

Mode: all

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source for the start of a sweep.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:
<n> irrelevant

Parameters:
<Source> IMMediate | EXTern | IFPower | TIME | VIDeo

IMMediate
Free Run

EXTern
External trigger

IFPower
Second intermediate frequency

TIME
Time interval

VIDeo
Video mode is only available in the time domain and only in Spectrum mode.

BBPower
Baseband power (for digital input via the Digital Baseband Interface, R&S FSV-B17)

*RST: IMMediate

Example: `TRIG:SOUR EXT`
Selects the external trigger input as source of the trigger signal

Mode: ALL

4.5.9.3 Other Referenced Commands

ABORt

This command aborts a current measurement and resets the trigger system.

Example: `ABOR;INIT:IMM`

Mode: all

DIAGnostic<n>:SERVice:NSOurce <State>

This command switches the 28 V supply of the noise source on the front panel on or off.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DIAG:SERV:NSO ON`

Mode: all

FORMat:DEXPort:DSEParator <Separator>

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

The suffix <1…4> is irrelevant, the separator is defined globally for all windows.

Parameters:

<Separator> POINt | COMMA

*RST: (factory setting is POINt; *RST does not affect setting)

Example: `FORM:DEXP:DSEP POIN`

Sets the decimal point as separator.

Mode: all

INITiate<n>:CONMeas

This command continues a stopped measurement at the current position in single sweep mode. The function is useful especially for trace functions MAXHold, MINHold and AVERage, if the previous results are not to be cleared with sweep count > 0 or average count > 0 on restarting the measurement (INIT:IMMediate resets the previous results on restarting the measurement).

The single sweep mode is automatically switched on. Synchronization to the end of the indicated number of measurements can then be performed with the commands *OPC, *OPC? or *WAI. In the continuous sweep mode, synchronization to the sweep end is not possible since the overall measurement "never" ends.

Suffix:

<n> irrelevant

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.
`INIT:CONM;*WAI`
Continues the measurement (next 20 sequences) and waits for the end.

Mode: A, ADEMOD, CDMA, EVDO, VSA, WCDMA, TDS

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

In the **"Spectrum" mode**, this setting refers to the sweep sequence (switching between continuous/single sweep).

Suffix:
<n> irrelevant

Parameters:
<State> ON | OFF

*RST: ON

Example: `INIT:CONT OFF`
Switches the sequence to single sweep.
`INIT:CONT ON`
Switches the sequence to continuous sweep.

Mode: all

INITiate<n>:ESPectrum

This command starts a Spectrum Emission Mask measurement.

Suffix:
<n> irrelevant

Example: `INIT:ESP`
Starts a Spectrum Emission Mask measurement.

Mode: A, CDMA, EVDO, TDS, WCDMA

MMEMory:STORe<n>:LIST <FileName>

This command stores the current list evaluation results in a `<file name>.dat` file. The file consists of a data section containing the list evaluation results.

Suffix:
<n> irrelevant

Parameters:

<FileName> <file name>

Example: `MMEM:STOR:LIST 'test'`
Stores the current list evaluation results in the `test.dat` file.

Mode: A, ADEMOD, CDMA, EVDO, NF, TDS, WCDMA

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command stores the selected trace in the specified window in a file with ASCII format. The file format is described in chapter 4.4.4.7, "ASCII File Export Format", on page 155

The decimal separator (decimal point or comma) for floating-point numerals contained in the file is defined with the `FORMat:DEXPort:DSEParator` command (see `FORMat:DEXPort:DSEParator` on page 295).

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<Trace> 1 to 6

selected measurement trace

<FileName> DOS file name
The file name includes indication of the path and the drive name. Indication of the path complies with DOS conventions.

Example: `MMEM:STOR:TRAC 3,'TEST.ASC'`
Stores trace 3 in the file TEST.ASC.

Mode: all

OUTPut:IF[:SOURce] <Source>

This command switches the source of the IF output between the demodulated signal and the IF signal.

The AF output available at the frontpanel can only be used if the IF output source is set to video.

Parameters:

<Source> IF | VIDeo

IF
intermediate frequency output

VIDeo
video output, 200 mV

*RST: IF

Example: `OUTP:IF VID`
Selects the video signal for the IF output connector.

Mode: A

OUTPut:TRIGger <PortLevel>

Sets the Trigger Out port in the Additional Interfaces (option B5 only) to low or high.Thus, you can trigger an additional device via the external trigger port, for example.

Parameters:

<PortLevel> LOW | HIGH

*RST: LOW

Example: `OUTP:TRIG HIGH`

Mode: A

SYSTem:DISPlay:UPDate <State>

In remote control mode, this command switches on or off the instrument display. If switched on, only the diagrams, traces and display fields are displayed and updated.

The best performance is obtained if the display output is switched off during remote control.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `SYST:DISP:UPD ON`

Mode: all

4.6 Status Reporting System of the CDMA2000 BTS Analysis (option K82)

Detailed information on the status registers of the base system is given in the base unit description. In this section, only the new and altered status registers/its for the CDMA2000 BTS Analysis option (K82) are described.

The R&S FSV-K82 uses the STATus:QUEStionable:SYNC register.

Although this register is provided by the base system, the CDMA2000 BTS Analysis option (K82) uses different bits and definitions.

The `STATus:QUEStionable:SYNC` register contains information on the error situation in the code domain analysis of the CDMA2000 BTS Analysis option. The bits can be queried with commands `STATus:QUEStionable:SYNC:CONDition` and `STATus:QUEStionable:SYNC[:EVENt]`.

Bit No	Meaning
0	This bit is not used.

1	Frame Sync failed. This bit is set when synchronization is not possible within the application. Possible reasons: Incorrectly set frequency Incorrectly set level Incorrectly set PN Offset Incorrectly set values for Swap IQ Invalid signal at input
2 to 14	These bits are not used.
15	This bit is always 0.

4.7 Glossary

For a more comprehensive glossary refer to the CDMA2000 standard.

APICH	auxiliary pilot channel
ATDPCH	auxiliary transmit diversity pilot channel
BCH	broadcast channel.
CACH	common assignment channel
CCCH	common control channel
CDEP	code domain error power
CDP	code domain power
Composite EVM	in accordance with the 3GPP2 specifications, determines the square root of the squared error between the real and the imaginary parts of the test signal and an ideally generated reference signal (EVM referred to the total signal) in a composite EVM measurement.
CPCCH	common power control channel
Crest factor	ratio of peak to average value of the signal
Inactive Channel Threshold	minimum power that a single channel must have compared with the total signal to be recognized as an active channel.
MC1	multi-carrier1 (one carrier system 1X).
MC2	multi-carrier3 (three carrier system 3X).
OTD	orthogonal transmit diversity, two antennas used
PCG	power control group: name in CDMA2000 system for 1536 chips or 1.25 ms interval; transmitter power is constant during a power control group
PCH	paging channel
PDCH	packet data channel
PDCCH	packet data control channel
PICH	pilot channel 0.64

RC	radio configuration; definition of sampling rate, permissible data rates, modulation types and use of special channels, and transmit diversity
Set	a group of 64 consecutive PCGs
SF	spreading factor
SYNC	synchronisation channel 32.64
TD	transmit diversity, two antennas used
TDPICH	transmit diversity pilot channel 16.128
x.y	Walsh code x.y, with code number x and spreading factor y of the channel

4.8 Appendix

Hadamard and BitReverse Code Tables

The following tables show the code sequences with Hadamard and BitReverse orders for the Code Domain Power and Code Domain Error Power result displays.

As an example, the corresponding cells for channel 8.32 (channel number 8 for spreading factor 32) are marked to show where the different codes of this channel are located.

	HADAMARD							BITREVERSE							
0	000000	0	0	0	0	0	0	0	0	0	0	0	0	000000	0
1	000001	0	0	0	0	0	1	1	0	0	0	0	0	100000	32
2	000010	0	0	0	0	1	0	0	1	0	0	0	0	010000	16
3	000011	0	0	0	0	1	1	1	1	0	0	0	0	110000	48
4	000100	0	0	0	1	0	0	0	0	1	0	0	0	001000	8
5	000101	0	0	0	1	0	1	1	0	1	0	0	0	101000	40
6	000110	0	0	0	1	1	0	0	1	1	0	0	0	011000	24
7	000111	0	0	0	1	1	1	1	1	1	0	0	0	111000	56
8	001000	0	0	1	0	0	0	0	0	0	1	0	0	000100	4
9	001001	0	0	1	0	0	1	1	0	0	1	0	0	100100	36
10	001010	0	0	1	0	1	0	0	1	0	1	0	0	010100	20
11	001011	0	0	1	0	1	1	1	1	0	1	0	0	110100	52
12	001100	0	0	1	1	0	0	0	0	1	1	0	0	001100	12
13	001101	0	0	1	1	0	1	1	0	1	1	0	0	101100	44
14	001110	0	0	1	1	1	0	0	1	1	1	0	0	011100	28
15	001111	0	0	1	1	1	1	1	1	1	1	0	0	111100	60
16	010000	0	1	0	0	0	0	0	0	0	0	1	0	000010	2
17	010001	0	1	0	0	0	1	1	0	0	0	1	0	100010	34
18	010010	0	1	0	0	1	0	0	1	0	0	1	0	010010	18
19	010011	0	1	0	0	1	1	1	1	0	0	1	0	110010	50
20	010100	0	1	0	1	0	0	0	0	1	0	1	0	001010	10
21	010101	0	1	0	1	0	1	1	0	1	0	1	0	101010	42
22	010110	0	1	0	1	1	0	0	1	1	0	1	0	011010	26
23	010111	0	1	0	1	1	1	1	1	1	0	1	0	111010	58
24	011000	0	1	1	0	0	0	0	0	0	1	1	0	000110	6
25	011001	0	1	1	0	0	1	1	0	0	1	1	0	100110	38
26	011010	0	1	1	0	1	0	0	1	0	1	1	0	010110	22
27	011011	0	1	1	0	1	1	1	1	0	1	1	0	110110	54
28	011100	0	1	1	1	0	0	0	0	1	1	1	0	001110	14
29	011101	0	1	1	1	0	1	1	0	1	1	1	0	101110	46
30	011110	0	1	1	1	1	0	0	1	1	1	1	0	011110	30
31	011111	0	1	1	1	1	1	1	1	1	1	1	0	111110	62
32	100000	1	0	0	0	0	0	0	0	0	0	0	1	000001	1
33	100001	1	0	0	0	0	1	1	0	0	0	0	1	100001	33
34	100010	1	0	0	0	1	0	0	1	0	0	0	1	010001	17
35	100011	1	0	0	0	1	1	1	1	0	0	0	1	110001	49
36	100100	1	0	0	1	0	0	0	0	1	0	0	1	001001	9
37	100101	1	0	0	1	0	1	1	0	1	0	0	1	101001	41
38	100110	1	0	0	1	1	0	0	1	1	0	0	1	011001	25
39	100111	1	0	0	1	1	1	1	1	1	0	0	1	111001	57
40	101000	1	0	1	0	0	0	0	0	0	1	0	1	000101	5
41	101001	1	0	1	0	0	1	1	0	0	1	0	1	100101	37
42	101010	1	0	1	0	1	0	0	1	0	1	0	1	010101	21
43	101011	1	0	1	0	1	1	1	1	0	1	0	1	110101	53
44	101100	1	0	1	1	0	0	0	0	1	1	0	1	001101	13
45	101101	1	0	1	1	0	1	1	0	1	1	0	1	101101	45
46	101110	1	0	1	1	1	0	0	1	1	1	0	1	011101	29
47	101111	1	0	1	1	1	1	1	1	1	1	0	1	111101	61
48	110000	1	1	0	0	0	0	0	0	0	0	1	1	000011	3
49	110001	1	1	0	0	0	1	1	0	0	0	1	1	100011	35
50	110010	1	1	0	0	1	0	0	1	0	0	1	1	010011	19
51	110011	1	1	0	0	1	1	1	1	0	0	1	1	110011	51
52	110100	1	1	0	1	0	0	0	0	1	0	1	1	001011	11
53	110101	1	1	0	1	0	1	1	0	1	0	1	1	101011	43
54	110110	1	1	0	1	1	0	0	1	1	0	1	1	011011	27
55	110111	1	1	0	1	1	1	1	1	1	0	1	1	111011	59
56	111000	1	1	1	0	0	0	0	0	0	1	1	1	000111	7
57	111001	1	1	1	0	0	1	1	0	0	1	1	1	100111	39
58	111010	1	1	1	0	1	0	0	1	0	1	1	1	010111	23
59	111011	1	1	1	0	1	1	1	1	0	1	1	1	110111	55
60	111100	1	1	1	1	0	0	0	0	1	1	1	1	001111	15
61	111101	1	1	1	1	0	1	1	0	1	1	1	1	101111	47
62	111110	1	1	1	1	1	0	0	1	1	1	1	1	011111	31
63	111111	1	1	1	1	1	1	1	1	1	1	1	1	111111	63

Fig. 4-18: Codetable for base spreading factor 64

	HADAMARD								BITREVERSE								
0	00000000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00000000	0
1	00000001	0	0	0	0	0	0	1	1	0	0	0	0	0	0	10000000	64
2	00000010	0	0	0	0	0	1	0	0	1	0	0	0	0	0	01000000	32
3	00000011	0	0	0	0	0	1	1	1	1	0	0	0	0	0	11000000	96
4	00000100	0	0	0	0	1	0	0	0	0	1	0	0	0	0	00100000	16
5	00000101	0	0	0	0	1	0	1	1	0	1	0	0	0	0	10100000	80
6	00000110	0	0	0	0	1	1	0	0	1	1	0	0	0	0	01100000	48
7	00000111	0	0	0	0	1	1	1	1	1	1	0	0	0	0	11100000	112
8	00001000	0	0	0	1	0	0	0	0	0	0	0	1	0	0	00010000	8
9	00001001	0	0	0	1	0	0	1	1	0	0	0	1	0	0	10010000	72
10	00001010	0	0	0	1	0	1	0	0	1	0	0	1	0	0	01010000	40
11	00001011	0	0	0	1	0	1	1	1	1	0	0	1	0	0	11010000	104
12	00001100	0	0	0	1	1	0	0	0	0	1	1	0	0	0	00110000	24
13	00001101	0	0	0	1	1	0	1	1	0	1	1	0	0	0	10110000	88
14	00001110	0	0	0	1	1	1	0	0	1	1	1	0	0	0	01110000	56
15	00001111	0	0	0	1	1	1	1	1	1	1	1	0	0	0	11110000	120
16	00010000	0	0	1	0	0	0	0	0	0	0	0	1	0	0	00001000	4
17	00010001	0	0	1	0	0	0	1	1	0	0	0	1	0	0	10001000	68
18	00010010	0	0	1	0	0	1	0	0	1	0	0	1	0	0	01001000	36
19	00010011	0	0	1	0	0	1	1	1	1	0	0	1	0	0	11001000	100
20	00010100	0	0	1	0	1	0	0	0	0	1	0	1	0	0	00101000	20
21	00010101	0	0	1	0	1	0	1	1	0	1	0	1	0	0	10101000	84
22	00010110	0	0	1	0	1	1	0	0	1	1	0	1	0	0	01101000	52
23	00010111	0	0	1	0	1	1	1	1	1	1	0	1	0	0	11101000	116
24	00011000	0	0	1	1	0	0	0	0	0	0	1	1	0	0	00011000	12
25	00011001	0	0	1	1	0	0	1	1	0	0	1	1	0	0	10011000	76
26	00011010	0	0	1	1	0	1	0	0	1	0	1	1	0	0	01011000	44
27	00011011	0	0	1	1	0	1	1	1	1	0	1	1	0	0	11011000	108
28	00011100	0	0	1	1	1	0	0	0	0	1	1	1	0	0	00111000	28
29	00011101	0	0	1	1	1	0	1	1	0	1	1	1	0	0	10111000	92
30	00011110	0	0	1	1	1	1	0	0	1	1	1	1	0	0	01111000	60
31	00011111	0	0	1	1	1	1	1	1	1	1	1	1	0	0	11111000	124
32	00100000	0	1	0	0	0	0	0	0	0	0	0	0	1	0	00000100	2
33	00100001	0	1	0	0	0	0	1	1	0	0	0	0	1	0	10000100	66
34	00100010	0	1	0	0	0	1	0	0	1	0	0	0	1	0	01000100	34
35	00100011	0	1	0	0	0	1	1	1	1	0	0	0	1	0	11000100	98
36	00100100	0	1	0	0	1	0	0	0	0	1	0	0	1	0	00100100	18
37	00100101	0	1	0	0	1	0	1	1	0	1	0	0	1	0	10100100	82
38	00100110	0	1	0	0	1	1	0	0	1	1	0	0	1	0	01100100	50
39	00100111	0	1	0	0	1	1	1	1	1	1	0	0	1	0	11100100	114
40	00101000	0	1	0	1	0	0	0	0	0	0	0	1	1	0	00010100	10
41	00101001	0	1	0	1	0	0	1	1	0	0	0	1	1	0	10010100	74
42	00101010	0	1	0	1	0	1	0	0	1	0	0	1	1	0	01010100	42
43	00101011	0	1	0	1	0	1	1	1	1	0	0	1	1	0	11010100	106
44	00101100	0	1	0	1	1	0	0	0	0	1	1	1	1	0	00110100	26
45	00101101	0	1	0	1	1	0	1	1	0	1	1	1	1	0	10110100	90
46	00101110	0	1	0	1	1	1	0	0	1	1	1	1	1	0	01110100	58
47	00101111	0	1	0	1	1	1	1	1	1	1	1	1	1	0	11110100	122
48	00110000	0	1	1	0	0	0	0	0	0	0	0	0	0	1	00001100	6
49	00110001	0	1	1	0	0	0	1	1	0	0	0	0	0	1	10001100	70
50	00110010	0	1	1	0	0	1	0	0	1	0	0	0	0	1	01001100	38
51	00110011	0	1	1	0	0	1	1	1	1	0	0	0	0	1	11001100	102
52	00110100	0	1	1	0	1	0	0	0	0	1	0	0	0	1	00101100	22
53	00110101	0	1	1	0	1	0	1	1	0	1	0	0	0	1	10101100	86
54	00110110	0	1	1	0	1	1	0	0	1	1	0	0	0	1	01101100	54
55	00110111	0	1	1	0	1	1	1	1	1	1	0	0	0	1	11101100	118
56	00111000	0	1	1	1	0	0	0	0	0	0	1	1	0	1	00011100	14
57	00111001	0	1	1	1	0	0	1	1	0	0	1	1	0	1	10011100	78
58	00111010	0	1	1	1	0	1	0	0	1	0	1	1	0	1	01011100	46
59	00111011	0	1	1	1	0	1	1	1	1	0	1	1	0	1	11011100	110
60	00111100	0	1	1	1	1	0	0	0	0	1	1	1	0	1	00111100	30
61	00111101	0	1	1	1	1	0	1	1	0	1	1	1	0	1	10111100	94
62	00111110	0	1	1	1	1	1	0	0	1	1	1	1	0	1	01111100	62
63	00111111	0	1	1	1	1	1	1	1	1	1	1	1	0	1	11111100	126

Fig. 4-19: Code table for base spreading factor 128 (part1)

	HADAMARD								BITREVERSE								
64	1000000	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0000001	1
65	1000001	1	0	0	0	0	0	1	1	0	0	0	0	0	1	1000001	65
66	1000010	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0100001	33
67	1000011	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1100001	97
68	1000100	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0010001	17
69	1000101	1	0	0	0	1	0	1	1	0	1	0	0	0	1	1010001	81
70	1000110	1	0	0	0	1	1	0	0	1	1	0	0	0	1	0110001	49
71	1000111	1	0	0	0	1	1	1	1	1	1	0	0	0	1	1110001	113
72	1001000	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0001001	9
73	1001001	1	0	0	1	0	0	1	1	0	0	1	0	0	1	1001001	73
74	1001010	1	0	0	1	0	1	0	0	1	0	1	0	0	1	0101001	41
75	1001011	1	0	0	1	0	1	1	1	1	0	1	0	0	1	1101001	105
76	1001100	1	0	0	1	1	0	0	0	0	1	1	0	0	1	0011001	25
77	1001101	1	0	0	1	1	0	1	1	0	1	1	0	0	1	1011001	89
78	1001110	1	0	0	1	1	1	0	0	1	1	1	0	0	1	0111001	57
79	1001111	1	0	0	1	1	1	1	1	1	1	1	0	0	1	1111001	121
80	1010000	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0000101	5
81	1010001	1	0	1	0	0	0	1	1	0	0	0	1	0	1	1000101	69
82	1010010	1	0	1	0	0	1	0	0	1	0	0	1	0	1	0100101	37
83	1010011	1	0	1	0	0	1	1	1	1	0	0	1	0	1	1100101	101
84	1010100	1	0	1	0	1	0	0	0	0	1	0	1	0	1	0010101	21
85	1010101	1	0	1	0	1	0	1	1	0	1	0	1	0	1	1010101	85
86	1010110	1	0	1	0	1	1	0	0	1	1	0	1	0	1	0110101	53
87	1010111	1	0	1	0	1	1	1	1	1	1	0	1	0	1	1110101	117
88	1011000	1	0	1	1	0	0	0	0	0	0	1	1	0	1	0001101	13
89	1011001	1	0	1	1	0	0	1	1	0	0	1	1	0	1	1001101	77
90	1011010	1	0	1	1	0	1	0	0	1	0	1	1	0	1	0101101	45
91	1011011	1	0	1	1	0	1	1	1	1	0	1	1	0	1	1101101	109
92	1011100	1	0	1	1	1	0	0	0	0	1	1	1	0	1	0011101	29
93	1011101	1	0	1	1	1	0	1	1	0	1	1	1	0	1	1011101	93
94	1011110	1	0	1	1	1	1	0	0	1	1	1	1	0	1	0111101	61
95	1011111	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1111101	125
96	1100000	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0000011	3
97	1100001	1	1	0	0	0	0	1	1	0	0	0	0	1	1	1000011	67
98	1100010	1	1	0	0	0	1	0	0	1	0	0	0	1	1	0100011	35
99	1100011	1	1	0	0	0	1	1	1	1	0	0	0	1	1	1100011	99
100	1100100	1	1	0	0	1	0	0	0	0	1	0	0	1	1	0010011	19
101	1100101	1	1	0	0	1	0	1	1	0	1	0	0	1	1	1010011	83
102	1100110	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0110011	51
103	1100111	1	1	0	0	1	1	1	1	1	1	0	0	1	1	1110011	115
104	1101000	1	1	0	1	0	0	0	0	0	0	1	0	1	1	0001011	11
105	1101001	1	1	0	1	0	0	1	1	0	0	1	0	1	1	1001011	75
106	1101010	1	1	0	1	0	1	0	0	1	0	1	0	1	1	0101011	43
107	1101011	1	1	0	1	0	1	1	1	1	0	1	0	1	1	1101011	107
108	1101100	1	1	0	1	1	0	0	0	0	1	1	0	1	1	0011011	27
109	1101101	1	1	0	1	1	0	1	1	0	1	1	0	1	1	1011011	91
110	1101110	1	1	0	1	1	1	0	0	1	1	1	0	1	1	0111011	59
111	1101111	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1111011	123
112	1110000	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0000111	7
113	1110001	1	1	1	0	0	0	1	1	0	0	0	1	1	1	1000111	71
114	1110010	1	1	1	0	0	1	0	0	1	0	0	1	1	1	0100111	39
115	1110011	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1100111	103
116	1110100	1	1	1	0	1	0	0	0	0	1	0	1	1	1	0010111	23
117	1110101	1	1	1	0	1	0	1	1	0	1	0	1	1	1	1010111	87
118	1110110	1	1	1	0	1	1	0	0	1	1	0	1	1	1	0110111	55
119	1110111	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1110111	119
120	1111000	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0001111	15
121	1111001	1	1	1	1	0	0	1	1	0	0	1	1	1	1	1001111	79
122	1111010	1	1	1	1	0	1	0	0	1	0	1	1	1	1	0101111	47
123	1111011	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1101111	111
124	1111100	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0011111	31
125	1111101	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1011111	95
126	1111110	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0111111	63
127	1111111	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1111111	127

Fig. 4-20: Code table for base spreading factor 128 (part 2)

List of Commands

[SENSe:]ADJust:ALL....239
[SENSe:]ADJust:CONFigure:LEVel:DURation....240
[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE....240
[SENSe:]ADJust:FREQuency....240
[SENSe:]ADJust:LEVel....240
[SENSe:]AVERage<n>:COUNt....274
[SENSe:]AVERage<n>[:STATe<Trace>]....275
[SENSe:]BANDwidth|BWIDth:VIDeo....254
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO....254
[SENSe:]BANDwidth|BWIDth:VIDeo:RATio....255
[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE....255
[SENSe:]BANDwidth|BWIDth[:RESolution]....252
[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO....252
[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT....253
[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio....253
[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE....253
[SENSe:]CDPower:ANTenna....232
[SENSe:]CDPower:CODE....232
[SENSe:]CDPower:ICThreshold....232
[SENSe:]CDPower:IQLength....233
[SENSe:]CDPower:LCODe:MASK....233
[SENSe:]CDPower:LCODe:MODE....235
[SENSe:]CDPower:LCODe:OFFSet....234
[SENSe:]CDPower:LEVel:ADJust....233
[SENSe:]CDPower:MAPPing....233
[SENSe:]CDPower:NORMalize....235
[SENSe:]CDPower:ORDer....235
[SENSe:]CDPower:OVERview....236
[SENSe:]CDPower:PNOFfset....236
[SENSe:]CDPower:PPReference....236
[SENSe:]CDPower:PREFerence....236
[SENSe:]CDPower:QINVert....237
[SENSe:]CDPower:SBANd....237
[SENSe:]CDPower:SET....238
[SENSe:]CDPower:SET:COUNt....237
[SENSe:]CDPower:SFACtor....238
[SENSe:]CDPower:SLOT....238
[SENSe:]CDPower:TPMeas....239
[SENSe:]ESPectrum:BWID....241
[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa....242
[SENSe:]ESPectrum:FILTer[:RRC][:STATe]....242
[SENSe:]ESPectrum:HighSPeed....242
[SENSe:]ESPectrum:PRESet:RESTore....243
[SENSe:]ESPectrum:PRESet:STORe....243
[SENSe:]ESPectrum:PRESet[:STANdard]....243
[SENSe:]ESPectrum:RANGe<range>:BANDwidth....244
[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo....244

[SENSe:]ESPectrum:RANGe<range>:COUNt....244
[SENSe:]ESPectrum:RANGe<range>:DELete....245
[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE....245
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation....246
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO....247
[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe....247
[SENSe:]ESPectrum:RANGe<range>:INSert....247
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt....248
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP....248
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt....248
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP....249
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe....249
[SENSe:]ESPectrum:RANGe<range>:RLEVel....250
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME....250
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO....250
[SENSe:]ESPectrum:RANGe<range>:TRANsducer....251
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt....245
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP....246
[SENSe:]ESPectrum:RRANge....251
[SENSe:]ESPectrum:RTYPe....251
[SENSe:]FREQuency:CENTer....256
[SENSe:]FREQuency:CENTer:STEP:AUTO....256
[SENSe:]FREQuency:CENTer:STEP:LINK....256
[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor....257
[SENSe:]FREQuency:CENTer:STEP[:VALue]....256
[SENSe:]FREQuency:OFFSet....257
[SENSe:]FREQuency:SPAN....257
[SENSe:]FREQuency:SPAN:FULL....258
[SENSe:]FREQuency:STARt....258
[SENSe:]FREQuency:STOP....258
[SENSe:]POWer:ACHannel:ACPairs....259
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel....259
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>....260
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]....259
[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel....260
[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel>....260
[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel>....261
[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel....261
[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTernate<channel>....261
[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel>....262
[SENSe:]POWer:ACHannel:MODE....262
[SENSe:]POWer:ACHannel:NAME:ACHannel....262
[SENSe:]POWer:ACHannel:NAME:ALTernate<channel>....263
[SENSe:]POWer:ACHannel:NAME:CHANnel<channel>....263
[SENSe:]POWer:ACHannel:PRESet....263
[SENSe:]POWer:ACHannel:PRESet:RLEVel....264
[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE....264
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO....264
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual....265
[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel>....266

[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel>....266
[SENSe:]POWer:ACHannel:SPACing[:ACHannel]....265
[SENSe:]POWer:ACHannel:TXCHannel:COUNt....266
[SENSe:]POWer:BANDwidth|BWIDth....267
[SENSe:]POWer:HSPeed....267
[SENSe:]POWer:NCORrection....267
[SENSe:]POWer:TRACe....267
[SENSe:]SWEep:COUNt....268
[SENSe:]SWEep:EGATe....269
[SENSe:]SWEep:EGATe:HOLDoff....269
[SENSe:]SWEep:EGATe:LENGth....269
[SENSe:]SWEep:EGATe:POLarity....270
[SENSe:]SWEep:EGATe:SOURce....270
[SENSe:]SWEep:EGATe:TRACe<k>:COMMent....270
[SENSe:]SWEep:EGATe:TRACe<k>: PERiod....270
[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range>....271
[SENSe:]SWEep:EGATe:TRACe<k>: STOP<range>....272
[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>]....271
[SENSe:]SWEep:EGATe:TYPE....271
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[SENSe:]SWEep:TIME....273
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CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]....186
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CALCulate<n>:DELTamarker<m>:MINimum:NEXT....187
CALCulate<n>:DELTamarker<m>:MINimum:RIGHt....188
CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]....188
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CALCulate<n>:DELTamarker<m>:X:RELative....189
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CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe....193
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CALCulate<n>:MARKer<m>:MAXimum:NEXT....202
CALCulate<n>:MARKer<m>:MAXimum:RIGHt....203
CALCulate<n>:MARKer<m>:MAXimum[:PEAK]....203
CALCulate<n>:MARKer<m>:MINimum:LEFT....203
CALCulate<n>:MARKer<m>:MINimum:NEXT....204
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CALCulate<n>:MARKer<m>:MINimum[:PEAK]....204
CALCulate<n>:MARKer<m>:TRACe....205
CALCulate<n>:MARKer<m>:X....206
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CALCulate<n>:PSEarch|PEAKsearch:PSHow....209
CALCulate<n>:PSEarch|PEAKsearch:SUBRanges....209
CALCulate<n>:PSEarch|PEAKsearch[:IMMediate]....208
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CALCulate<n>:STATistics:SCALe:Y:LOWer....212

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CONFigure:CDPower[:BTS]:CTABle:DATA....218
CONFigure:CDPower[:BTS]:CTABle:DATA....217
CONFigure:CDPower[:BTS]:CTABle:DELete....219
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