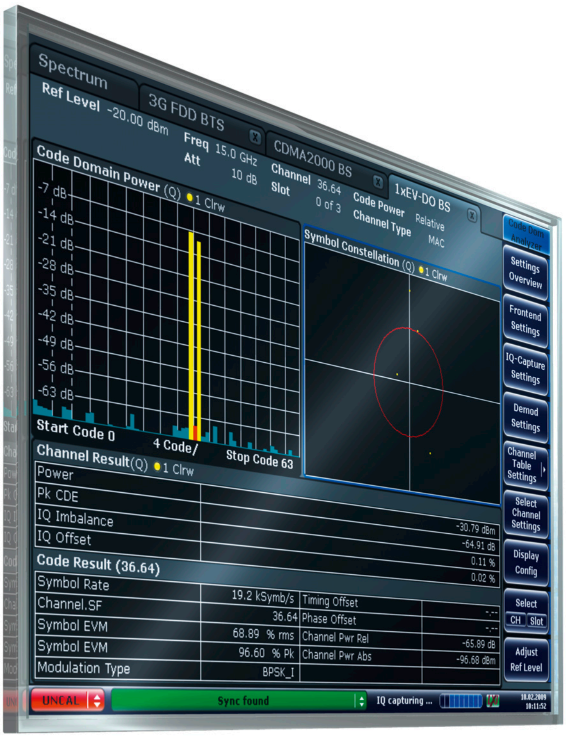
R&S® FSV-K84/-K85 Firmware Option 1xEV-DO BTS Analysis and MS Measurements
Operating Manual



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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

This manual describes the following options:

- R&S FSV-K84 (1310.8803.02)
- R&S FSV-K85 (1310.8778.02)

The contents of this manual correspond to the following R&S®FSVR models with firmware version 2.23 or higher:

- R&S®FSVR7 (1311.0006K7)
- R&S®FSVR13 (1311.0006K13)
- R&S®FSVR30 (1311.0006K30)
- R&S®FSVR40 (1311.0006K40)

The software contained in this product 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. R&S®FSVR is abbreviated as R&S FSVR.

Contents

1 Preface

1.1 Documentation Overview

The user documentation for the R&S FSVR 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:

Chapter 1	Introduction, General information
Chapter 2	Front and Rear Panel
Chapter 3	Preparing for Use
Chapter 4	Firmware Update and Installation of Firmware Options
Chapter 5	Basic Operations
Chapter 6	Basic Measurement Examples
Chapter 7	Brief Introduction to Remote Control
Appendix	Printer Interface
Appendix	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 R&S FSVR 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 R&S FSVR is not included in the option manuals.

The following Operating Manuals are available for the R&S FSVR:

- R&S FSVR base unit; in addition:
  – R&S FSV-K7S Stereo FM Measurements
  – R&S FSV-K9 Power Sensor Support
  – R&S FSV-K14 Spectrogram Measurement
- 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 Operating Manual
  R&S FSV-K70 Vector Signal Analysis Getting Started (First measurements)
- 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 802.11
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application
- R&S FSV-K101/K105 EUTRA / LTE Uplink Measurement Application

These manuals are available in PDF format on the CD delivered with the instrument.

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 R&S FSVR 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 R&S FSVR and all available options. It describes both manual and remote operation. The online help is installed on the R&S FSVR 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.

1.2 Conventions Used in the Documentation

1.2.1 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.

1.2.2 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 touchscreen 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 instrument 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 instrument or on a keyboard.

1.2.3 Notes on Screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as much as possible of the provided functions and possible interdependencies between parameters.

The screenshots usually show a fully equipped product, that is: with all options installed. Thus, some functions shown in the screenshots may not be available in your particular product configuration.

1.3 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.

2 Introduction

Overview of Firmware Options R&S FSV-K84/-K85

This section contains all information required for operation of an R&S FSVR equipped with Application Firmware R&S FSV-K84 or -K85. It covers operation via menus and the remote control commands for the 1xEV-DO Analysis.

This part of the documentation consists of the following chapters:

- chapter 3, "Measurement Examples for the 1xEV-DO BTS Analysis (K84)", on page 11
  Explains some basic 1xEV-DO base station tests.
- chapter 4, "Measurement Examples for the 1xEV-DO MS Analysis (K85)", on page 20
  Explains some basic 1xEV-DO mobile station tests.
- chapter 5, "Test Setup for Base Station and Mobile Station Tests", on page 29
  Describes the measurement setup for base station and mobile station tests.
- chapter 6, "Instrument Functions of the 1xEV-DO Analysis", on page 31
  Describes the instrument functions of 1xEV-DO Analysis.
- chapter 7, "Remote Commands of the 1xEV-DO Analysis", on page 204
  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 8, "Status Reporting System of the 1xEV-DO Analysis", on page 358
  Contains device-specific error messages for R&S FSV-K84/-K85.

This part of the documentation includes only functions of the Application Firmware R&S FSV-K84/-K85. For all other descriptions, please refer to the description of the base unit.

3 Measurement Examples for the 1xEV-DO BTS Analysis (K84)

3.1 Measuring the Signal Channel Power

In the Power measurement, the total channel power of the 1xEV-DO 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 R&S FSVR (coaxial cable with N connectors).

Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: 1xEV-DO BTS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Activate the "1xEV-DO BTS Analysis" mode.
   a) Press the MODE key and activate the "1xEV-DO BTS Analysis" option.
3. Start the Power measurement
   a) Press the MEAS key.
   b) Press the "Power" 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*.

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.

3.2 Measuring the Spectrum Emission Mask

To detect spurious emissions such as harmonics or intermodulation products, the R&S FSVR 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" on page 124 softkey in the "Spectrum Emission Mask" menu.

Test setup:

- Connect the RF output of the signal generator to the RF input of the R&S FSVR (coaxial cable with N connectors).

Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: 1xEV-DO BTS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO BTS Analysis" mode.
   a) Press the MODE key and select the "1xEV-DO 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.

3.3 Measuring the Relative Code Domain Power and the Frequency Error

A Code Domain Power measurement analyses the signal over a single slot. 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 R&S FSVR.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSVR 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: 1xEV-DO BTS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO BTS Analysis" mode.
   a) Press the MODE key and select "1xEV-DO BTS Analysis".
3. Select 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-K84 displays two measurement screens. After a preset the first (screen A) is always the Code Domain Power result display. The second (screen B) is always the Result Display

For more information on the display concept refer to the "Display Config" on page 85 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.
   a) 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.

► 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 R&S FSVR 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.
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 R&S FSVR

3.4 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 slot. 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 R&S FSVR.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSVR to the reference input of the signal generator (coaxial cable with BNC connectors).
- Connect the external trigger input on the rear panel of the R&S FSVR (EXT TRIGGER/GATE IN) to the external trigger output of the signal generator.

Signal generator settings (e.g. R&S SMU):

Frequency: 878.49 MHz

Level: 0 dBm

Standard: 1xEV-DO BTS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO BTS Analysis" Mode.
   a) Press the MODE key and select 1xEV-DO BTS Analysis.
3. Select 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 slot is shown.

3.4.1 Adjusting the Trigger Offset

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

- Set an external trigger source and the trigger offset.
  – Open the IQ Capture dialog box.
  – Set the "Trigger Source" option to "External".
  – 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 Trigger to Frame result, the offset between the trigger event and the start of the slot has been adjusted.

3.4.2 Behaviour With the Wrong PN Offset

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

- Set a PN Offset.
  – Open the "Result 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 R&S FSVR is the same as that of the signal. In the result summary the "Trigger to Frame" value is now shown correctly.

3.5 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 R&S FSVR. 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 slot. 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 slots and the y-axis shows the EVM values.

Test Setup:

- Connect the RF output of the Signal Generator to the RF input of the R&S FSVR. (coaxial cables with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the R&S FSVR 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: 1xEV-DO BTS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO BTS Analysis" Mode.
   a) Press the MODE key and select 1xEV-DO BTS Analysis.
3. Select 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.

3.6 Measuring the Peak Code Domain Error

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSVR. 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 slot. 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 slots 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 R&S FSVR (coaxial cable with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the R&S FSVR to the reference output (REF) on the signal generator (coaxial cable with BNC connectors).
- Connect external triggering of the R&S FSVR (EXT TRIG GATE) to the signal generator trigger (TRIGOUT1 at PAR DATA).

Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: 1xEV-DO BTS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO BTS Analysis" mode.
   a) Press the MODE key and select the "1xEV-DO BTS Analysis" option.
3. Select 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 R&S FSVR 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 Measurement Examples for the 1xEV-DO MS Analysis (K85)

4.1 Measuring the Signal Channel Power

In the Power measurement, the total channel power of the 1xEV-DO 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 R&S FSVR (coaxial cable with N connectors).

Signal generator settings:

Frequency: 833.49 MHz

Level: 0 dBm

Standard: 1xEV-DO MS MS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Activate the "1xEV-DO MS Analysis" mode.
   a) Press the MODE key and activate the "1xEV-DO MS Analysis" option.
3. Start the Power measurement
   a) Press the MEAS key.
   b) Press the "Power" softkey.
4. Set the center frequency.
   a) Press the FREQ key and enter *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.

4.2 Measuring the Spectrum Emission Mask

To detect spurious emissions such as harmonics or intermodulation products, the R&S FSVR 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" on page 124 softkey in the "Spectrum Emission Mask" menu.

Test setup:

- Connect the RF output of the signal generator to the RF input of the R&S FSVR (coaxial cable with N connectors).

Signal generator settings:

Frequency: 833.49 MHz

Level: 0 dBm

Standard: 1xEV-DO MS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO MS Analysis" mode.
   a) Press the MODE key and select the "1xEV-DO 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 *833.49 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 Measuring the Relative Code Domain Power and the Frequency Error

A Code Domain Power measurement analyses the signal over a single slot. 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 R&S FSVR.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSVR 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: 1xEV-DO MS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO MS Analysis" mode.
   a) Press the MODE key and select "1xEV-DO MS Analysis".
3. Select 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.

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.

a) 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.

► 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 4.0 kHz, a Code Domain Power measurement on the R&S FSVR 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 4.3 kHz, the probability of incorrect synchronization increases. This is indicated by the SYNC FAILED error message.
If the frequency error exceeds approximately 4.3 kHz, a Code Domain Power measurement cannot be performed. This is also indicated by the SYNC FAILED error message.
Reset the center frequency of the signal generator to 833.49 MHz.

The center frequency of the DUT should not deviate by more than 4.0 kHz from that of the R&S FSVR.

4.4 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 slot. 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 R&S FSVR.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSVR to the reference input of the signal generator (coaxial cable with BNC connectors).
- Connect the external trigger input on the rear panel of the R&S FSVR (EXT TRIGGER/GATE IN) to the external trigger output of the signal generator.

Signal generator settings (e.g. R&S SMU):

Frequency: 833.49 MHz

Level: 0 dBm

Standard: 1xEV-0DO

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO MS Analysis" Mode.
   a) Press the MODE key and select 1xEV-DO MS Analysis.
3. Select 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 slot is shown.

4.4.1 Adjusting the Trigger Offset

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

- Set an external trigger source and the trigger offset.
  – Open the IQ Capture dialog box.
  – Set the "Trigger Source" option to "External".
  – 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 Trigger to Frame result, the offset between the trigger event and the start of the slot has been adjusted.

4.5 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 R&S FSVR. 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 slot. 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 slots and the y-axis shows the EVM values.

Test Setup:

- Connect the RF output of the Signal Generator to the RF input of the R&S FSVR. (coaxial cables with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the R&S FSVR 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: 1xEV-DO MS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO MS Analysis" Mode.
   a) Press the MODE key and select 1xEV-DO MS Analysis.
3. Select 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.

4.6 Measuring the Peak Code Domain Error

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSVR. 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 slot. 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 slots 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 R&S FSVR (coaxial cable with N connectors).
- Connect the reference input (EXT REF IN/OUT) on the rear panel of the R&S FSVR to the reference output (REF) on the signal generator (coaxial cable with BNC connectors).
- Connect external triggering of the R&S FSVR (EXT TRIG GATE) to the signal generator trigger (TRIGOUT1 at PAR DATA).

Signal generator settings:

Frequency: 833.49 MHz

Level: 0 dBm

Standard: 1xEV-DO MS

Procedure:

1. Set the R&S FSVR to its default state.
   a) Press the PRESET key.
2. Select the "1xEV-DO MS Analysis" mode.
   a) Press the MODE key and select the "1xEV-DO MS Analysis" option.
3. Select 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 *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 R&S FSVR 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.

5 Test Setup for Base Station and Mobile Station Tests

This section describes the default settings of the R&S FSVR, if it is used as a 1xEV-DO base station or mobile station tester. Before starting the measurements, the R&S FSVR 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-K84 (base station tests) or -K85 (mobile station tests) must be enabled. Installation and enabling of the application firmware are described in the Quick Start Guide, chapter 3.

NOTICE

Risk of instrument damage during operation

An unsuitable operating site or test setup can cause damage to the instrument and to connected devices. Ensure the following operating conditions before you switch on the instrument:

- 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 positioned as described in the following sections.
- 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.

Connect the antenna output (or TX output) of the base/mobile station to the RF input of the R&S FSVR. 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 R&S FSVR must be operated with an external frequency reference to ensure that the error limits of the 1xEV-DO 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 or 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

1. Enter the external attenuation.
2. Enter the reference level.
3. Enter the center frequency.
4. Set the trigger.
5. If used, enable the external reference.
6. Select the standard and the desired measurement.
7. Set the PN offset.

6 Instrument Functions of the 1xEV-DO Analysis

The R&S FSVR equipped with the "1xEV-DO BTS Analysis" option (K84) performs Code Domain measurements on forward link signals according to the 3GPP2 Standard (Third Generation Partnership Project 2) High Rate Packet Data, generally referred to as 1xEVDO.

The R&S FSVR equipped with the "1xEV-DO MS Analysis" option (K85) performs Code Domain measurements on reverse link signals according to the 3GPP2 Standard.

This standard is based on the following specifications:

- "CDMA2000 High Rate Packet Data Air Interface Specification", C.S0024-B version 3.0
- "Recommended Minimum Performance Standards for CDMA2000 High Rate Packet Data Access Network", C.S0032-B version 1.0
- "Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Terminal", C.S0033-B, version 1.0

When the 1xEV-DO specification is mentioned in the document, these standards are meant.

In addition to the measurements called for by the 1xEV-DO standard in the code domain, the "1xEV-DO Analysis" options feature measurements in the spectral range such as channel power, adjacent channel power, occupied bandwidth and spectrum emission mask with predefined settings.

To open the 1xEV-DO settings menu

- If the "1xEV-DO Analysis" mode is not the active measurement mode, press the MODE key and select the "1xEV-DO" option.
- If the "1xEV-DO Analysis" mode is already active, press the HOME key.

The "1xEV-DO" menu is identical to the "Measurement" menu. It contains the following commands for the different measurement types:

"Code Domain Analyzer" on page 123
"Power" on page 123
"Ch Power ACLR" on page 124
"Spectrum Emission Mask" on page 134
"Occupied Bandwidth" on page 143
"CCDF" on page 144
"Power vs Time" on page 149

For details on the measurement types, see chapter 6.1, "Measurements and Result Displays", on page 32.

6.1 Measurements and Result Displays

The 1xEV-DO Analysis options provide various measurement types and result displays. All measurements and result displays are accessed via the MEAS key.

6.1.1 Display Concept

Measurement results

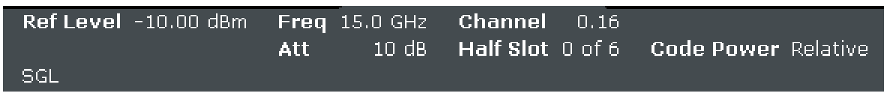
The code domain analyzer can show up to four result diagrams in four different screens (windows) at one time. For each screen, you can define which type of result diagram is to be displayed, or deactivate the screen temporarily. The current configuration of the display, i.e. which screens are displayed 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 72
Freq	Center frequency defined in "Center" on page 72
Channel	Channel with spreading factor

Label	Description
Att	Attenuation
(Half) Slot	Number of analyzed (half) slot and total number of (half) slots
Code Power	Relative or absolute power values
Channel Type (BTS mode only)	Channel type of the selected channel. Possible values are Pilot, Mac, Data and Preamble.

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 R&S FSVR Quick Start Guide).

6.1.2 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 269
4. Select the required result diagram to be displayed in the selected screen.
   Tip: SCPI command: `CALCulate<n>:FEED` on page 209
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".

6.1.3 Code Domain Analysis Results (BTS Mode)

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

6.1.3.1 Code Domain Power

This result display determines the power of all codes of a specific channel and plots it in a diagram. The x-axis represents the code number. The number of codes depends on the "Channel Type" on page 76. Each bar in the diagram represents one code. The y-axis is a logarithmic level axis that shows the power of each code. By default the scaling is relative.

The measurement evaluates the total signal of a specific channel over a single slot.

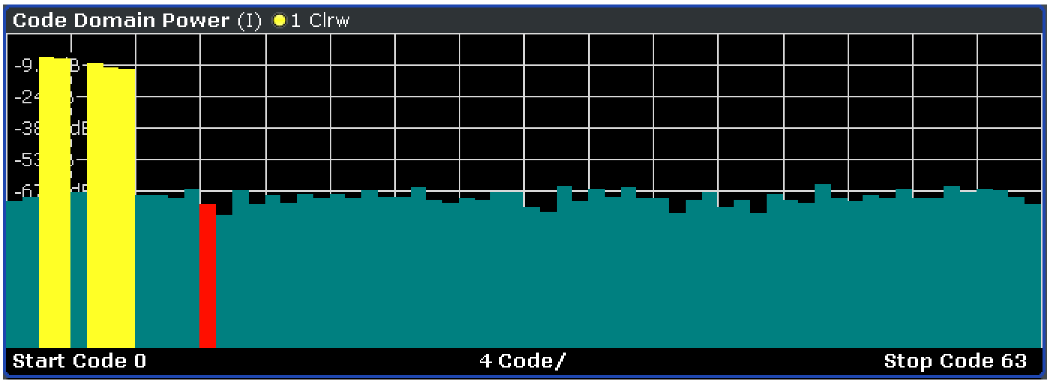


Fig. 6-1: Code Domain Power result display

The standard requires an averaged code domain analysis. Select "CDP Average" on page 85 and the R&S FSVR performs a measurement over all slots and averages the results. For the Data and Preamble channels the standard assumes that in the slots, preambles of different lengths do not occur.

Active and inactive channels are defined via "Inactive Channel Threshold" on page 78. The power values of the assigned and unassigned codes are displayed in different colors:

- Yellow: assigned code
- Cyan: unassigned code

Set the mapping with "Mapping Type" on page 76. The Mapping Auto function causes complex mapping to be analyzed separately for the "Data" channel type and mapping for the I or Q branch to be analyzed separately for the other channel types. In the latter case the I/Q selection can be set by means of "Invert Q" on page 73.

Another option for obtaining an overview of the CDP is to enable complex mapping. The code domain power is then constantly displayed as a complex analysis on screen A for the selected channel type. In case of an analysis of the Data channel, the results of complex analysis are approximately 3 dB higher than the results of a separate I or Q analysis. This is because 50 % of the power values are distributed to I and Q, respectively, for the complex modulation types of the DATA channel type.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XPOW:CDP'` or `CALC:FEED 'XPOW:CDP:RAT'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.1, "Code Domain Power (BTS mode)", on page 328.

6.1.3.2 General Results

The General Results show the data of various measurements in numerical form for all channels.

General Result (Set : 0) ● 1 Clrw			
Carrier Frequency Error	42.69 Hz	Rho Pilot	0.99998
Carrier Frequency Error	0.01 ppm	Rho MAC	0.99999
Chip Rate Error	0.05 ppm	Rho Data	0.99999
Trigger To Frame	-.-----	Rho Overall-1,2	0.99999/0.99999
Slot Result (Set : 0 / Slot : 0)			
Power Pilot	-30.79 dBm	Data Mode Type	8PSK
Power MAC	-30.79 dBm	Active MAC Chs	7
Power Data	-30.79 dBm	Active Data Chs	16
Power Preamble	-30.79 dBm	Preamble Length	64
Composite EVM	0.37 %	Rho	0.99999
Max. Power Data	-14.51 dB	Max. Inactive Power MAC	-75.72 dB
Min. Power Data	-15.67 dB		

Fig. 6-2: General Results result display

Results for all channels

The General Results in the upper part of the table show results for all channels and over all slots of a specific set.

- Carrier Frequency Error (absolute and relative)
  Shows the frequency error referred to the center frequency of the R&S FSVR. The absolute frequency error is the sum of the frequency error of the R&S FSVR and that of the device under test.
  Differences of more than 4.0 kHz between transmitter and receiver frequency impair the synchronization of the Code Domain Power measurement. If at all possible, the transmitter and the receiver should be synchronized.
  The unit of the frequency error is either Hz or 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 1xEV-DO signal.
- Trigger to Frame
  Reflects the timing offset from the beginning of the recorded signal section to the start of the first slot. In case of triggered data acquisition, this corresponds to the timing offset:
  "frame to trigger (+ trigger offset) – start of first slot."
  If it was not possible to synchronize the R&S FSVR to the 1xEV-DO signal, this measurement result is meaningless.
  For the Free Run trigger mode, dashes are displayed.
- Rho Pilot
  Shows the quality parameter RHO for the pilot channel.

- Rho Overall-1/2
  Shows the quality parameter RHO for all chips and over all slots. According to the standard, the averaging limit is on the half slot limit.
- Rho Mac
  Shows the quality parameter RHO for the MAC channel
- Rho Data
  Shows the quality parameter RHO for the Data channel

Slot-specific results

The Code Results in the lower part of the table show results specific to the selected slot:

- Power Pilot
  Shows the absolute power of the Pilot channel in dBm.
- Power Mac
  Shows the absolute power of the Mac channel in dBm.
- Power Data
  Shows the absolute power of the Pilot channel in dBm.
- Power Preamble
  Shows the absolute power of the Preamble channel in dBm.
- Composite EVM
  The composite EVM is the difference between the test signal and ideal reference signal. For further details refer to the Composite EVM result display.
- Max. Power Data
  Shows the maximum power of the Data channel. This is the highest value of the I- and Q-branch of the Data channel.
- Min. Power Data
  Shows the minimum power of the Data channel. This is the smallest value of the I- and Q-Branch of the Data channel.
- Data Mode Type
  Shows the modulation type of the Data channel.
- Active Mac Chs
  Shows the number of active MAC channels.
- Active Data Chs
  Shows the number of active Data channels.
- Preamble Length
  Shows the length of the preamble in chips. If no preamble is present in the slot, this value is 0.
- Rho
  Shows the quality parameter RHO calculated over a slot.
  According to the standard, RHO is the normalized, correlated power between the measured and the ideally generated reference signal. It is measured over all slots.
- Max. Inactive Power Mac
  Shows the maximum power of inactive Mac channels. This is the highest inactive channel from the I- and Q-branch of the MAC channels. The power is displayed relative to the absolute power of the MAC channel.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:SUMM'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 211.

6.1.3.3 Channel Results

The Channel Results show the data of various measurements in numerical form for a specific channel.

Channel Result(I) ● 1 Clrw			
Power			-30.79 dBm
Pk CDE			-65.16 dB
IQ Imbalance			0.11 %
IQ Offset			0.01 %
Code Result (12.64)			
Symbol Rate	19.2 kSymb/s	Timing Offset	-.--
Channel.SF	12.64	Phase Offset	-.--
Symbol EVM	78.93 % rms	Channel Pwr Rel	-67.60 dB
Symbol EVM	100.00 % Pk	Channel Pwr Abs	-98.38 dBm
Modulation Type	BPSK_I		

Fig. 6-3: Channel results result display

Channel results

The Channel Results show common results for the selected channel:

- Power
  Shows the total power of the selected channel type.
- IQ Imbalance
  Shows the IQ imbalance of the signal in percent.
- Pk CDE (SF xx/IQ)
  The Peak Code Domain Error measurement specifies a projection of the difference between test signal and ideal reference signal to the spreading factor that belongs to the channel type. This spreading factor is shown in brackets.
- IQ Offset
  Shows the DC offset of the signal in percent.

Code results

The Code Results show results specific to the selected channel type and the selected slot:

- Symbol Rate
  Shows the symbol rate with which the channel is transmitted.
- Channel.SF
  Shows the code number and its associated spreading factor.

- Symbol EVM
  Shows the peak and the mean values of the Error Vector Magnitude. For further details refer to the EVM vs Symbol result display.
- Timing Offset
  Shows the timing offset between the selected channel and the first active channel in the channel type.
- Phase Offset
  Shows the phase offset between the selected channel and the first active channel in the channel type.
- Channel Pwr Rel
  Shows the relative channel power (referred to the total power of the channel type).
- Channel Pwr Abs
  Shows the absolute channel power (referred to the total power of the channel type).
- Modulation Type
  Shows the modulation type of the channel.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:SUMM'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 211.

6.1.3.4 Power vs Chip

This result display shows the power for all chips in a specific slot. Therefore, a trace consists of 2048 power values.

The measurement evaluates the total signal over a single slot.

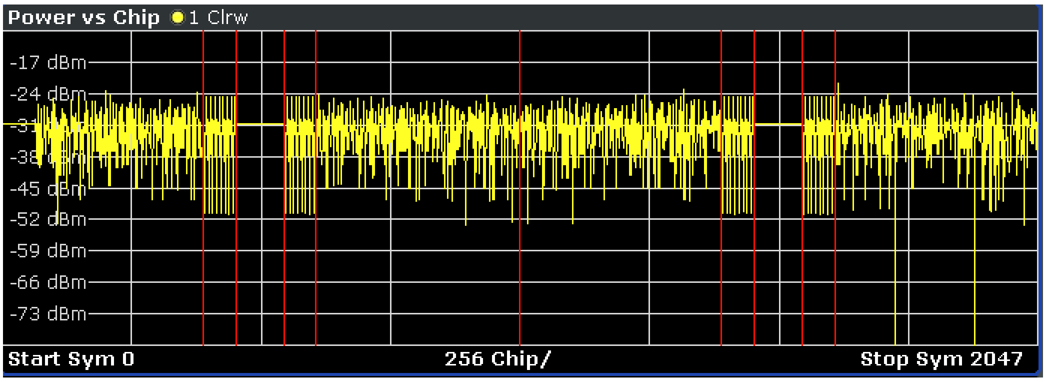


Fig. 6-4: Power vs Chip result display

Select the slot to be analyzed via the Select softkey.

Due to the symmetric structure of the 1xEV-DO forward link signal, it is easy to identify which channel types in the slot have power.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:PVChip'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.5, "Power vs Chip (BTS Mode)", on page 332.

6.1.3.5 Power vs Symbol

This result display shows the power of of a code at each symbol time. The number of symbols on the x-axis is between 2 and 100, depending on the channel type.

The measurement evaluates a specific channel type over a single slot.

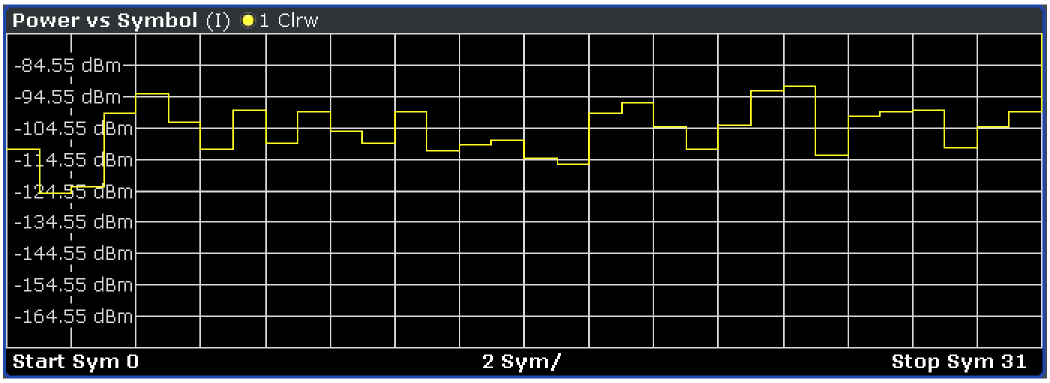


Fig. 6-5: Power vs Symbol result display

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:PVSYmbol'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.7, "Power vs Symbol", on page 332.

6.1.3.6 Composite EVM

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 to the power of an ideally generated reference signal. To calculate the mean error power, the root mean square average (of the real and imaginary parts of the signal) is used.

The EVM is shown in %. The diagram consists of a composite EVM for each slot. Set the number of slots via the "Capture Length" on page 74 field.

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

Fig. 6-6: 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 78 field.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:MACCuracy'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.8, "Composite EVM", on page 332.

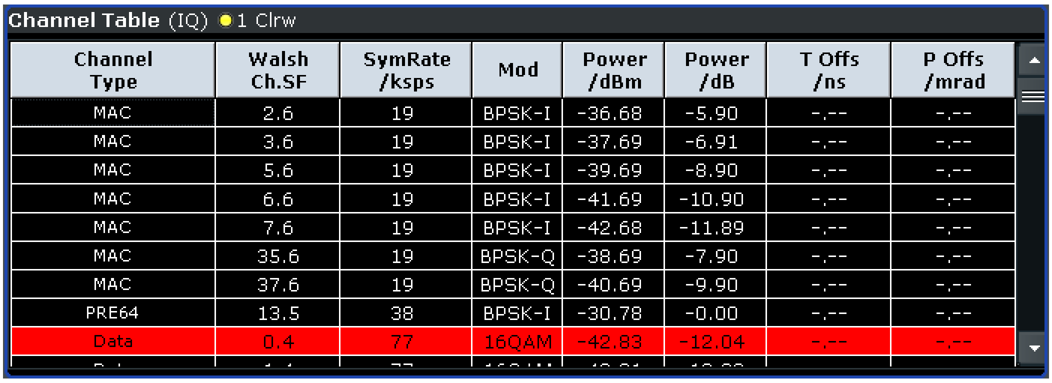
6.1.3.7 Channel Table

Starts the Channel Occupancy Table analysis.

In this result display all active channels are displayed. Therefore the channel table can contain up to 146 entries: one entry for Pilot and Preamble channel type each, 16 entries for the Data channel type and 128 entries for the MAC channel type (64 on the I and Q branch respectively).

The channels are listed in the following order: first the Pilot channel, then the MAC and Preamble channels and the Data channel last. Within the channel types, the channels are sorted by ascending code number.

The measurement evaluates the total signal over a single slot.



Channel Table (IQ) ● 1 Clrw

Channel Type	Walsh Ch.SF	SymRate /ksps	Mod	Power /dBm	Power /dB	T Offs /ns	P Offs /mrad
MAC	2.6	19	BPSK-I	-36.68	-5.90	-.--	-.--
MAC	3.6	19	BPSK-I	-37.69	-6.91	-.--	-.--
MAC	5.6	19	BPSK-I	-39.69	-8.90	-.--	-.--
MAC	6.6	19	BPSK-I	-41.69	-10.90	-.--	-.--
MAC	7.6	19	BPSK-I	-42.68	-11.89	-.--	-.--
MAC	35.6	19	BPSK-Q	-38.69	-7.90	-.--	-.--
MAC	37.6	19	BPSK-Q	-40.69	-9.90	-.--	-.--
PRE64	13.5	38	BPSK-I	-30.78	-0.00	-.--	-.--
Data	0.4	77	16QAM	-42.83	-12.04	-.--	-.--

Fig. 6-7: Channel Table result display

The R&S FSVR determines the following parameters for the channels:

- Channel Type
  Shows the channel type of the active channel. Possible values are Pilot, Mac and Data. For the Preamble channel, the length in chips is similarly specified, thus resulting in the following options for the Preamble channel type: PRE64, PRE128, PRE256, PRE512 or PRE1024.
- CHAN.SF
  Channel number including the spreading factor (in the form <Channel>.<SF>).
- Symb Rate
  Symbol rate with which the channel is transmitted.
- Modulation/Mapping
  Shows the modulation type of the channel. For Data channels possible values are QPSK, 8-PSK and 16 QAM. For all other channel types possible values are either BPSK-I or BPSK-Q.
- Pwr Abs/Pwr Rel
  Absolute and relative power (referred to the total power in the channel type) of the channel.
- T Offs
  Shows the timing offset between the current channel and the first active channel. It can be enabled by means of Time Phase Estimation On Off.
- Ph Offs
  Phase offset between this channel and the first active channel. It can be enabled by means of Time Phase Estimation On Off.

Remote control

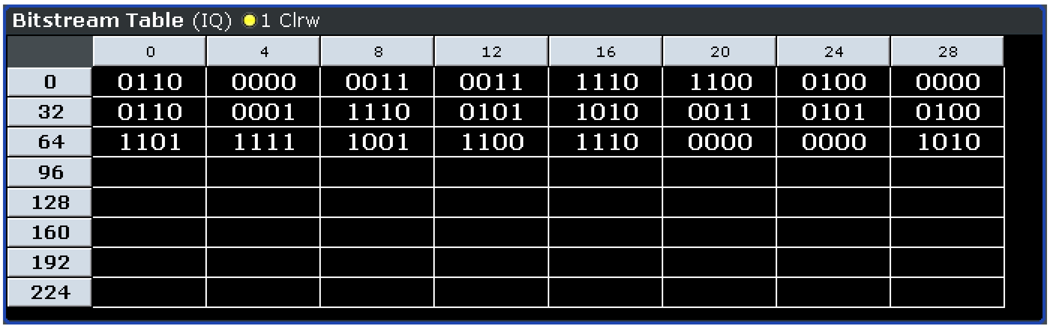
In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:CTABle'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.12, "Channel Table (Trace, BTS mode)", on page 333.

6.1.3.8 Channel Bitstream

This result display provides information on the demodulated bits for the selected channel type. All bits that are part of inactive channels are marked as being invalid by means of dashes. For 64QAM modulation '-----' is displayed, for 16QAM modulation '----', for 8PSK modulation '---', for QPSK '--' and for BPSK '-'.

The measurement evaluates a single channel type over a single slot.


Bitstream Table (IQ) 1 Clrw

	0	4	8	12	16	20	24	28
0	0110	0000	0011	0011	1110	1100	0100	0000
32	0110	0001	1110	0101	1010	0011	0101	0100
64	1101	1111	1001	1100	1110	0000	0000	1010
96								
128								
160								
192								
224								

Fig. 6-8: Channel 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 modulation and the channel type, a slot may contain a minimum of 4 and a maximum of 400 bits. For more information on this topic refer to chapter 6.4.2, "Working with Channel Tables", on page 176 .

Depending on the modulation type, a symbol consists of the following bits:

- BPSK: 1 bit (only the I or the Q component is assigned; in case of complex mapping a 2BPSK modulation is displayed with both the I and Q components)
- QPSK: 2 bits (I-component followed by the Q-component)
- 8PSK: 3 bits
- 16QAM: 4 bits
- 64QAM: 5 bits

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:BSTReam'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.16, "Channel Bitstream", on page 337.

6.1.3.9 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 is projected onto the code domain at a specific base spreading factor. The spreading factor is automatically set by the channel type. Set the number of slots via the "Capture Length" on page 74 field. In the diagram, each bar of the x-axis represents one PCG. The y-axis represents the error power.

The measurement evaluates the total signal over the entire period of observation. The currently selected slot is marked in red.

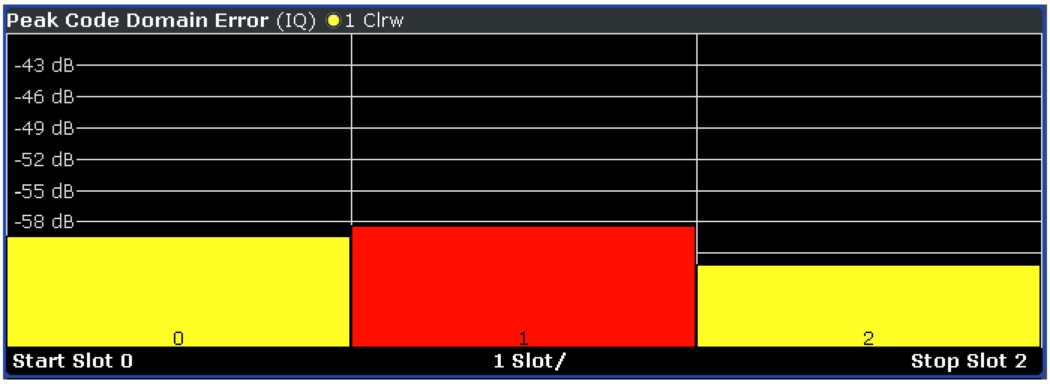


Fig. 6-9: Peak Code Domain Error result display

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 for all slots.

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 78 field.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:PCDomain'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.17, "Peak Code Domain Error", on page 337.

6.1.3.10 Code Domain Error

This result display shows the difference in power of the test signal and an ideally generated reference signal. In the diagram, the codes are plotted on the x-axis. The number of codes corresponds to the base spreading factor, which depends on the channel type. Refer to for an overview of the spreading factors for each channel type. 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 slot.

Fig. 6-10: Code Domain Error result display

The power values of the active and inactive codes are displayed in different colors:

- Yellow: active code
- Cyan: inactive code

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XPOW:CDEP'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.18, "Code Domain Error (BTS Mode)", on page 337.

6.1.3.11 Symbol Constellation

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

The measurement evaluates a single code over a single slot.

You can select a specific code and slot with the Select softkey.

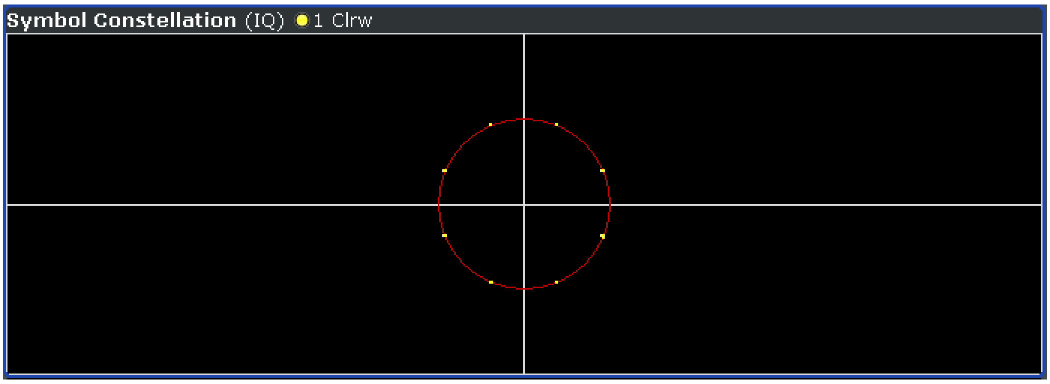


Fig. 6-11: Symbol Constellation result display

The R&S FSV-K84 supports BPSK, QPSK, 8PSK and 16QAM modulation schemes. The modulation scheme itself depends on the channel type. Refer to chapter 6.4.2, "Working with Channel Tables", on page 176 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.

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

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:SYMB:CONSt'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.20, "Symbol Constellation", on page 339.

6.1.3.12 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 number of symbols depends on the channel type and is in the range from 2 to 100. Refer to chapter 6.4.2, "Working with Channel Tables", on page 176 for further information.

The measurement evaluates a single channel over a single slot.

You can select a specific code and slot with the Select softkey.

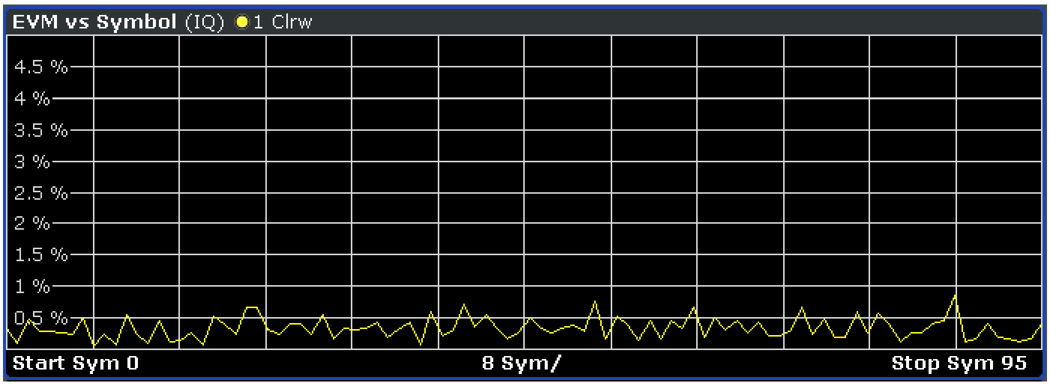


Fig. 6-12: EVM vs Symbol result display

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 chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command TRACe:DATA? <TRACeX>; see chapter 7.9.21, "EVM vs Symbol", on page 339.

6.1.3.13 Composite Constellation

This result display provides information about the constellation points at chip level. For each chip, a constellation point is displayed in the diagram. The number of chips is between 64 and 1500. It depends on the channel type and, in case of Preamble and Data channels, on the length of the preamble. Refer to chapter 6.4.2, "Working with Channel Tables", on page 176 for further information.

The measurement evaluates the total signal over a single slot.

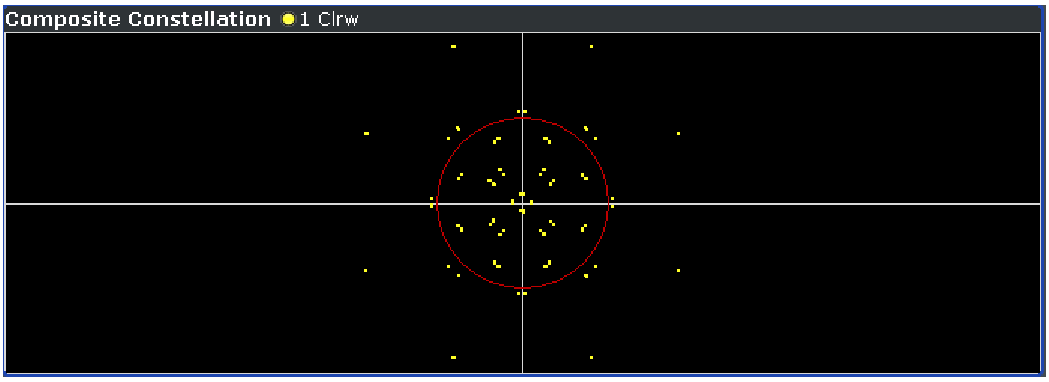


Fig. 6-13: Composite Constellation result display

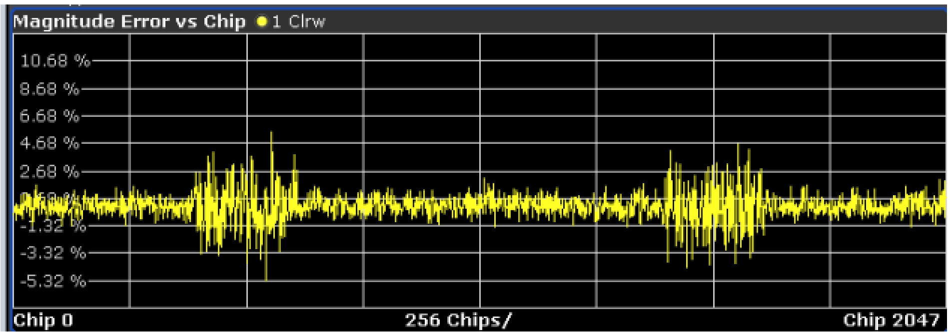
Remote control

In remote control, this display configuration is selected using CALC:FEED 'XTIM:CDP:COMP:CONSt'; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command TRACe:DATA? <TRACeX>; see chapter 7.9.22, "Composite Constellation", on page 339.

6.1.3.14 Mag Error vs Chip

Mag Error vs Chip activates the Magnitude Error versus chip display. The magnitude error is displayed for all chips of the slected slot. The magnitude error is calculated by the difference of the magnitude of received signal and magnitude of reference signal. The reference signal is estimated from the channel configuration of all active channels. The magnitude error is related to the square root of the mean power of reference signal and given in percent.



Result data for remote query

SCPI command:

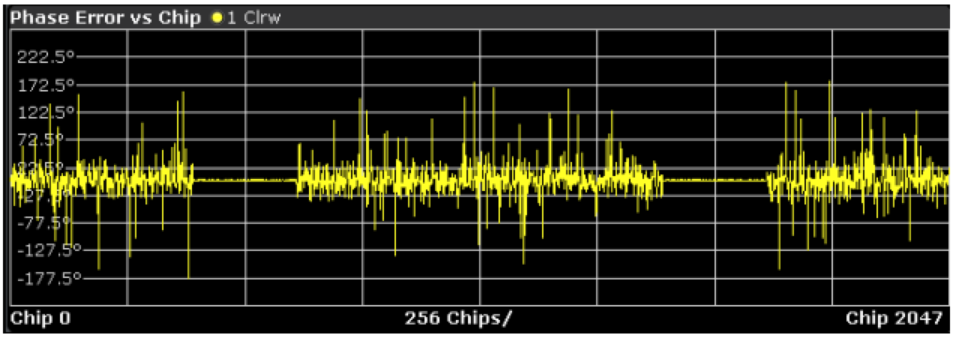
`CALC:FEED "XTIM:CDP:CHIP:MAGN"`, see `CALCulate<n>:FEED` on page 209

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, a list of magnitude error values of all chips at the selected slot is returned. The values are calculated as the magnitude difference between the received signal and the reference signal for each chip in %, and are normalized to the square root of the average power at the selected slot.

6.1.3.15 Phase Error vs Chip

"Phase Error vs Chip" activates the phase error versus chip display. The phase error is displayed for all chips of the slected slot. The phase error is calculated by the difference of the phase of received signal and phase of reference signal. The reference signal is estimated from the channel configuration of .all active channels. The phase error is given in degrees in a range of +180° to -180°.



Result data for remote query

SCPI command:

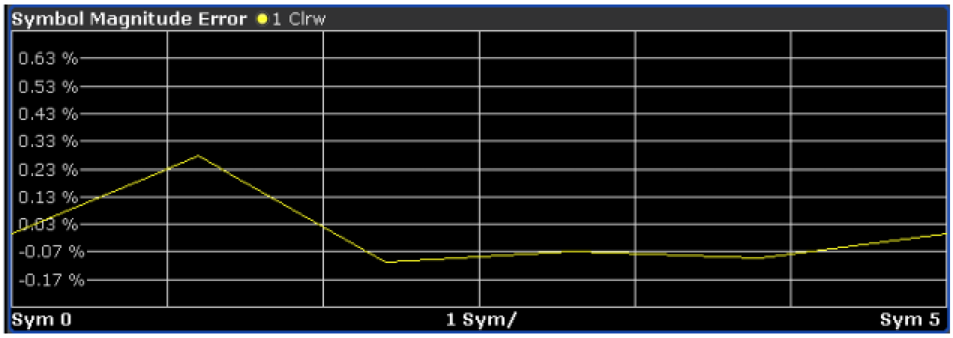
`CALC:FEED "XTIM:CDP:CHIP:PHAS"`, see `CALCulate<n>:FEED` on page 209

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, a list of phase error values of all chips at the selected slot is returned. The values are calculated as the phase difference between the received signal and the reference signal for each chip in degrees, and are normalized to the square root of the average power at the selected slot.

6.1.3.16 Symbol Magnitude Error

The "Symbol Magnitude Error" is calculated analogous to symbol EVM. The result of calculation is one symbol magnitude error value for each symbol of the slot of a special channel. Positive values of symbol magnitude error indicate a symbol magnitude that is larger than the expected ideal value; negative symbol magnitude errors indicate a symbol magnitude that is less than the ideal one.The symbol magnitude error is the difference of the magnitude of the received symbol and that of the reference symbol, related to the magnitude of the reference symbol.



Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:EVM:MAGN"`, see `CALCulate<n>:FEED` on page 209

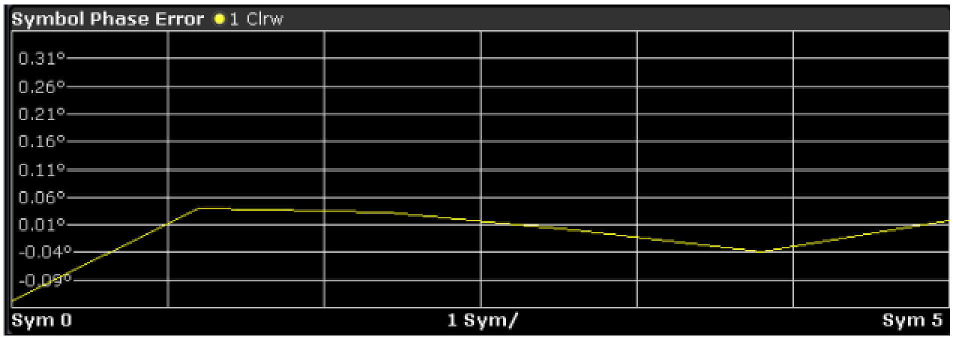
TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the magnitude error in % of each symbol at the selected slot is transferred. The number of the symbols depends on the spreading factor of the selected channel:

NOFSymbols=10*2$^{(8\text{-CodeClass})}$

6.1.3.17 Symbol Phase Error

The "Symbol Phase Error" is calculated analogous to symbol EVM. The result of calculation is one symbol phase error value for each symbol of the slot of a special channel. Positive values of symbol phase error indicate a symbol phase that is larger than the expected ideal value; negative symbol phase errors indicate a symbol phase that is less than the ideal one.



Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:EVM:PHAS"`, see `CALCulate<n>:FEED` on page 209

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the phase error in degrees of each symbol at the selected slot is transferred. The number of the symbols depends on the spreading factor of the selected channel:

$NOFSymbols=10*2^{(8-CodeClass)}$

6.1.4 Code Domain Analysis Results (MS Mode)

Basically, the measurement results for code domain analysis are very similar for base station and mobile station tests. The main difference is that while base station tests are performed on slots, mobile station tests are performed on half-slots. Furthermore, mobile station tests provide measurements on composite data. For these measurements, a special channel contains two codes whose results are displayed simultaneously. These measurements are only available for subtypes 2 or higher.

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

RF measurement results are described in chapter 6.1.5, "RF Measurement Results", on page 66.

6.1.4.1 Code Domain Power

This result display determines the power of all codes of a specific channel and plots it in a diagram. The x-axis represents the code number. The number of codes depends on the "Select Channel Settings" on page 75. Each bar in the diagram represents one code. The y-axis is a logarithmic level axis that shows the power of each code. By default the scaling is relative.

The measurement evaluates the total signal of a specific channel over a single slot.

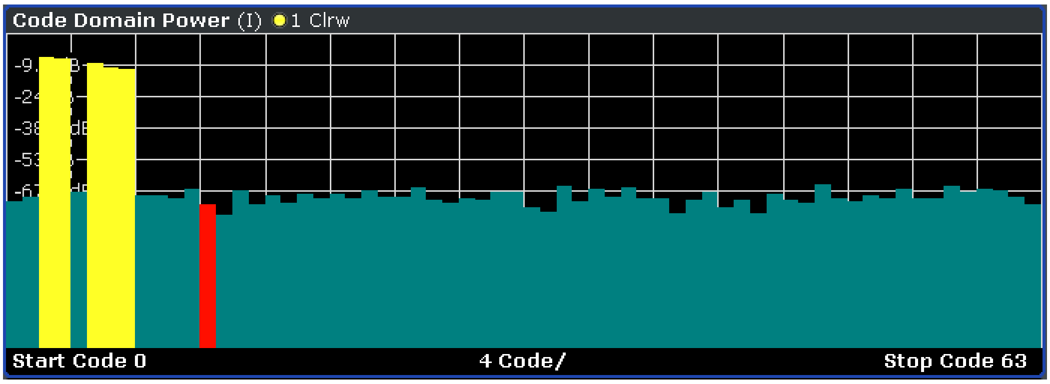


Fig. 6-14: Code Domain Power result display

The standard requires an averaged code domain analysis. Select "CDP Average" on page 85 and the R&S FSVR performs a measurement over all slots and averages the results. For the Data and Preamble channels the standard assumes that in the slots, preambles of different lengths do not occur.

Active and inactive channels are defined via "Inactive Channel Threshold" on page 78. The power values of the assigned and unassigned codes are displayed in different colors:

- Yellow: assigned code
- Cyan: unassigned code

Set the mapping with "Mapping Type" on page 76. The Mapping Auto function causes complex mapping to be analyzed separately for the "Data" channel type and mapping for the I or Q branch to be analyzed separately for the other channel types. In the latter case the I/Q selection can be set by means of "Invert Q" on page 73.

Another option for obtaining an overview of the CDP is to enable complex mapping. The code domain power is then constantly displayed as a complex analysis on screen A for the selected channel type. In case of an analysis of the Data channel, the results of complex analysis are approximately 3 dB higher than the results of a separate I or Q analysis. This is because 50 % of the power values are distributed to I and Q, respectively, for the complex modulation types of the DATA channel type.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XPOW:CDP'` or `CALC:FEED 'XPOW:CDP:RAT'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.2, "Code Domain Power (MS mode)", on page 328.

6.1.4.2 Result Summary

The Result Summary show the data of various measurements in numerical form for all channels.

General Result (Set : 0) (I) ● 1 Clrw			
Carrier Frequency Error	-19588.68 Hz/ -1.31 ppm	Composite Data Power	-203.86 dB
Rho Overall	0.02252	Chip Rate Error	0.00 ppm
Active Channels	1	Trigger To Frame	-.-----
Slot Result (Half Slot : 0)			
Total Power	-202.64 dBm	Composite EVM	100.00 %
Pilot/RRI Power	-217.89/-.-- dBm	Pk CDE (SF 16/I)	0.00 dB
IQ Imbalance/IQ Offset	0.00/ 0.00 %	Rho	0.01946
Channel Result			
Channel Pwr Rel/Abs	-15.25dB/-217.89 dBm	Channel.SF	0.16
Timing/Phase Offset	--.--/--.--	Symbol Rate	76.8 ksym/s
Composite Data EVM	58.39 % rms	Composite Data EVM	100.00 % Pk
Symbol EVM(RMS/Pk)	60.15/100.00 %	Composite Data Modulation	BPSK_I

Fig. 6-15: Result Summary

The Result Summary is divided in three parts:

- General results for the selected set
- Slot results for the selected half-slot
- Channel results for the selected channel

General Results for all channels

The General Results in the upper part of the table show results for all channels and over all half-slots of a specific set.

- Carrier Frequency Error (absolute and relative)
  Shows the frequency error referred to the center frequency of the R&S FSVR. The absolute frequency error is the sum of the frequency error of the R&S FSVR and that of the device under test.

Differences of more than 4.0 kHz between transmitter and receiver frequency impair the synchronization of the Code Domain Power measurement. If at all possible, the transmitter and the receiver should be synchronized.
The unit of the frequency error is either Hz or ppm referred to the carrier frequency.

- Composite Data Power
Power of the special channel containing composite data
- Rho Overall-1/2
Shows the quality parameter RHO for all chips and over all half-slots. According to the standard, the averaging limit is on the half-slot limit.
- 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 1xEV-DO signal.
- Active Channels
Indicates the number of active channels
- Trigger to Frame
Reflects the timing offset from the beginning of the recorded signal section to the start of the first half-slot. In case of triggered data acquisition, this corresponds to the timing offset:
"frame to trigger (+ trigger offset) – start of first half-slot."
If it was not possible to synchronize the R&S FSVR to the 1xEV-DO signal, this measurement result is meaningless.
For the Free Run trigger mode, dashes are displayed.

Slot-specific results

The Code Results in the second part of the table show results specific to the selected half-slot:

- Total Power
- Composite EVM
The composite EVM is the difference between the test signal and ideal reference signal. For further details refer to the Composite EVM (RMS) result display.
- Pilot/RRI Power
Shows the absolute power of the Pilot channel/ RRI channel in dBm.
- Pk CDE (SF xx/IQ)
The Peak Code Domain Error measurement specifies a projection of the difference between test signal and ideal reference signal to the spreading factor that belongs to the channel type. This spreading factor is shown in brackets.
- IQ Imbalance/IQ Offset
Shows the IQ imbalance/DC offset of the signal in percent.
- Rho
Shows the quality parameter RHO calculated over a half-slot.
According to the standard, RHO is the normalized, correlated power between the measured and the ideally generated reference signal. It is measured over all half-slots.

Channel results

The Channel Results in the lower part of the table show results for the selected channel.

- Channel Pwr /Rel/Abs
  Channel power of the selected channel (relative/absolute values)
- Channel.SF
  Channel spreading factor
- Timing/Phase Offset
- Symbol Rate
- Composite Data EVM
  RMS error vector magnitude values of composite data channel in %
- Composite Data EVM
  Peak EVM values of composite data channel in %
- Symbol EVM (RMS/Pk)
  Symbol Error Vector Magnitude (RMS/Peak values)
- Composite Data Modulation
  Modulation and selected branch of the composite data channel

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:SUMM'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 211.

6.1.4.3 Power vs Half Slot

This result display shows the power of the selected channel over all half-slots.

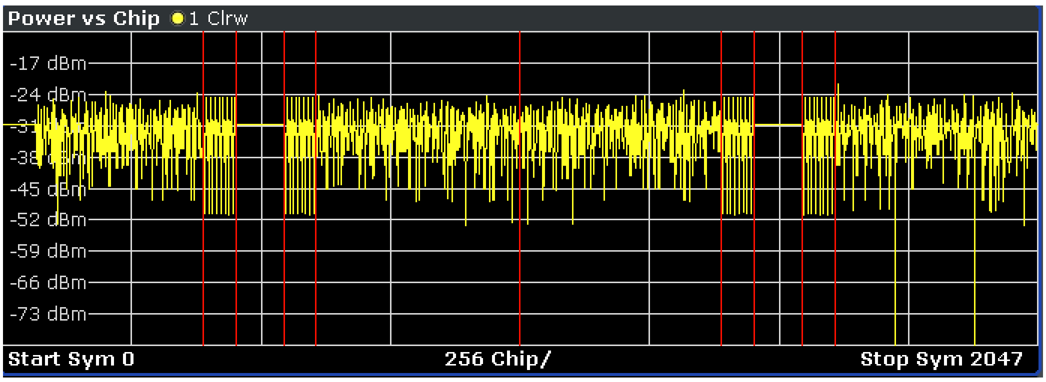


Fig. 6-16: Power vs Half Slot result display

Select the channel to be analyzed via the Select softkey.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:PVChip'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.6, "Power vs Halfslot (MS Mode)", on page 332.

6.1.4.4 Power vs Symbol

This result display shows the power of the selected channel and the selected half-slot at each symbol time. The number of symbols on the x-axis is between 2 and 100, depending on the channel type.

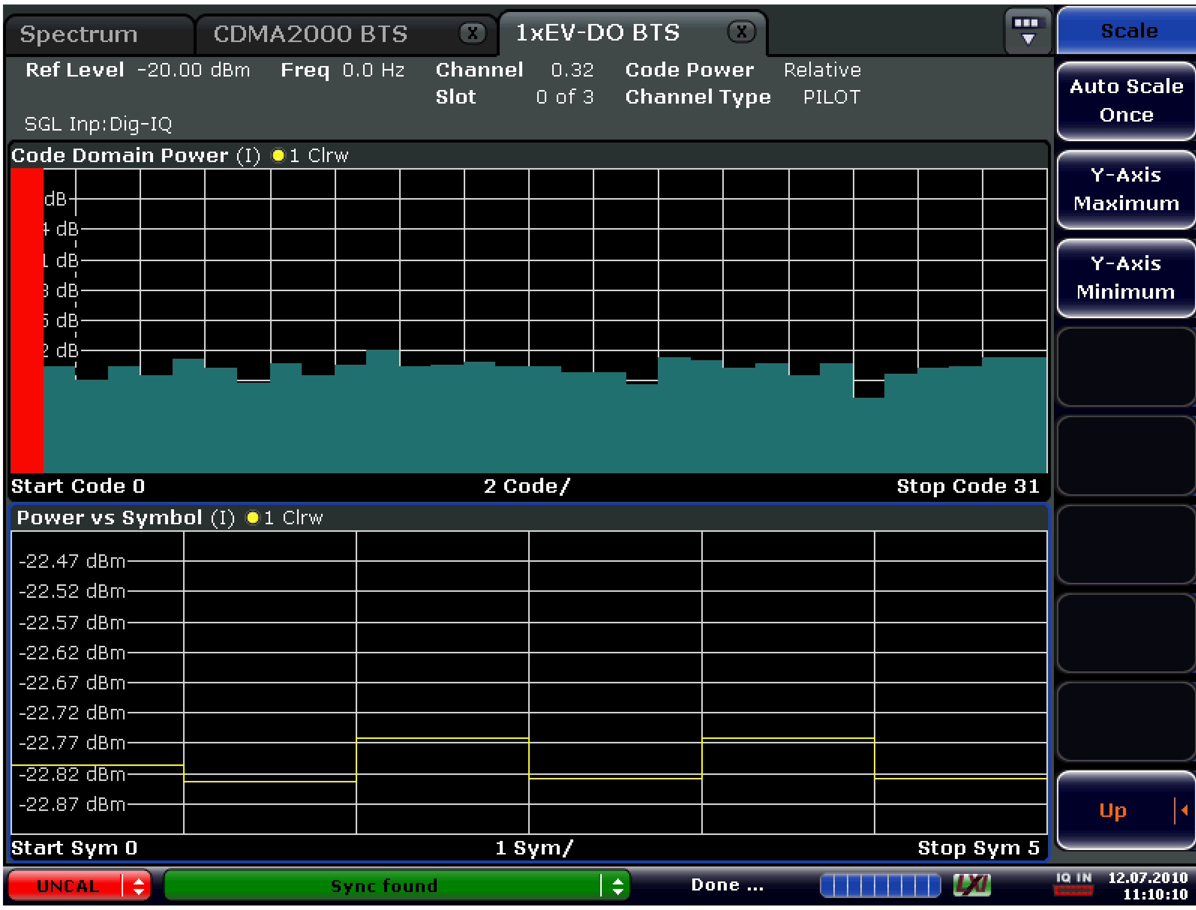


Fig. 6-17: Power vs Symbol result display

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:PVSYmbol'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command TRACe:DATA? <TRACeX>; see chapter 7.9.7, "Power vs Symbol", on page 332.

6.1.4.5 Composite EVM (RMS)

This result display is used to measure 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 to the power of an ideally generated reference signal. To calculate the mean error power, the root mean square average (of the real and imaginary parts of the signal) is used.

The EVM is shown in %. The diagram consists of a composite EVM for each half-slot. Set the number of slots via the "Capture Length" on page 74 field.

The measurement evaluates the total signal over the entire period of observation. The selected half-slot is displayed red.

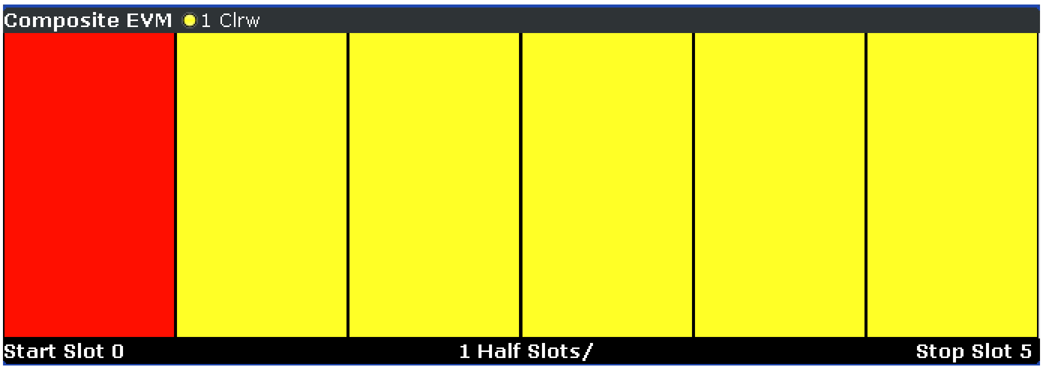


Fig. 6-18: Composite EVM result display

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 78 field.

Remote control

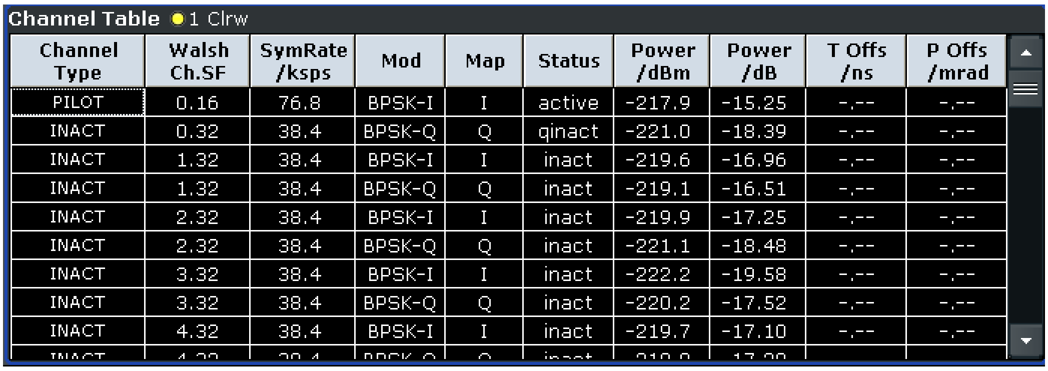
In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:MACCuracy'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command TRACe:DATA? <TRACeX>; see chapter 7.9.8, "Composite EVM", on page 332.

6.1.4.6 Channel Table

Starts the Channel Occupancy Table analysis.

In this result display the main channel table settings of each channel are displayed. The channel occupancy table can contain a maximum of 33 entries, corresponding to the highest base spreading factor 16 with both I and Q branch plus the RRI channel. The Channel Table evaluation considers the total signal over precisely one half-slot. The half-slot to be evaluated can be set by means of the Select softkey. The channels are listed in ascending code number order (within a code number: first I and then Q branch). Unassigned codes are thus always at the end of the table.



Channel Type	Walsh Ch.SF	SymRate /ksps	Mod	Map	Status	Power /dBm	Power /dB	T Offs /ns	P Offs /mrad
PILOT	0.16	76.8	BPSK-I	I	active	-217.9	-15.25	-.--	-.--
INACT	0.32	38.4	BPSK-Q	Q	qinact	-221.0	-18.39	-.--	-.--
INACT	1.32	38.4	BPSK-I	I	inact	-219.6	-16.96	-.--	-.--
INACT	1.32	38.4	BPSK-Q	Q	inact	-219.1	-16.51	-.--	-.--
INACT	2.32	38.4	BPSK-I	I	inact	-219.9	-17.25	-.--	-.--
INACT	2.32	38.4	BPSK-Q	Q	inact	-221.1	-18.48	-.--	-.--
INACT	3.32	38.4	BPSK-I	I	inact	-222.2	-19.58	-.--	-.--
INACT	3.32	38.4	BPSK-Q	Q	inact	-220.2	-17.52	-.--	-.--
INACT	4.32	38.4	BPSK-I	I	inact	-219.7	-17.10	-.--	-.--

Fig. 6-19: Channel Table result display

The following channel settings are displayed:

Column	Description
Channel Type	Type of channel
Walsh Ch.SF	Number of the channel spreading code (0 to [spreading factor – 1]) including the spreading factor of the channel in Chan.SF notation
SymRate/ksps	Symbol rate with which the channel is transmitted (76.8 ksps to 307.2 ksps)
Mod	Modulation of the channel
Map	Mapping of the channel (I or Q branch)
Status	Status display. Unassigned codes are identified as inactive channels
Power/dBm	Specifies the absolute power of the channel
Power/dB	Specifies the relative power of the channel (referred to the PICH or the total power of signal)
T Offs /ns	Timing offset
P Offs /mrad	Phase offset

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:CTABle'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.13, "Channel Table (Trace, MS mode)", on page 335.

6.1.4.7 Composite Data EVM

This result display determines the error vector magnitude (EVM) over the special composite data channel. The EVM is the root of the ratio of the mean error power to the power of an ideally generated reference signal. To calculate the mean error power, the root mean square average (of the real and imaginary parts of the signal) is used.

The EVM is shown in %. The diagram consists of an EVM for each chip.

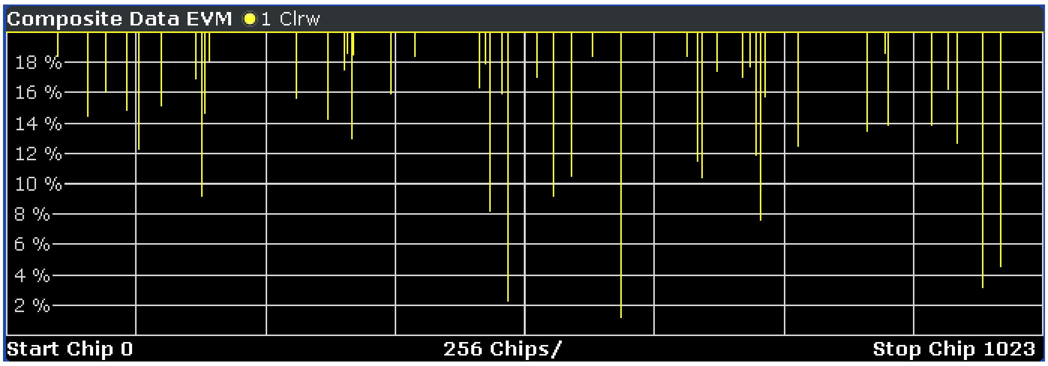


Fig. 6-20: Composite Data EVM result display

This measurement result is only available for subtypes 2 or higher. The results are displayed for the special composite data channel, regardless of which channel is selected.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:SYMB:CEVM'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.9, "Composite Data EVM (MS Mode)", on page 333.

6.1.4.8 Composite Data Constellation

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

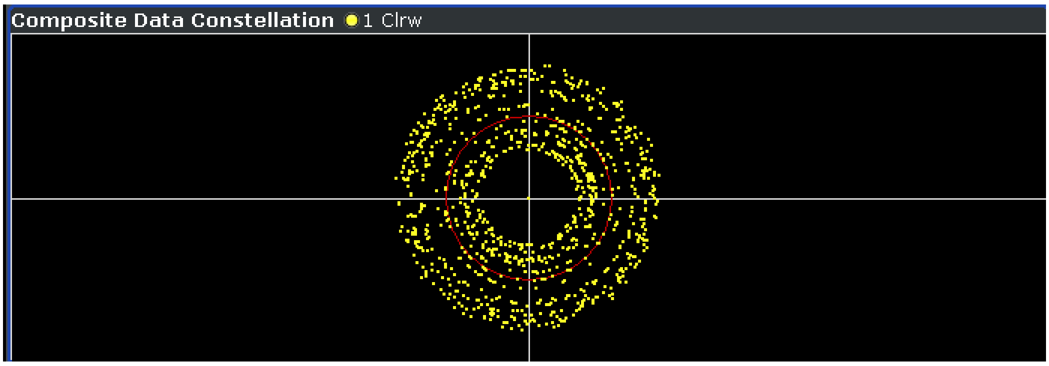


Fig. 6-21: Composite Data Constellation result display

This measurement result is only available for subtypes 2 or higher. The results are displayed for the special composite data channel, regardless of which channel is selected.

Remote control

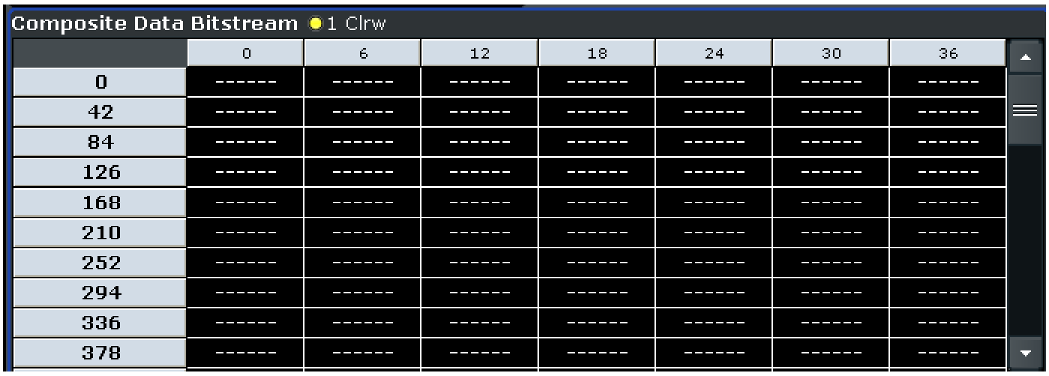
In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:SYMB:CCONst'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.10, "Composite Data Constellation (MS Mode)", on page 333.

6.1.4.9 Composite Data Bitstream

This result display provides information on the demodulated bits for the composite data channel and selected half-slot.

This measurement result is only available for subtypes 2 or higher. The results are displayed for the special composite data channel, regardless of which channel is selected.


Composite Data Bitstream ● 1 Clrw

	0	6	12	18	24	30	36
0	------	------	------	------	------	------	------
42	------	------	------	------	------	------	------
84	------	------	------	------	------	------	------
126	------	------	------	------	------	------	------
168	------	------	------	------	------	------	------
210	------	------	------	------	------	------	------
252	------	------	------	------	------	------	------
294	------	------	------	------	------	------	------
336	------	------	------	------	------	------	------
378	------	------	------	------	------	------	------

Fig. 6-22: Composite Data Bitstream result display

Select a specific symbol using the MKR key. Enter a number and press the ENTER key; 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.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:CBSTReam'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.11, "Composite Data Bitstream (MS Mode)", on page 333.

6.1.4.10 Symbol Constellation

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

You can select a specific code and half-slot with the Select softkey.

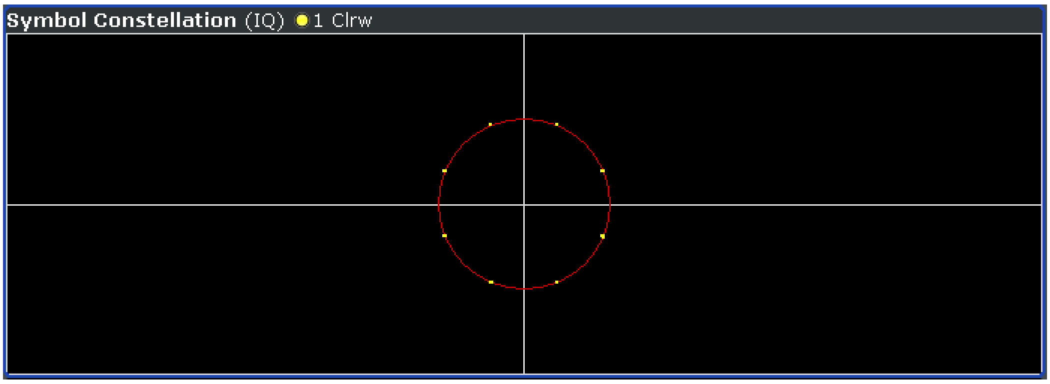


Fig. 6-23: Symbol Constellation result display

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:SYMB:CONSt'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.20, "Symbol Constellation", on page 339.

6.1.4.11 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 number of symbols depends on the channel type and is in the range from 2 to 100. Refer to chapter 6.4.2, "Working with Channel Tables", on page 176 for further information.

The measurement evaluates a single channel over a single slot.

You can select a specific code and half-slot with the Select softkey.

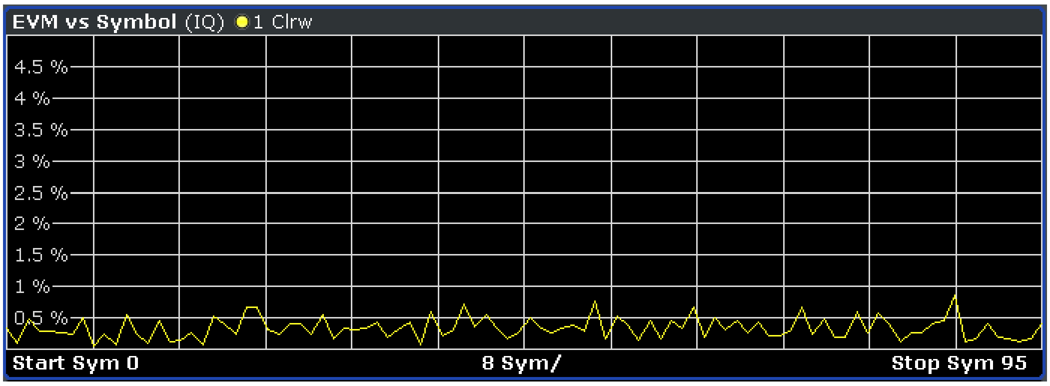


Fig. 6-24: EVM vs Symbol result display

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 chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.21, "EVM vs Symbol", on page 339.

6.1.4.12 Composite Constellation

This result display provides information about the constellation points at chip level. For each chip, a constellation point is displayed in the diagram.

The measurement evaluates the total signal over a single half-slot.

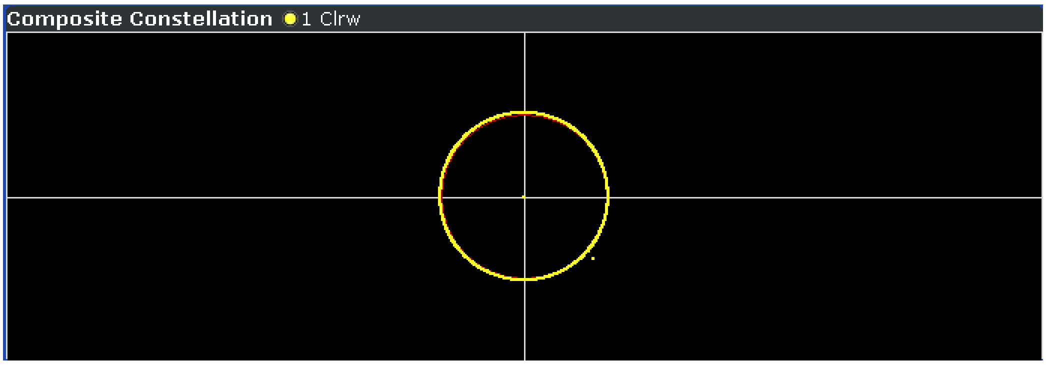


Fig. 6-25: Composite Constellation result display

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:COMP:CONSt'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.22, "Composite Constellation", on page 339.

6.1.4.13 Channel Bitstream

This result display provides information on the demodulated bits for the selected channel type. All bits that are part of inactive channels are marked as being invalid by means of dashes. For 64QAM modulation '-----' is displayed, for 16QAM modulation '----', for 8PSK modulation '---', for QPSK '--' and for BPSK '-'.

The measurement evaluates a single channel type over a single slot.

Bitstream Table (IQ) ●1 Clrw

	0	4	8	12	16	20	24	28
0	0110	0000	0011	0011	1110	1100	0100	0000
32	0110	0001	1110	0101	1010	0011	0101	0100
64	1101	1111	1001	1100	1110	0000	0000	1010
96								
128								
160								
192								
224								

Fig. 6-26: Channel 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 modulation and the channel type, a slot may contain a minimum of 4 and a maximum of 400 bits. For more information on this topic refer to chapter 6.4.2, "Working with Channel Tables", on page 176 .

Depending on the modulation type, a symbol consists of the following bits:

- BPSK: 1 bit (only the I or the Q component is assigned; in case of complex mapping a 2BPSK modulation is displayed with both the I and Q components)
- QPSK: 2 bits (I-component followed by the Q-component)
- 8PSK: 3 bits
- 16QAM: 4 bits
- 64QAM: 5 bits

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:BSTReam'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.16, "Channel Bitstream", on page 337.

6.1.4.14 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 is projected onto the code domain at a specific base spreading factor. The spreading factor is automatically set by the channel type. Set the number of slots via the "Capture Length" on page 74 field. In the diagram, each bar of the x-axis represents one PCG. The y-axis represents the error power.

The measurement evaluates the total signal over the entire period of observation. The currently selected half-slot is marked in red.

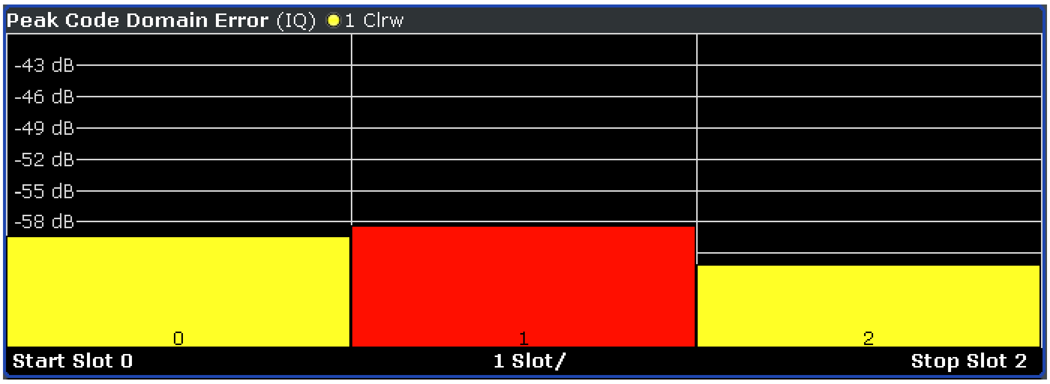


Fig. 6-27: Peak Code Domain Error result display

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 for all half-slots.

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 78 field.

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:ERR:PCDomain'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.17, "Peak Code Domain Error", on page 337.

6.1.4.15 Code Domain Error

This result display shows the difference in power of the test signal and an ideally generated reference signal. In the diagram, the codes are plotted on the x-axis. The number of codes corresponds to the base spreading factor, which depends on the channel type. Refer to chapter 6.4.3, "Channel Type Characteristics", on page 177 for an overview of the spreading factors for each channel type. 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 half-slot.

Fig. 6-28: Code Domain Error result display

The power values of the active and inactive codes are displayed in different colors:

- Yellow: active code
- Cyan: inactive code

Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XPOW:CDEP'`; see chapter 7.2.1, "CALCulate:FEED Subsystem", on page 209.

To query these results, use the command `TRACe:DATA? <TRACeX>`; see chapter 7.9.19, "Code Domain Error (MS Mode)", on page 338.

6.1.4.16 Mag Error vs Chip

Mag Error vs Chip activates the Magnitude Error versus chip display. The magnitude error is displayed for all chips of the slected slot. The magnitude error is calculated by the difference of the magnitude of received signal and magnitude of reference signal. The reference signal is estimated from the channel configuration of all active channels. The magnitude error is related to the square root of the mean power of reference signal and given in percent.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:CHIP:MAGN"`, see `CALCulate<n>:FEED` on page 209

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, a list of magnitude error values of all chips at the selected slot is returned. The values are calculated as the magnitude difference between the received signal and the reference signal for each chip in %, and are normalized to the square root of the average power at the selected slot.

6.1.4.17 Phase Error vs Chip

"Phase Error vs Chip" activates the phase error versus chip display. The phase error is displayed for all chips of the slected slot. The phase error is calculated by the difference of the phase of received signal and phase of reference signal. The reference signal is estimated from the channel configuration of .all active channels. The phase error is given in degrees in a range of +180° to -180°.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:CHIP:PHAS"`, see `CALCulate<n>:FEED` on page 209

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, a list of phase error values of all chips at the selected slot is returned. The values are calculated as the phase difference between the received signal and the reference signal for each chip in degrees, and are normalized to the square root of the average power at the selected slot.

6.1.4.18 Symbol Magnitude Error

The "Symbol Magnitude Error" is calculated analogous to symbol EVM. The result of calculation is one symbol magnitude error value for each symbol of the slot of a special channel. Positive values of symbol magnitude error indicate a symbol magnitude that is larger than the expected ideal value; negative symbol magnitude errors indicate a symbol magnitude that is less than the ideal one.The symbol magnitude error is the difference of the magnitude of the received symbol and that of the reference symbol, related to the magnitude of the reference symbol.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:EVM:MAGN"`, see `CALCulate<n>:FEED` on page 209

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the magnitude error in % of each symbol at the selected slot is transferred. The number of the symbols depends on the spreading factor of the selected channel:

$NOFSymbols=10*2^{(8\text{-}CodeClass)}$

6.1.4.19 Symbol Phase Error

The "Symbol Phase Error" is calculated analogous to symbol EVM. The result of calculation is one symbol phase error value for each symbol of the slot of a special channel. Positive values of symbol phase error indicate a symbol phase that is larger than the expected ideal value; negative symbol phase errors indicate a symbol phase that is less than the ideal one.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:EVM:PHAS"`, see `CALCulate<n>:FEED` on page 209

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the phase error in degrees of each symbol at the selected slot is transferred. The number of the symbols depends on the spreading factor of the selected channel:

NOFSymbols=10*2$^{(8\text{-CodeClass})}$

6.1.5 RF Measurement Results

6.1.5.1 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 1xEV-DO 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" on page 123 softkey in the "Measurement" menu.

6.1.5.2 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" on page 124 softkey in the "Measurement" menu.

6.1.5.3 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" on page 134 softkey in the "Measurement" menu.

6.1.5.4 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" on page 143 in the "Measurement" menu.

6.1.5.5 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" on page 144 in the "Measurement" menu.

6.1.5.6 Power vs Time

The Power vs Time measurement examines a specified number of half slots. Up to 36 half slots can be captured and processed simultaneously. That means that for a standard measurement of 100 half slots only three data captures are necessary. After the capturing of the data the R&S FSVR averages the measured values and compares the results to the emission envelope mask. You can define the emission envelope mask in the corresponding submenu.

Setting	Default value
Frequency	Span 0 (Zero Span)
Sweep Time	833.38 Ms
RBW	3 MHz

Setting	Default value
VBW	10 MHz
Detector	RMS
Trace Mode	Average

For details on the softkeys of the Power vs Time measurement see "Power vs Time" on page 149 in the "Measurement" menu.

6.2 Menu and Softkey Description for CDA Measurements

The following chapters describe the menus and softkeys specific to 1xEV-DO Analysis (R&S FSV-84 and R&S FSV-85 options) for CDA measurements.

The "Lines" menu is not available for CDA measurements in the "1xEV-DO Analysis" modes.

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

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

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

Importing and Exporting I/Q Data

I/Q data can be imported from a file for processing in R&S FSV-K84/-K85, and captured I/Q data can be stored to a file ("IQ Import"/"IQ Export" softkeys in the "Save/Rcl" menu). For details see the base unit description.

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 1.3, "How to Use the Help System", on page 8.

6.2.1 Softkeys of the Code Domain Analyzer menu in BTS mode

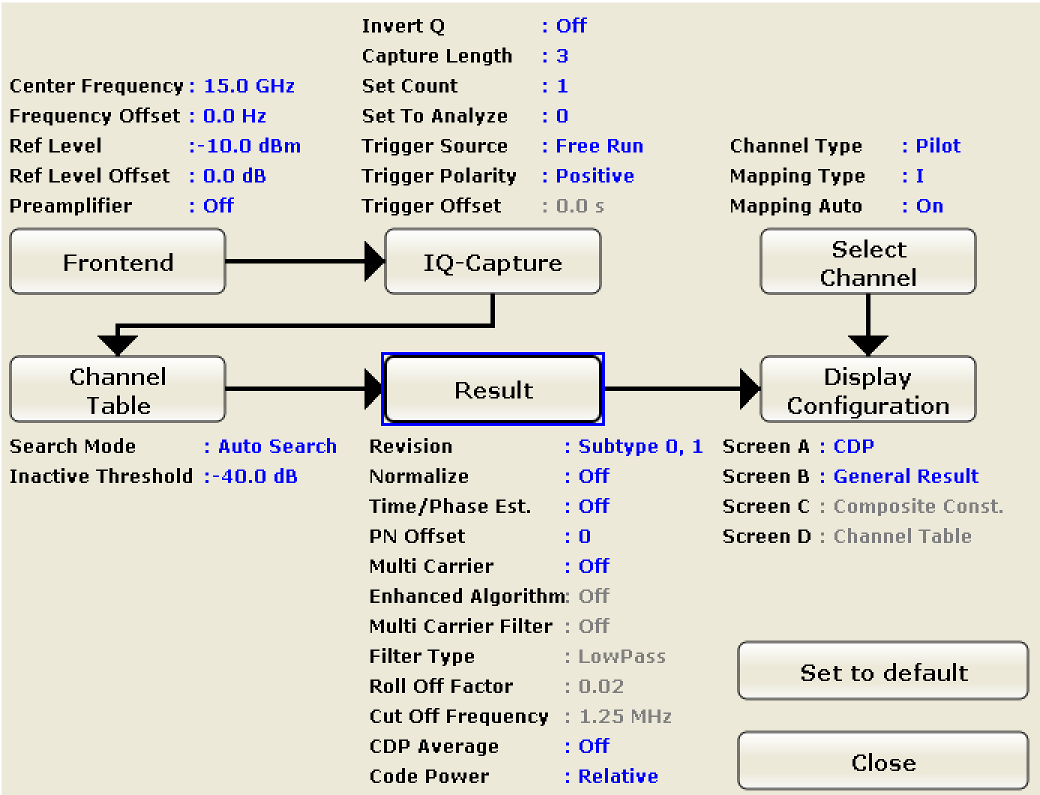
The following chapter describes all softkeys available in the main menu of the "1xEV-DO BTS Analysis" option.

You can also access the main menu via the MEAS CONFIG hardkey.

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.

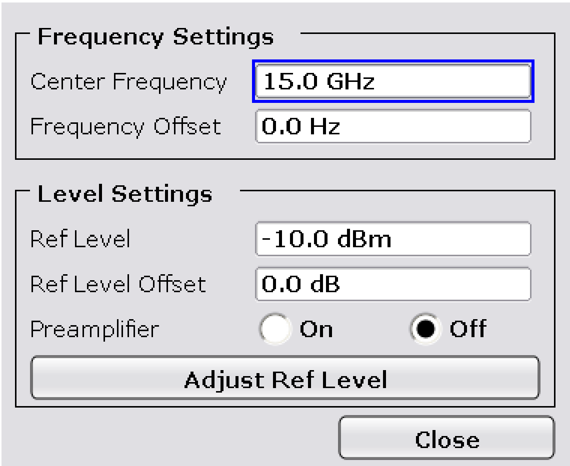


To change the settings, either use the rotary knob or the cursor keys to change the focus to any other block or press one of the following buttons:

- "Frontend Settings" on page 72
- "IQ Capture Settings" on page 73
- "Select" on page 87
- "Channel Table Settings" on page 77
- "Result Settings" on page 81
- "Display Config" on page 85

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

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

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

Remote command:
[SENSe:]FREQuency:CENTer on page 305

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 frequency offset. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
[SENSe:]FREQuency:OFFSet on page 306

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

The reference level 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.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 272

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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 272

Preamp On/Off ← Frontend Settings
Switches the preamplifier on and 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.

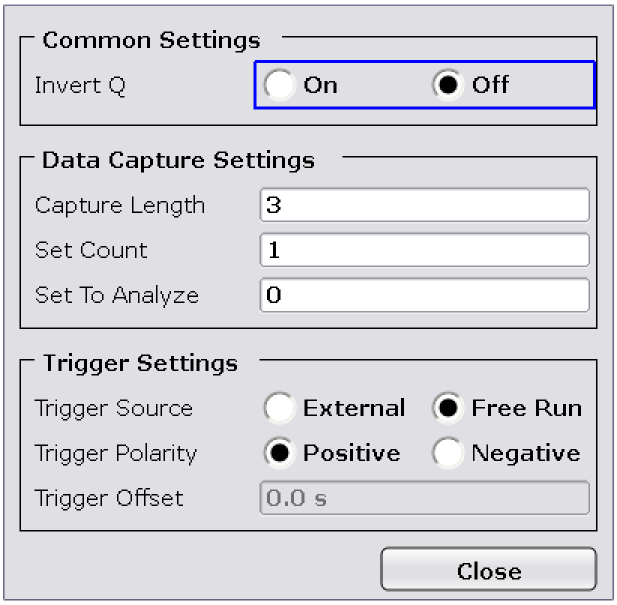
This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:GAIN:STATe` on page 346

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

Remote command:
`[SENSe:]ADJust:LEVel` on page 288

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.

Remote command:
`[SENSe:]CDPower:QINVert` on page 282

Capture Length ← IQ Capture Settings
Sets the number of slots you want to analyze. The input value is always in multiples of the slots. The maximum capture length is 32.

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

The default value is 3.

Remote command:
`[SENSe:]CDPower:IQLength` on page 278

Set Count ← IQ Capture Settings
Defines the number of consecutive sets to be stored in the instrument's IQ memory. One set consists of 32 slots. The R&S FSVR can capture up to 15680 slots (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 slots (see Capture Length). In case you want to capture more than one set, the capture length is always 32. The R&S FSVR automatically sets the capture length to 32 and the Capture Length field is not available for modification.

Remote command:
`[SENSe:]CDPower:SET:COUNt` on page 283

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].

Remote command:
`[SENSe:]CDPower:SET[:VALue]` on page 283

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.

Remote command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 349

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.

Remote command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 349

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.

Remote command:

`TRIGger<n>[:SEQuence]:SLOPe` on page 349

`[SENSe:]SWEep:EGATe:POLarity` on page 320

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 the R&S Digital I/Q Interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples. See the R&S Digital I/Q Interface(R&S FSV-B17) description in the base unit.

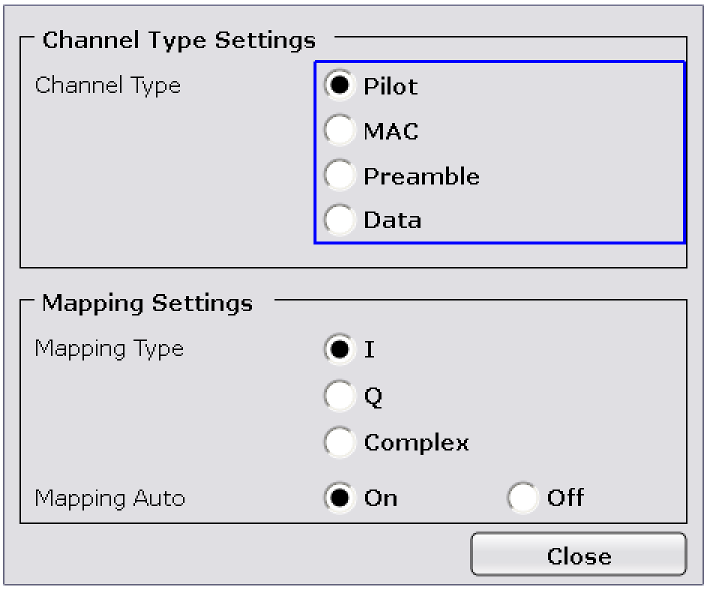
In the "External" or "IF Power" trigger mode, a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger delay (trigger offset) as well.

Remote command:

`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 348

Select Channel Settings

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



Channel Type ← Select Channel Settings

Select one of the following channel types for the measurement:

- Pilot
- MAC
- Preamble
- Data

For further details on the characteristics of the channel types refer to chapter 6.4.2, "Working with Channel Tables", on page 176.

Remote command:
[SENSe:]CDPower:CTYPe on page 278

Mapping Type ← Select Channel Settings

The mapping mode determines whether the complex signal, the I or the Q branch is analyzed in the measurement.

Use manual mapping to obtain the option of examining any channel type as either a complex signal or in the I and Q branch. This setting is valid for any channel type. Also refer to "Mapping Auto" on page 76.

Remote command:
[SENSe:]CDPower:MMODe on page 280

Mapping Auto ← Select Channel Settings

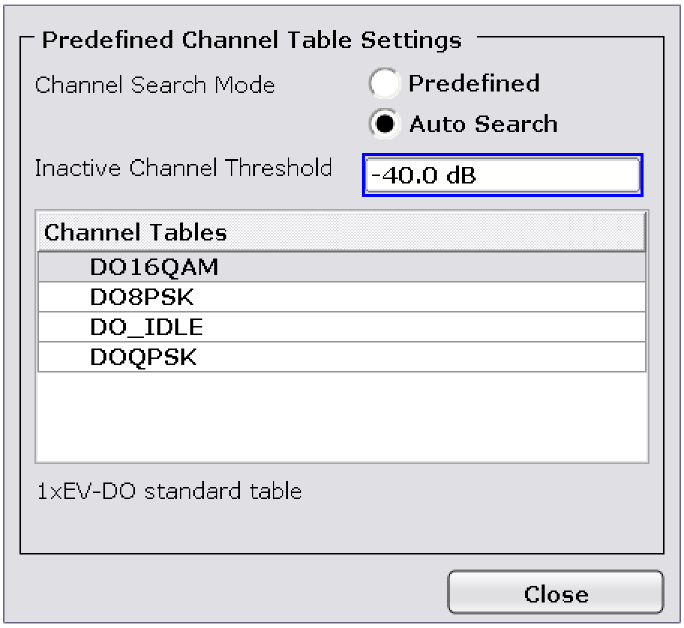
Automatically sets the type of mapping to be used in the measurement according to the following table:

Channel type	Mapping
Pilot	I or Q
MAC	I or Q

Channel type	Mapping
Preamble	I or Q
Data	Complex

Remote command:
[SENSe:]CDPower:MMODe on page 280

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



Predefined channel tables are a way to customize measurements. The RECENT channel table contains the last configuration used before switching from Auto Search to Predefined. The DOQPSK, DO8PSK, DO16QAM and DO_IDLE channel tables are included in the option per default and are configured according to the standard. For details on the predefined channel tables refer to chapter 6.4.1, "Predefined Channel Tables", on page 173. 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) 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 field and the chapter 6.4.1, "Predefined Channel Tables", on page 173.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle[:STATe]` on page 256
`CONFigure:CDPower[:BTS]:CTABle:SELect` on page 261

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 -40 dB. With this value all channels with signals such as the 1xEV-DO 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.

Remote command:
`[SENSe:]CDPower:ICTReshold` on page 278

Channel Tables ← Channel Table Settings
In this field a list of the available channel tables is shown. To activate a predefined channel table, select the table name by using either the touchscreen or the the cursor keys and pressing the ENTER key. The selected channel table is the basis for future measurements (until you choose another or select Auto Search).

An active channel table must completely describe the supplied signal.

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

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:CATalog?` on page 256

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. See Save softkey for details.

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 R&S FSVR:

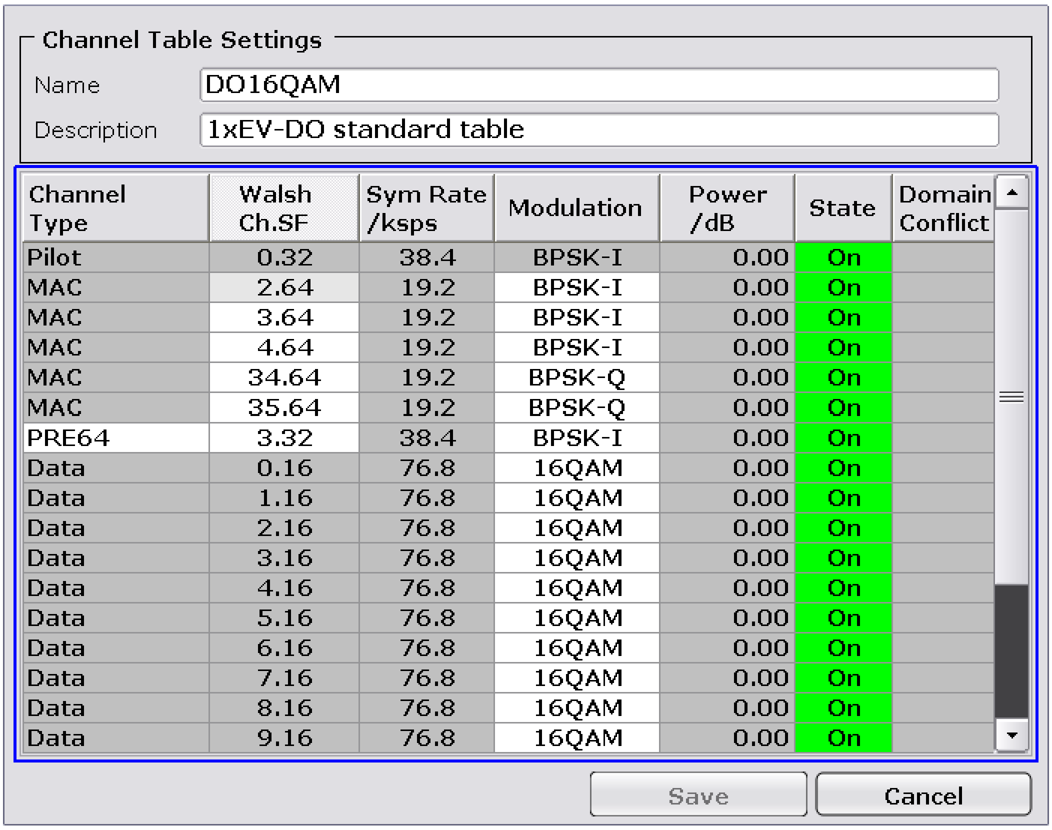


Table 6-1: Channel table settings

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
Modulation	Enter the modulation type for the channel.
Power/dB	Contains the measured relative code domain power. The unit is dB. The fields are filled with values after pressing the "Meas" on page 80 softkey.

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

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:NAME` on page 260
`CONFigure:CDPower[:BTS]:CTABle:COPY` on page 257

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

ChannelType	MAC
Walsh Ch.SF	2.64
Sym Rate/ksps	19.2 ksps (automatically calculated)
Modulation	BPSK-I
Power/dB	0 dB (automatically calculated)
State	Off
DomainConflict	No (automatically calculated)

To change the channel type use the dropdown menu that opens when selecting/highlighting the "Channel Type" field that should be changed. modulation settings are changed in the same way.

To change the channel number, type another channel number in the form 'ChannelNumber.SpreadingFactor' or just the code number in the respective field. Confirm the change with the ENTER key.

To activate or deactivate a channel, select the "State" field and confirm with the ENTER key.

The R&S FSVR automatically checks for conflicts between two active channels.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 257

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 77). 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 you have selected the Auto Search mode in the "Channel Table Settings" dialog box.

Sort ← New/Copy/Edit ← Channel Table Settings
Sorts the table according to the following rules.

First off, active channels are separated from inactive channels. Within these categories sorting is then done first by the channel type (special channels like F-SYNC first, then data channels) and next by the spreading factor in ascending order. Last, the sorting is done by the code number, also 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.

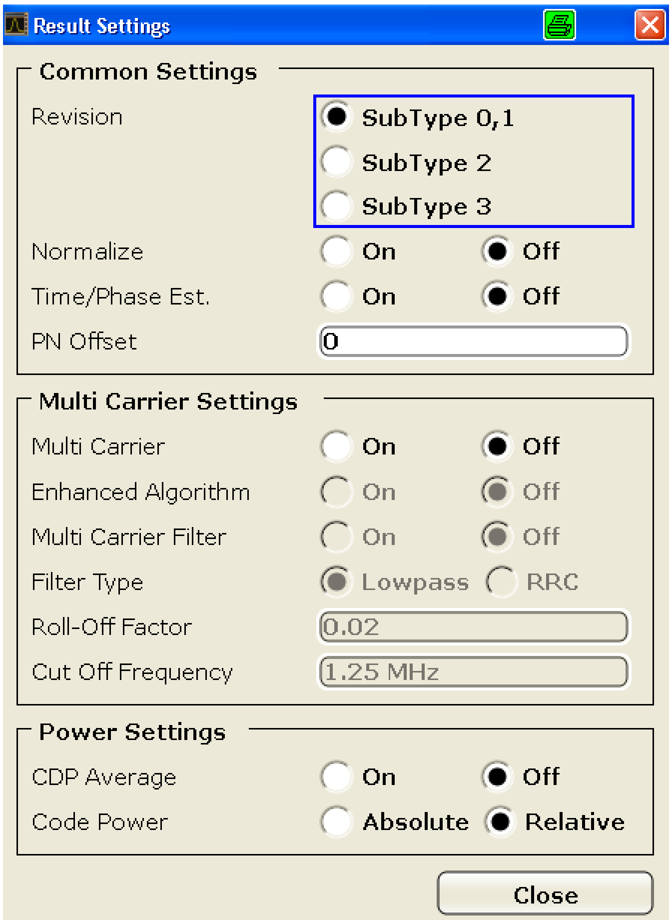
Reload ← New/Copy/Edit ← Channel Table Settings
Reloads the original content of the copied channel table.

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 6.4.1, "Predefined Channel Tables", on page 173) 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.

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



Subtype ← Result Settings

Specifies the characteristics of the signal you want to analyze.

In subtype 2 the number of active users increases. That means that the spreading factor (number of orthogonal codes) doubles for channel types MAC and PREAMBLE.

The amount of returned trace data in the MAC and PREAMBLE channels is different for subtype 0/1 and 2, depending on the channel type and selected evaluation (see chapter 6.4.3, "Channel Type Characteristics", on page 177). The R&S FSVR detects all the channels on a per slot basis. Therefore the R&S FSVR recognizes changes in the channel configuration and modulation over the recorded slots.

In subtype 2 the following modulation types are added within some of the MAC channels:

- ON/OFF keying ACK on the I branch (OOKA-I),

- ON/OFF keying ACK on the Q branch (OOKA-Q),

- ON/OFF keying NACK on the I branch (OOKN-I) and the

- ON/OFF keying NACK on the Q branch (OOKN-Q)

If the 2 bits within an ON/OFF keying modulation are identical, the modulation cannot be recognized as an ON/OFF keying modulation. If both bits contain '1' (ON) the modulation is identical to a BPSK and is recognized as BPSK. If both bits contain '0' (OFF) there is no power within that code and slot and therefore no modulation is detected. If the evaluation is set to "MAPPING COMPLEX" the separate I and Q branch detection within the result summary is no longer selected and the modulation type is a 2BPSK with the coding number 5 via remote.

In subtype 3 in R&S FSV-K84, the modulation type 64QAM can be detected. The MAC RA channel occupies a variable code number and the preamble occupies the I- and the Q-branch.

Remote command:
`CONFigure:CDPower[:BTS]:SUBType` on page 267

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

Remote command:
`[SENSe:]CDPower:NORMalize` on page 280

Time/Phase Est. ← Result Settings
Activates 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.

Remote command:
`[SENSe:]CDPower:TPMeas` on page 286

PN Offset ← Result Settings
Specifies the Pseudo Noise (PN) offset of the base station. In a 1xEV-DO 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.

Remote command:
`[SENSe:]CDPower:PNOFfset` on page 282

Multi-Carrier ← Result Settings
Selects or deselects 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.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier [:STATe]` on page 261

Enhanced Algorithm ← Result Settings
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 84 are deactivated, the multi-carrier mode is automatically switched off.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:MALGo` on page 263

Multi-Carrier Filter ← Result Settings
Activates or deactivates the usage of a filter for signal detection on multi-carrier signals.

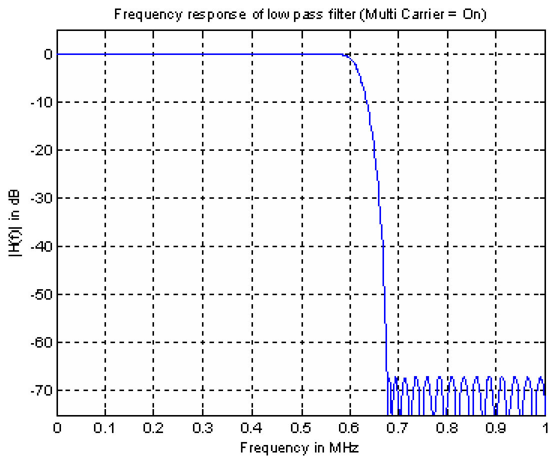
If both the "Enhanced Algorithm" on page 83 and the Multi-Carrier Filter are deactivated, the multi-carrier mode is automatically switched off.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer [:STATe]` on page 261

Filter Type ← Result Settings
Selects the filter type if "Multi-Carrier Filter" on page 84 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 84 and the "Cut Off Frequency" on page 85.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer [:STATe]` on page 261

Roll-Off Factor ← Result Settings
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.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE on page 262
CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF on page 262

Cut Off Frequency ← Result Settings
Defines the cutoff 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.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE on page 262
CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency on page 261

CDP Average ← Result Settings
Activate CDP Average and the Code Domain Analysis is averaged over all slots in the set. For channel type Data and Preamble this calculation assumes that preambles of different lengths do not occur in the slots. If active, ALL is displayed in the Slot field above the measurement screen.

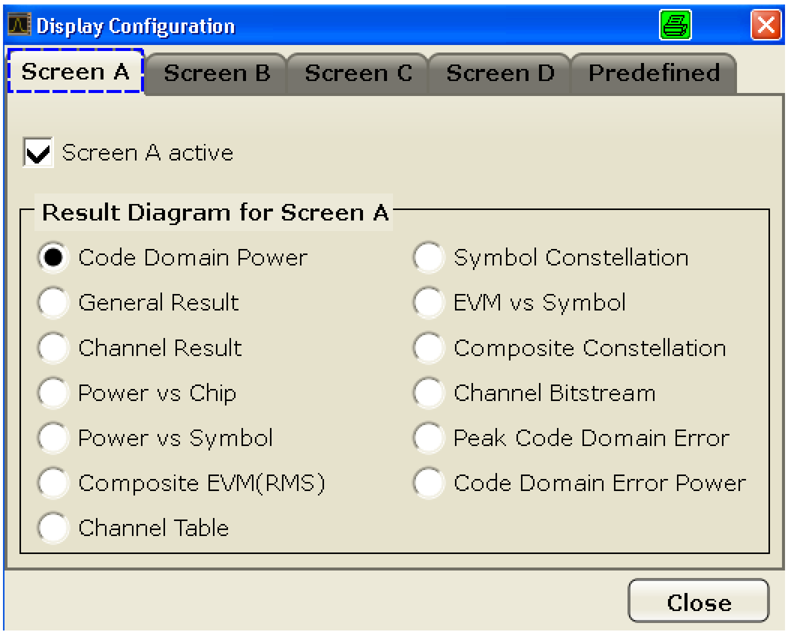
This softkey is available for Code Domain Analysis and is required by the 1xEV-DO standard.

Remote command:
[SENSe:]CDPower:AVERage on page 277

Code Power ← Result Settings
Selects for the Code Domain Power measurement whether the y-values are displayed as an absolute (dBm) or relative (dB). In relative mode the reference is the total power of the channel type.

Remote command:
CALCulate<n>:FEED on page 209

Display Config
This softkey opens the "Display Config" dialog box to select the result display. In the Code Domain Analyzer, the results are displayed in up to four screens. Any result can be displayed in either screen.



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
General Result	General measurement results in a table
Channel Result	Various measurement results for a specific channel
Power vs Chip	Power of the selected channel versus all chips
Power vs Symbol	Power of the selected channel and of the selected slot versus all symbols
Composite EVM (RMS)	Averaged error between the test signal and the ideal reference signal
Channel Table	Channel occupancy table
Symbol Constellation	Channel constellation of the modulated signal at symbol level
EVM vs Symbol	Error Vector Magnitude result display
Composite Constellation	Composite Constellation result display
Channel Bitstream	Display of demodulated bits
Peak Code Domain Error	Projection of the maximum error between the test signal and the reference signal
Code Domain Error Power	Code Domain Error Power result display

For details on the displayed results and default settings refer to chapter 6.1, "Measurements and Result Displays", on page 32.

You can configure the result displays via the "Result Settings" on page 81 dialog box.

Select

Opens a dialog box to select a specific channel and/or slot for evaluation. Enter the channel number and slot number to be evaluated as a decimal in the respective field.

The number of available channels depends on the specified channel type. For channel type PILOT and PREAMBLE values between 0 and 31 are valid. For channel type MAC the range is between 0 and 63 and for DATA channels the range is 0 to 15.

The slot range is from 0 to (Capture Length -1). Refer to Capture Length for further details.

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

- chapter 6.1.3.8, "Channel Bitstream", on page 43
- chapter 6.1.3.3, "Channel Results", on page 38
- chapter 6.1.3.12, "EVM vs Symbol", on page 46
- chapter 6.1.3.5, "Power vs Symbol", on page 40
- chapter 6.1.3.11, "Symbol Constellation", on page 45

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

- chapter 6.1.3.8, "Channel Bitstream", on page 43
- chapter 6.1.3.3, "Channel Results", on page 38
- chapter 6.1.3.7, "Channel Table", on page 41
- chapter 6.1.3.1, "Code Domain Power", on page 35
- chapter 6.1.3.10, "Code Domain Error", on page 44
- chapter 6.1.3.13, "Composite Constellation", on page 47
- chapter 6.1.3.12, "EVM vs Symbol", on page 46
- chapter 6.1.3.2, "General Results", on page 36
- chapter 6.1.3.4, "Power vs Chip", on page 39
- chapter 6.1.3.5, "Power vs Symbol", on page 40
- chapter 6.1.3.11, "Symbol Constellation", on page 45

Remote command:
`[SENSe:]CDPower:SLOT` on page 284
`[SENSe:]CDPower:CODE` on page 277

6.2.2 Softkeys of the Code Domain Analyzer Menu in MS Mode

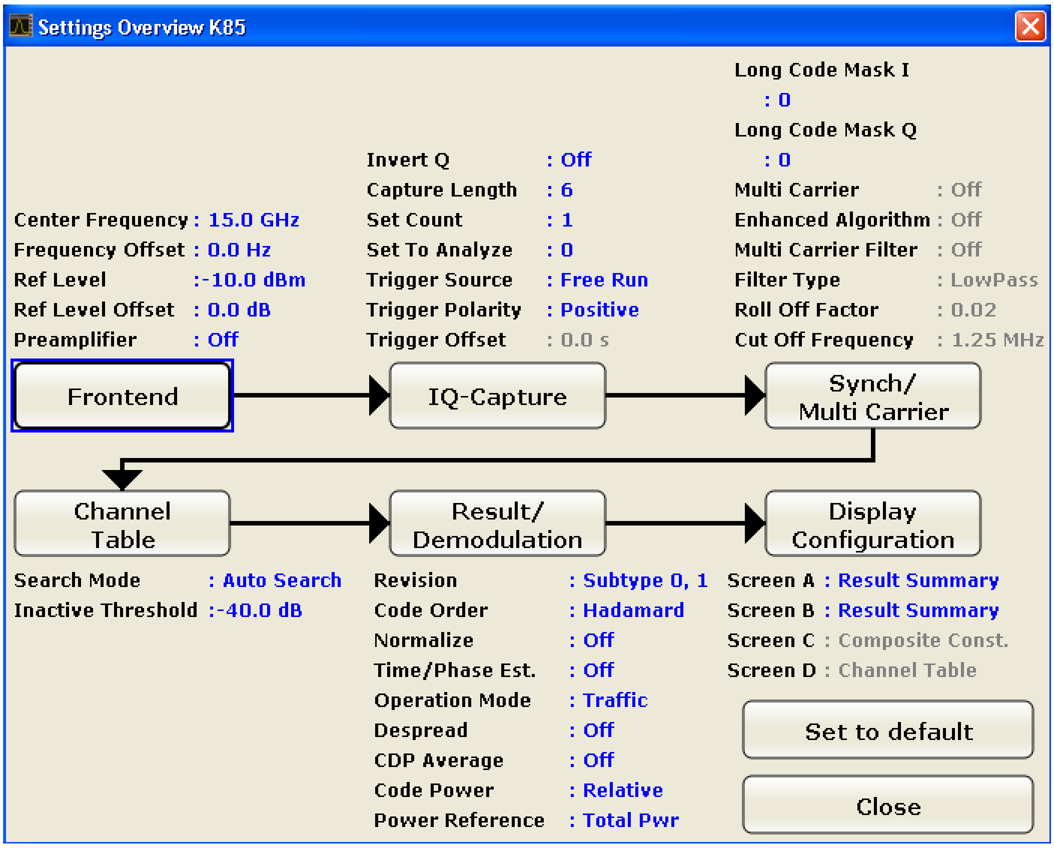
The following chapter describes all softkeys available in the main menu of the "1xEV-DO BTS Analysis" option.

You can also access the main menu via the MEAS CONFIG hardkey.

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.



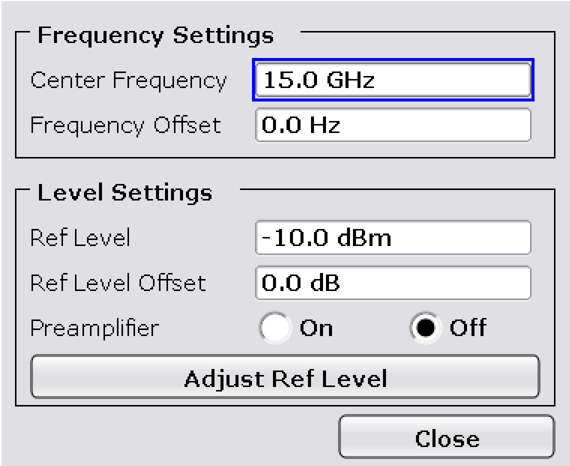
To change the settings, either use the rotary knob or the cursor keys to change the focus to any other block or press one of the following buttons:

- "Frontend Settings" on page 72
- "IQ Capture Settings" on page 73
- "Synch/Multicarrier Settings" on page 93
- "Channel Table Settings" on page 77
- "Result/Demod Settings" on page 101
- "Display Config" on page 105

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.

Remote command:
[SENSe:]FREQuency:CENTer on page 305

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 frequency offset. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
[SENSe:]FREQuency:OFFSet on page 306

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

The reference level 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.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 272

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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 272

Preamp On/Off ← Frontend Settings
Switches the preamplifier on and 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.

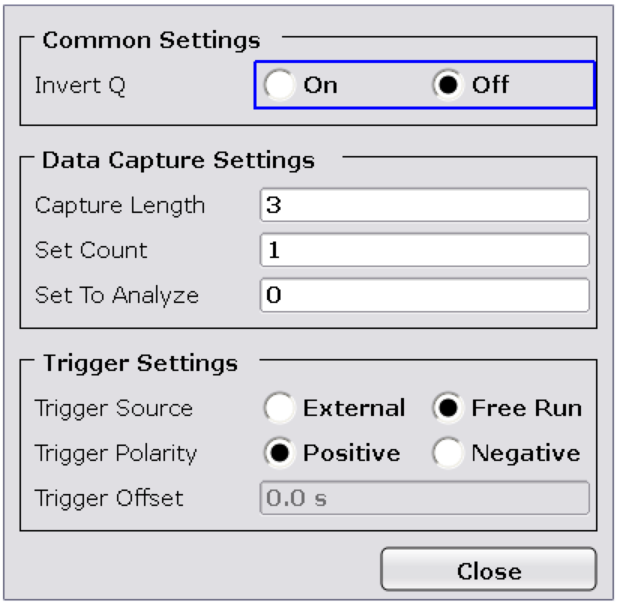
This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:GAIN:STATe` on page 346

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

Remote command:
`[SENSe:]ADJust:LEVel` on page 288

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.

Remote command:
`[SENSe:]CDPower:QINVert` on page 282

Capture Length ← IQ Capture Settings
Sets the number of slots you want to analyze. The input value is always in multiples of the slots. The maximum capture length is 32.

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

The default value is 3.

Remote command:
`[SENSe:]CDPower:IQLength` on page 278

Set Count ← IQ Capture Settings
Defines the number of consecutive sets to be stored in the instrument's IQ memory. One set consists of 32 slots. The R&S FSVR can capture up to 15680 slots (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 slots (see Capture Length). In case you want to capture more than one set, the capture length is always 32. The R&S FSVR automatically sets the capture length to 32 and the Capture Length field is not available for modification.

Remote command:
`[SENSe:]CDPower:SET:COUNt` on page 283

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].

Remote command:
`[SENSe:]CDPower:SET[:VALue]` on page 283

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.

Remote command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 349

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.

Remote command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 349

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.

Remote command:
`TRIGger<n>[:SEQuence]:SLOPe` on page 349
`[SENSe:]SWEep:EGATe:POLarity` on page 320

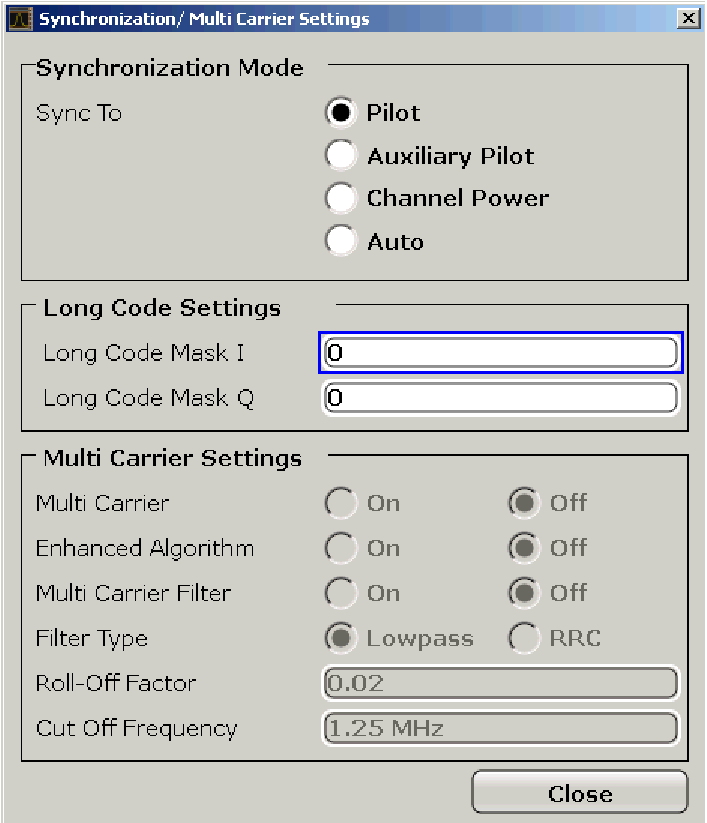
Trigger Offset ← IQ Capture Settings
Opens an edit dialog box to enter the time offset between the trigger signal and the start of the sweep.

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 the R&S Digital I/Q Interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples. See the R&S Digital I/Q 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.

Remote command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 348

Synch/Multicarrier Settings
This dialog contains the multicarrier and synchronization parameters.



Sync To ← Synch/Multicarrier Settings

The application has two synchronization stages: the frame synchronization (detection of the first chip of the frame) and the rough frequency/phase synchronization. For the frame synchronization, different methods are implemented. Two methods use the known sequence of a pilot channel (Pilot or Auxiliary Pilot); a third does not require a pilot channel. The frequency/phase synchronization always requires a pilot channel (Pilot or Auxiliary Pilot). Synchronization is usually only successful if both frame and frequency/phase synchronization were performed correctly.

"Auto" The following modes are tried sequentially until synchronization was successful. If none of the methods was successful a failed synchronization is reported. If the result of the correlation methods (sync on Pilot and Auxiliary Pilot) becomes increasingly worse (due to bad power conditions), the non-data-aided synchronization works optimally and synchronization should be successful.

"Pilot" For frame synchronization, this method uses the correlation characteristic of the known pilot channel (i.e. pilot channel sequence = spreading code including scrambling sequence). The correlation must be calculated for all hypotheses of the scrambling code (32768; for external triggers only 2048) in order to get the correct peak at the position where the frame begins. This correlation method may fail if the power of the underlying pilot channel is too low compared to the total power. In this case, the expected correlation peak is hidden by the upcoming auto-correlation noise of the bad hypothesis.
The frequency/phase synchronization also takes advantage of the known linear phase of the pilot channel.

"Auxiliary Pilot" Similar to synchronization on pilot, but with the different known sequence (= spreading code) of the auxiliary pilot channel. The benefits and problems of this approach are therefore identical to the synchronization on pilot. This mode is useful if the signal does not contain a pilot channel.

"Channel Power" This frame synchronization method does not require a pilot channel because it analyzes the power of any specified channel (currently code 3 with spreading factor 4, which is the data channel 2). Again the channel power must be calculated for all hypotheses of the scrambling code (32768; for external triggers only 2048). Only for the correct position the result is low (inactive channel) or high (active channel) in contrast to the wrong hypothesis. Obviously, a small band exists for which we will not get a power drop or peak if the power of the tested channel is nearly equal to the noise of the other hypotheses (from total signal).
The frequency/phase synchronization works in the same way as for the methods above with the difference that here, both pilot channels are tried consecutively.

Remote command:
`SENS:CDP:SMODe` on page 284

Long Code Mask I ← Synch/Multicarrier Settings
Defines the long code mask for the I branch of the mobile in hexadecimal form. The value range is from `0` to `4FFFFFFFFFF`.

Remote command:
`[SENSe:]CDPower:LCODe:I` on page 278

Long Code Mask Q ← Synch/Multicarrier Settings
Defines the long code mask for the Q branch of the mobile in hexadecimal form. The value range is from `0` to `4FFFFFFFFFF`.

Remote command:
`[SENSe:]CDPower:LCODe:Q` on page 279

Multi-Carrier ← Synch/Multicarrier Settings
Selects or deselects 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.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier [:STATe]` on page 261

Enhanced Algorithm ← Synch/Multicarrier Settings
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 are deactivated, the multi carrier mode is automatically switched off.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:MALGo` on page 263

Multi Carrier Filter ← Synch/Multicarrier Settings
Activates or deactivates the usage of a filter for signal detection on multi-carrier signals.

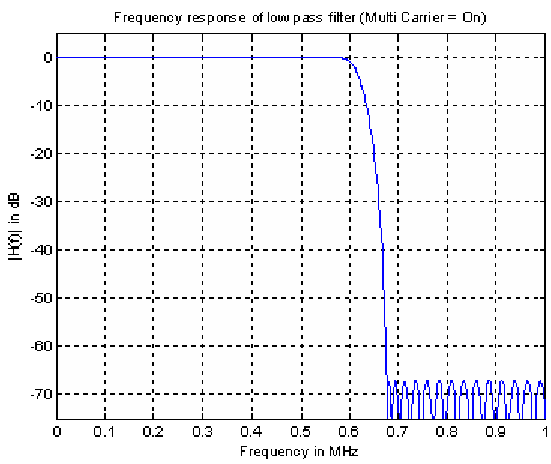
If both the Enhanced Algorithm and the Multi Carrier Filter are deactivated, the multi carrier mode is automatically switched off.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer [:STATe]` on page 261

Filter Type ← Synch/Multicarrier Settings
Selects the filter type if Multi Carrier Filter 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 and the Cut Off Frequency.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 262

Roll-Off Factor ← Synch/Multicarrier Settings
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.

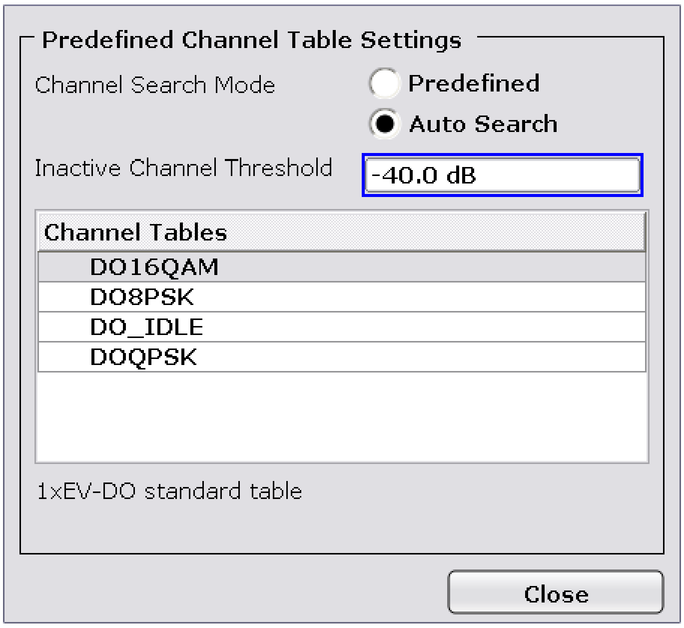
Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 262
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF` on page 262

Cut Off Frequency ← Synch/Multicarrier Settings
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.

Remote command:
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 262
`CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency` on page 261

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



Predefined channel tables are a way to customize measurements. The RECENT channel table contains the last configuration used before switching from Auto Search to Predefined. The DOQPSK, DO8PSK, DO16QAM and DO_IDLE channel tables are included in the option per default and are configured according to the standard. For details on the predefined channel tables refer to chapter 6.4.1, "Predefined Channel Tables", on page 173. 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) 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 field and the chapter 6.4.1, "Predefined Channel Tables", on page 173.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle[:STATe]` on page 256
`CONFigure:CDPower[:BTS]:CTABle:SELect` on page 261

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 -40 dB. With this value all channels with signals such as the 1xEV-DO 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.

Remote command:
`[SENSe:]CDPower:ICTReshold` on page 278

Channel Tables ← Channel Table Settings

In this field a list of the available channel tables is shown. To activate a predefined channel table, select the table name by using either the touchscreen or the the cursor keys and pressing the ENTER key. The selected channel table is the basis for future measurements (until you choose another or select Auto Search).

An active channel table must completely describe the supplied signal.

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

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:CATalog?` on page 256

New/Copy/Edit ← Channel Table Settings

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

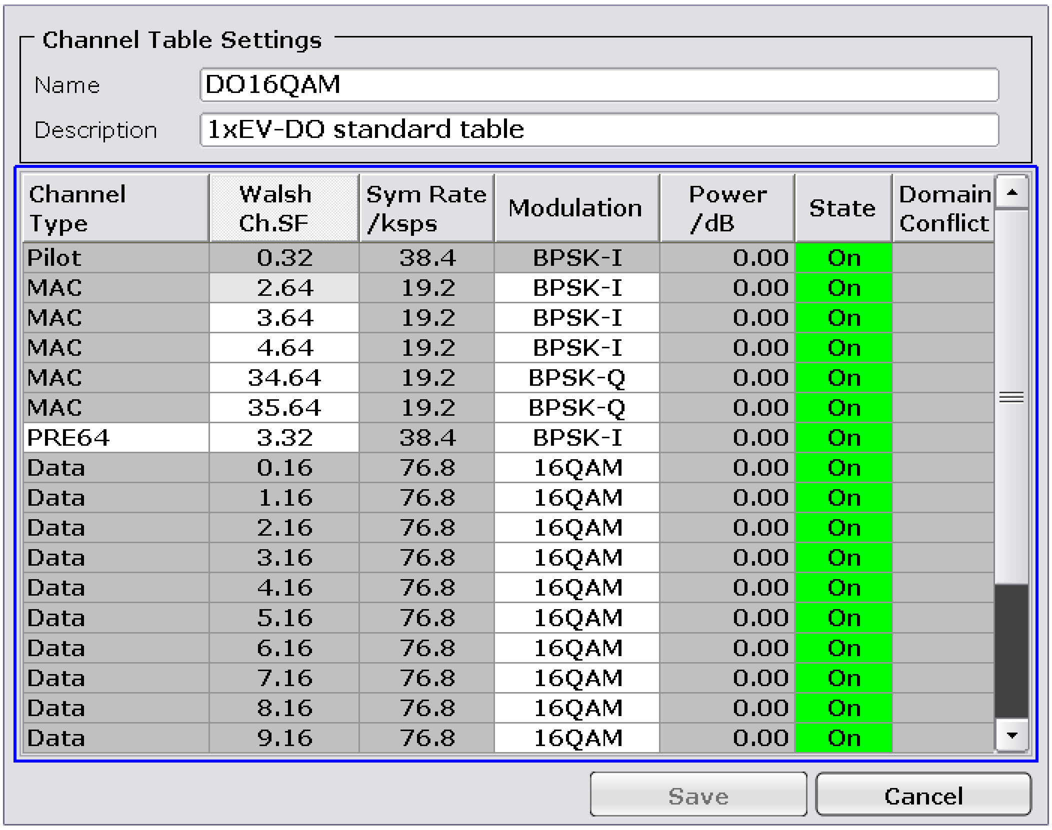
The "New" softkey opens the "New Channel Table" dialog box. In this dialog you can build a new channel table. All fields are empty.

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. See Save softkey for details.

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 R&S FSVR:



Channel Type	Walsh Ch.SF	Sym Rate /ksps	Modulation	Power /dB	State	Domain Conflict
Pilot	0.32	38.4	BPSK-I	0.00	On	
MAC	2.64	19.2	BPSK-I	0.00	On	
MAC	3.64	19.2	BPSK-I	0.00	On	
MAC	4.64	19.2	BPSK-I	0.00	On	
MAC	34.64	19.2	BPSK-Q	0.00	On	
MAC	35.64	19.2	BPSK-Q	0.00	On	
PRE64	3.32	38.4	BPSK-I	0.00	On	
Data	0.16	76.8	16QAM	0.00	On	
Data	1.16	76.8	16QAM	0.00	On	
Data	2.16	76.8	16QAM	0.00	On	
Data	3.16	76.8	16QAM	0.00	On	
Data	4.16	76.8	16QAM	0.00	On	
Data	5.16	76.8	16QAM	0.00	On	
Data	6.16	76.8	16QAM	0.00	On	
Data	7.16	76.8	16QAM	0.00	On	
Data	8.16	76.8	16QAM	0.00	On	
Data	9.16	76.8	16QAM	0.00	On	

Table 6-2: Channel table settings

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.

Item	Description
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
Modulation	Enter the modulation type for the channel.
Power/dB	Contains the measured relative code domain power. The unit is dB. The fields are filled with values after pressing the "Meas" on page 80 softkey.
State	Indicates whether a channel is active or inactive.
DomainConflict	A red bullet indicates if there's a conflict of any sorts between two or more channels (e.g. two conflicting channel codes)

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:NAME` on page 260
`CONFigure:CDPower[:BTS]:CTABle:COPY` on page 257

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

ChannelType	MAC
Walsh Ch.SF	2.64
Sym Rate/ksps	19.2 ksps (automatically calculated)
Modulation	BPSK-I
Power/dB	0 dB (automatically calculated)
State	Off
DomainConflict	No (automatically calculated)

To change the channel type use the dropdown menu that opens when selecting/highlighting the "Channel Type" field that should be changed. modulation settings are changed in the same way.

To change the channel number, type another channel number in the form 'ChannelNumber.SpreadingFactor' or just the code number in the respective field. Confirm the change with the ENTER key.

To activate or deactivate a channel, select the "State" field and confirm with the ENTER key.

The R&S FSVR automatically checks for conflicts between two active channels.

Remote command:
`CONFigure:CDPower[:BTS]:CTABle:DATA` on page 257

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 77). 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 you have selected the Auto Search mode in the "Channel Table Settings" dialog box.

Sort ← New/Copy/Edit ← Channel Table Settings
Sorts the table according to the following rules.

First off, active channels are separated from inactive channels. Within these categories sorting is then done first by the channel type (special channels like F-SYNC first, then data channels) and next by the spreading factor in ascending order. Last, the sorting is done by the code number, also 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.

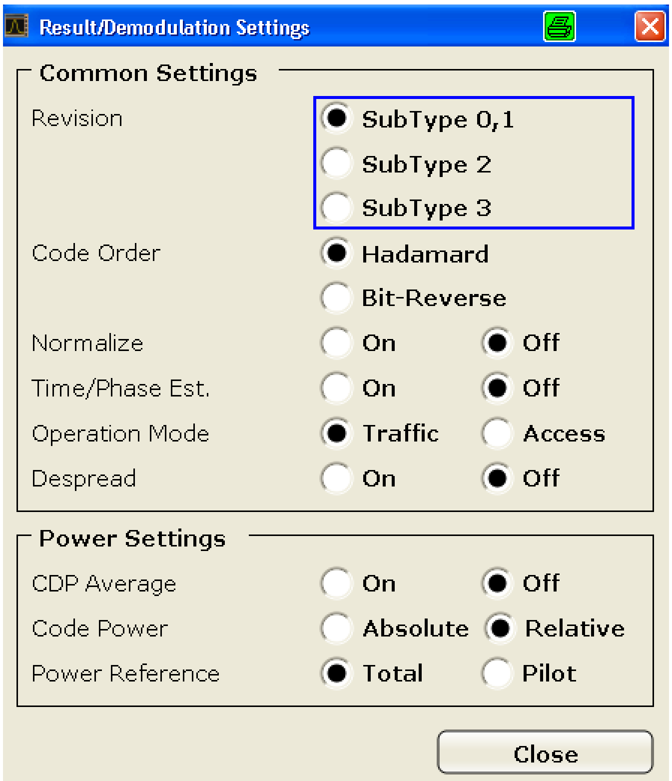
Reload ← New/Copy/Edit ← Channel Table Settings
Reloads the original content of the copied channel table.

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 6.4.1, "Predefined Channel Tables", on page 173) 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.

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



Subtype ← Result/Demod Settings
Specifies the characteristics of the signal you want to analyze.

In subtype 2 the number of active users increases. That means that the spreading factor (number of orthogonal codes) doubles for channel types MAC and PREAMBLE.

The amount of returned trace data in the MAC and PREAMBLE channels is different for subtype 0/1 and 2, depending on the channel type and selected evaluation (see chapter 6.4.3, "Channel Type Characteristics", on page 177). The R&S FSVR detects all the channels on a per slot basis. Therefore the R&S FSVR recognizes changes in the channel configuration and modulation over the recorded slots.

In subtype 2 the following modulation types are added within some of the MAC channels:

- ON/OFF keying ACK on the I branch (OOKA-I),

- ON/OFF keying ACK on the Q branch (OOKA-Q),

- ON/OFF keying NACK on the I branch (OOKN-I) and the

- ON/OFF keying NACK on the Q branch (OOKN-Q)

If the 2 bits within an ON/OFF keying modulation are identical, the modulation cannot be recognized as an ON/OFF keying modulation. If both bits contain '1' (ON) the modulation is identical to a BPSK and is recognized as BPSK. If both bits contain '0' (OFF) there is no power within that code and slot and therefore no modulation is detected. If the evaluation is set to "MAPPING COMPLEX" the separate I and Q branch detection within the result summary is no longer selected and the modulation type is a 2BPSK with the coding number 5 via remote.

As of Subtype 2, the R&S FSV-K85 can demodulate the new demodulation types B4, Q4, Q2, Q4Q2 and E4E2. For the data channel, the software also provides the new results displays "Composite Data EVM", "Composite Data Constellation" and "Composite Data Bitstream".

In R&S FSV-K85, there is no difference between subtype 2 and subtype 3 in the software.

Remote command:
`CONFigure:CDPower[:BTS]:SUBType` on page 267

Code Order ← Result/Demod 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.

Remote command:
`[SENSe:]CDPower:ORDer` on page 281

Normalize ← Result/Demod Settings
Select this parameter to eliminate the DC offset from the signal. By default, the parameter is deselected.

Remote command:
`[SENSe:]CDPower:NORMalize` on page 280

Time/Phase Estimation ← Result/Demod 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.

Remote command:
`[SENSe:]CDPower:TPMeas` on page 286

Operation Mode ← Result/Demod Settings
The operation mode is used for the channel search.

"Access" In ACCESS mode only PICH (always available) and DATA channels can exist.

"Traffic" In TRAFFIC mode all channels (PICH/RRI/DATA/ACK and DRC) can exist. PICH and RRI are always in the signal.

CDP Average ← Result/Demod Settings

Activate CDP Average and the Code Domain Analysis is averaged over all slots in the set. For channel type Data and Preamble this calculation assumes that preambles of different lengths do not occur in the slots. If active, ALL is displayed in the Slot field above the measurement screen.

This softkey is available for Code Domain Analysis and is required by the 1xEV-DO standard.

Remote command:
`[SENSe:]CDPower:AVERage` on page 277

Code Power ← Result/Demod Settings

Selects for the Code Domain Power measurement whether the y-values are displayed as an absolute (dBm) or relative (dB). In relative mode the reference is the total power of the channel type.

Remote command:
`CALCulate<n>:FEED` on page 209

Power Reference ← Result/Demod Settings

Determines the reference power for relative power measurements.

Pilot Channel	By default, the reference power is the power of the pilot channel.
Total Power	The power is measured over one half slot. The reference power is the total power of the signal for the corresponding half slot.

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 half slots. Therefore it can be used as a constant reference for the result display. In contrast, the total power can vary from half slot to half slot due to the possibility of a power level change in the different code channels.

In the Power vs half slot 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:

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).

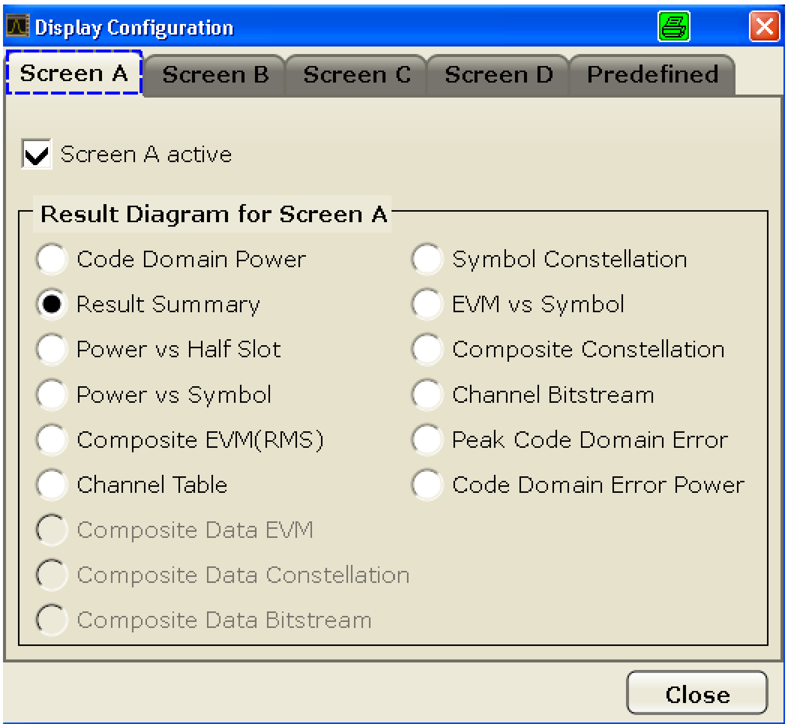
In the "Power vs. Half Slot" diagram, a straight line is displayed instead of the expected power staircase.

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.

Remote command:
`[SENSe:]CDPower:PREFerence` on page 282

Display Config

This softkey opens the "Display Config" dialog box to select the result display. In the Code Domain Analyzer, the results are displayed in up to four screens. Any result can be displayed in either screen.



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
Result Summary	Various measurement results in a table
Power vs Half Slot	Power of the selected channel versus all half slots
Power vs Symbol	Power of the selected channel and of the selected slot versus all symbols
Composite EVM (RMS)	Averaged error between the test signal and the ideal reference signal
Channel Table	Channel occupancy table
Composite Data EVM	EVM display for special composite data channel only available for subtypes 2 or higher (see "Subtype" on page 102)
Composite Data Constellation	Constellation of the special composite data channel only available for subtypes 2 or higher (see "Subtype" on page 102)
Composite Data Bitstream	Display of demodulated bits for the special composite data channel only available for subtypes 2 or higher (see "Subtype" on page 102)
Symbol Constellation	Channel constellation of the modulated signal at symbol level
EVM vs Symbol	Error Vector Magnitude result display
Composite Constellation	Composite Constellation result display
Channel Bitstream	Display of demodulated bits
Peak Code Domain Error	Projection of the maximum error between the test signal and the reference signal
Code Domain Error Power	Code Domain Error Power result display

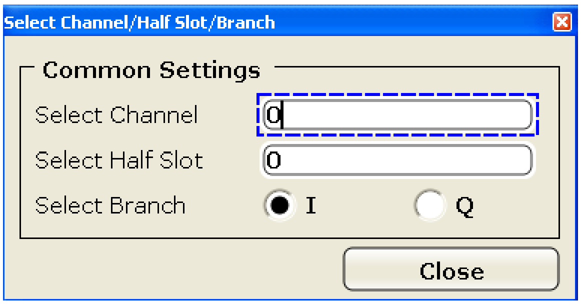
For details on the displayed results and default settings refer to chapter 6.1.4, "Code Domain Analysis Results (MS Mode)", on page 50.

You can configure the result displays via the "Result/Demod Settings" on page 101 dialog box.

Select

Opens a dialog box to select a specific channel, half slot or branch for evaluation. Enter the channel number and half slot number to be evaluated as a decimal in the respective field.

The slot range is from 0 to (Capture Length -1). Refer to Capture Length for further details.



Remote command:
[SENSe:]CDPower:SLOT on page 284
[SENSe:]CDPower:CODE on page 277

6.2.3 Softkeys of the Frequency Menu for CDA Measurements

The following chapter describes all softkeys available in the "Frequency" menu in "1xEV-DO Analysis" modes for CDA measurements.

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

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: $0\ Hz \le f_{center} \le f_{max}$

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

Remote command:
[SENSe:]FREQuency:CENTer on page 305

CF Stepsize

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

The step size defines the value by which the center frequency is increased or decreased when the arrow keys are pressed. When you use the rotary knob, the center frequency changes in steps of 10% of the "Center Frequency Stepsize".

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

Remote command:
[SENSe:]FREQuency:CENTer:STEP on page 305

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 frequency offset. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
`[SENSe:]FREQuency:OFFSet` on page 306

6.2.4 Softkeys of the Amplitude Menu for CDA Measurements

The following chapter describes all softkeys available in the "Amplitude" menu in "1xEV-DO Analysis" modes for CDA and Power vs time measurements. For all other RF measurements, see chapter 6.3.4, "Softkeys of the Amplitude Menu for RF Measurements", on page 156.

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

The reference level 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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 272

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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO` on page 271

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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MAXimum` on page 274

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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MINimum` on page 274

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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 272

Preamp On/Off
Switches the preamplifier on and 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 input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:GAIN:STATe` on page 346

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 current reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

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

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

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

Note: As of firmware version 1.63, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display. The increased mixer level allows for an improved signal, but also increases the risk of overloading the instrument!

Remote command:
`INPut:ATTenuation` on page 340

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 input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:ATTenuation:AUTO` on page 341

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 input from the R&S Digital I/Q Interface (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.

Remote command:
`INPut:EATT:AUTO` on page 345

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.

Remote command:
`INPut:EATT:AUTO` on page 345
`INPut:EATT` on page 345

Input (AC/DC)
Toggles the RF input of the R&S FSVR between AC and DC coupling.

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

Remote command:
`INPut:COUPling` on page 341

6.2.5 Softkeys of the Sweep Menu for CDA Measurements

The following chapter describes all softkeys available in the "Sweep" menu in "1xEV-DO Analysis" modes for CDA measurements. For RF measurements, the softkeys are described in chapter 6.3.6, "Softkeys of the Sweep Menu", on page 167.

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 112).

Remote command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 352

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.

Remote command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 352

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.

Remote command:
INITiate<n>:CONMeas on page 351

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.

Remote command:
[SENSe:]SWEep:COUNt on page 318

6.2.6 Softkeys of the Trigger Menu for CDA Measurements

The following chapter describes all softkeys available in the "Trigger" menu in "1xEV-DO Analysis" modes for CDA measurments.

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

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.

Remote command:
TRIG:SOUR IMM, see TRIGger<n>[:SEQuence]:SOURce on page 349

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.

Remote command:
TRIG:SOUR EXT, see TRIGger<n>[:SEQuence]:SOURce on page 349

Frequency Mask

Activates the frequency mask trigger and opens the dialog box to set up a frequency mask for the frequency mask trigger.

For more information see chapter 6.4.4, "Working with the Frequency Mask Trigger", on page 178.

Remote command:
see chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240

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.

Remote command:
`TRIGger<n>[:SEQuence]:SLOPe` on page 349
`[SENSe:]SWEep:EGATe:POLarity` on page 320

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 the R&S Digital I/Q Interface (R&S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples. See the R&S Digital I/Q 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.

Remote command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 348

6.2.7 Softkeys of the Trace Menu for CDA Measurements

The following chapter describes all softkeys available in the "Trace" menu in "1xEV-DO BTS Analysis" mode for Code Domain Analysis measurements.

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

Clear Write

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

All available detectors can be selected.

Remote command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

Max Hold

The maximum value is determined over several sweeps and displayed. The R&S FSVR 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.

Remote command:
`DISP:TRAC:MODE MAXH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

Min Hold

The minimum value is determined from several measurements and displayed. The R&S FSVR saves 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.

Remote command:
`DISP:TRAC:MODE MINH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

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 6.4.5, "Detector Overview", on page 182).

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE AVER`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

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

Note: 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 displayed trace no longer matches the current instrument setting is indicated by the  icon on the tab label.

If the level range or reference level is changed, the R&S FSVR 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.

Remote command:
`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

6.2.8 Softkeys of the Auto Set Menu for CDA Measurements

The following chapter describes all softkeys available in the "Auto Set" menu in "1xEV-DO Analysis" modes for CDA measurements.

For RF measurements refer to the description of the AUTO SET key in the base unit.

Auto All
Performs all automatic settings.

- "Auto Freq" on page 116
- "Auto Level" on page 116

Remote command:
`[SENSe:]ADJust:ALL` on page 287

Auto Freq
Defines the center frequency and the reference level 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 input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`[SENSe:]ADJust:FREQuency` on page 288

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.

Remote command:
`[SENSe:]ADJust:LEVel` on page 288

Settings
Opens a submenu to define settings for automatic leveling.

Possible settings are:

- "Meas Time Manual" on page 116
- "Meas Time Auto" on page 116

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 116). The default value is 1 ms.

Remote command:
`[SENSe:]ADJust:CONFigure:LEVel:DURation` on page 287

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.

Upper Level Hysteresis ← Settings
Defines an upper threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

Remote command:
`[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer` on page 287

Lower Level Hysteresis ← Settings
Defines a lower threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

Remote command:
`[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer` on page 287

6.2.9 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 6.3.7, "Softkeys of the Input/ Output Menu for RF Measurements", on page 171.

Input (AC/DC)

Toggles the RF input of the R&S FSVR between AC and DC coupling.

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

Remote command:
`INPut:COUPling` on page 341

Noise Source

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

Remote command:
`DIAGnostic<n>:SERVice:NSOurce` on page 350

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 "Digital IQ" input path is used for measurements. "Digital IQ" is only available if option R&S FSV-B17 (R&S Digital I/Q 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.

Remote command:
`INPut:SELect` on page 347

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

The device name is unknown.

Remote command:
`INPut:DIQ:CDEVice` on page 341

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.

Remote command:
`INPut:DIQ:SRATe` on page 344

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.

Remote command:
`INPut:DIQ:RANGe[:UPPer]` on page 343

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

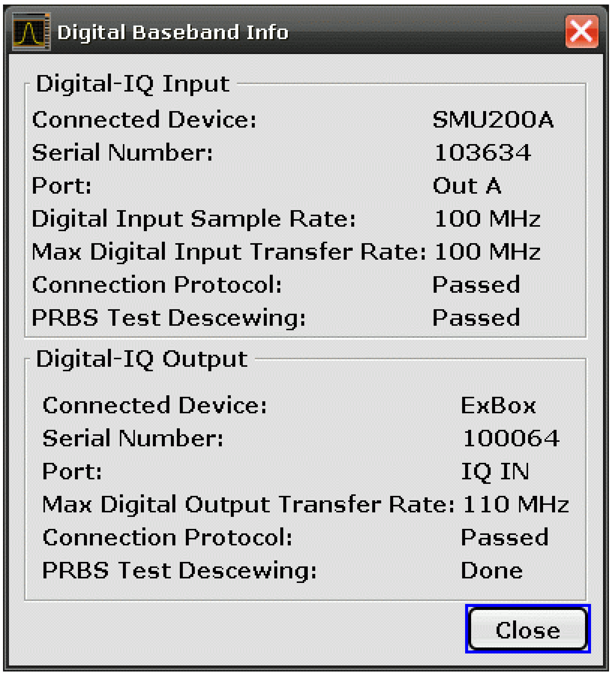
Remote command:
`INPut:DIQ:RANGe[:UPPer]:UNIT` on page 344

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.

Remote command:
`INPut:DIQ:RANGe:COUPling` on page 343

Digital IQ Info
Displays a dialog box with information on the digital I/Q input and output connection via the optional R&S Digital I/Q 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 - R&S Digital I/Q Interface (Option R&S FSV-B17)" in the description of the base unit.

Remote command:
`INPut:DIQ:CDEVice` on page 341

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

Note: The EX-IQ-Box functionality is not supported for R&S FSVR models 1321.3008Kxx.

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 R&S FSVR to the R&S EX-IQ-BOX in addition to the R&S Digital I/Q 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 R&S Digital I/Q 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 R&S FSVR for digital output to a connected device ("Transmitter" Type).

RX Settings ← EXIQ
Opens the "EX-IQ-BOX Settings" dialog box to configure the R&S FSVR 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 R&S FSVR 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 R&S FSVR 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 R&S FSVR once again.

Remote command:
Remote commands for the R&S DigIConf software always begin with `SOURce:EBOX`. Such commands are passed on from the R&S FSVR 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.

6.3 Softkeys and Menus for RF Measurements

The following chapter describes the softkeys and menus available for RF measurements in 1xEVDO BTS Analysis mode.

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

6.3.1 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

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 6.2.1, "Softkeys of the Code Domain Analyzer menu in BTS mode", on page 70 or .chapter 6.2.2, "Softkeys of the Code Domain Analyzer Menu in MS Mode", on page 87 For details on the measurements in the code domain, initial configuration and screen layout refer to chapter 6.1, "Measurements and Result Displays", on page 32.

Remote command:

`CONFigure:CDPower[:BTS]:MEASurement` on page 263

Power

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

Remote command:

`CONFigure:CDPower[:BTS]:MEASurement` on page 263

`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` on page 215

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 R&S FSVR 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.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 314

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.

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 263
`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` on page 215

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

Remote command:
`CONFigure:CDPower[:BTS]:BCLass|BANDclass` on page 254

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 6.4.15, "Predefined CP/ACLR Standards", on page 200 and chapter 6.4.16, "Optimized Settings for CP/ACLR Test Parameters", on page 201).

# 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.

Remote command:
`[SENSe:]POWer:ACHannel:TXCHannel:COUNt` on page 316

# 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.

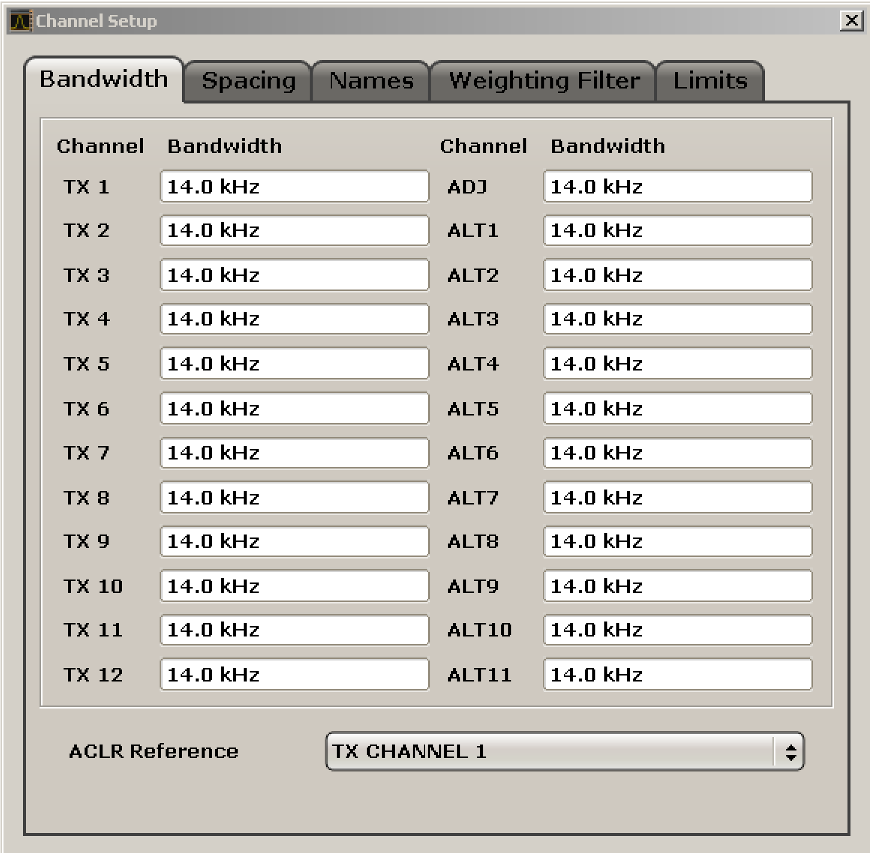
The following measurements are performed depending on the number of the channels:

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.

Remote command:
[SENSe:]POWer:ACHannel:ACPairs on page 308

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 126
- "Spacing" on page 127
- "Names" on page 129
- "Weighting Filter" on page 129
- "Limits" on page 129

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 6.4.16, "Optimized Settings for CP/ACLR Test Parameters", on page 201).

- 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 6.4.7, "Selecting the Appropriate Filter Type", on page 185.

Remote command:
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]` on page 309
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel` on page 309
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>` on page 309

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.

Remote command:
`[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual` on page 315
`[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO` on page 314

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.

Remote command:
`[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel>` on page 316
`[SENSe:]POWer:ACHannel:SPACing[:ACHannel]` on page 315
`[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel>` on page 315

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.

Remote command:

`[SENSe:]POWer:ACHannel:NAME:ACHannel` on page 312

`[SENSe:]POWer:ACHannel:NAME:ALTernate<channel>` on page 312

`[SENSe:]POWer:ACHannel:NAME:CHANnel<channel>` on page 313

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

Remote command:

`POW:ACH:FILT:CHAN1 ON`, see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel>` on page 311

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 310

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 311

Activates the weighting filter for the adjacent channel.

`POW:ACH:FILT:ALPH:ACH 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel` on page 310

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 311

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 310

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 R&S FSVR 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.

Remote command:
CALCulate<n>:LIMit<k>:ACPower[:STATe] on page 234
CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult on page 230
CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative] on page 233

Relative Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR

Defines a limit relative to the carrier signal.

Remote command:
CALC:LIM:ACP ON, see CALCulate<n>:LIMit<k>:ACPower[:STATe] on page 234
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.

Remote command:
CALC:LIM:ACP ON, see CALCulate<n>:LIMit<k>:ACPower[:STATe] on page 234
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 229

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 131 and "ACLR Reference" on page 127 to obtain the signal to noise ratio.

Remote command:
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ on page 216

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).

Remote command:
CALC:MARK:FUNC:POW:MODE WRIT, see CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE on page 215

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.

Remote command:
CALC:MARK:FUNC:POW:MODE MAXH, see CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE on page 215

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 6.4.6, "Trace Mode Overview", on page 184.

Remote command:
[SENSe:]POWer:TRACe on page 318

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.

Remote command:
[SENSe:]POWer:ACHannel:MODE on page 312

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 6.4.16, "Optimized Settings for CP/ACLR Test Parameters", on page 201.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet` on page 313

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.

Remote command:
`[SENSe:]SWEep:TIME` on page 323

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 R&S FSVR 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 6.4.7, "Selecting the Appropriate Filter Type", on page 185.

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 R&S FSVR 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.

Remote command:
`[SENSe:]POWer:HSPeed` on page 317

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".

Remote command:
`[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE` on page 314

Noise Correction ← Ch Power ACLR
If activated, the results are corrected by the instrument's inherent noise, which increases the dynamic range.

"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. Noise correction must be switched on again manually after the change.

"OFF" No noise correction is performed.

"AUTO" Noise correction is performed. After a parameter change, noise correction is restarted automatically and a new correction measurement is performed.

Remote command:
`[SENSe:]POWer:NCORrection` on page 317

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 R&S FSVR 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.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 314

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.

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 263
CALCulate<n>:LIMit<k>:FAIL? on page 235

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 "Close Sweep List" on page 137).

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 6.4.11, "Format Description of Spectrum Emission Mask XML Files", on page 189).

If you load one of the provided XML files ("Load Standard" softkey, see "Load Standard" on page 143), the sweep list contains ranges and parameters according to the selected standard. For further details refer also to chapter 6.4.12, "Provided XML Files for the Spectrum Emission Mask Measurement", on page 194.

Note: If you edit the sweep list, always follow the rules and consider the limitations described in chapter 6.4.13, "Ranges and Range Settings", on page 197.

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 6.4.13, "Ranges and Range Settings", on page 197.

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.

Remote command:
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt on page 294
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP on page 294

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 6.4.14, "Fast Spectrum Emission Mask Measurements", on page 198.

Note: If "Fast SEM" mode is deactivated while Symmetric Setup mode is on, "Symmetrical Setup" mode is automatically also deactivated.
If "Fast SEM" mode is activated while "Symmetrical Setup" mode is on, not all range settings can be set automatically.

Remote command:
`[SENSe:]ESPectrum:HighSPeed` on page 290

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 6.4.7, "Selecting the Appropriate Filter Type", on page 185.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE` on page 293

RBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the RBW value for this range.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution]` on page 292

VBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the VBW value for this range.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo` on page 292

Sweep Time Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates or deactivates the auto mode for the sweep time.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO` on page 299

Sweep Time ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the sweep time value for the range.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME` on page 299

Ref. Level ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the reference level for the range.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:RLEVel` on page 298

RF Att. Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates or deactivates the auto mode for RF attenuation.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO` on page 295

RF Attenuator ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask

Sets the attenuation value for that range.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation` on page 295

Preamp ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask

Switches the preamplifier on or off.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe` on page 296

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.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:TRANsducer` on page 300

Limit Check 1-4 ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask

Sets the type of limit check for all ranges.

For details on limit checks see the base unit description "Working with Lines in SEM".

The limit state affects the availability of all limit settings ("Abs Limit Start" on page 136, "Abs Limit Stop" on page 137, "Rel Limit Start" on page 137, "Rel Limit Stop" on page 137).

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.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe` on page 298
`CALCulate<n>:LIMit<k>:FAIL?` on page 235

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 136).

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt` on page 296

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 136).

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP` on page 297

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 136).

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt` on page 297

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 134).

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP` on page 297

Close Sweep List ← Sweep List ← Spectrum Emission Mask

Closes the "Sweep List" dialog box and 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 6.4.13, "Ranges and Range Settings", on page 197.

Remote command:
`ESP:RANG3:INS BEF`, see `[SENSe:]ESPectrum:RANGe<range>:INSert` on page 296

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 6.4.13, "Ranges and Range Settings", on page 197.

Remote command:
`ESP:RANG1:INS AFT`, see `[SENSe:]ESPectrum:RANGe<range>:INSert` on page 296

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 6.4.13, "Ranges and Range Settings", on page 197.

Remote command:
`[SENSe:]ESPectrum:RANGe<range>:DELete` on page 293

Symmetric Setup ← Sweep List ← Spectrum Emission Mask

If activated, the current sweep list configuration is changed to define a symmetrical setup regarding the reference range. The number of ranges to the left of the reference range is reflected to the right, i.e. any missing ranges on the right are inserted, while superfluous ranges are removed. The values in the ranges to the right of the reference range are adapted symmetrically to those in the left ranges.

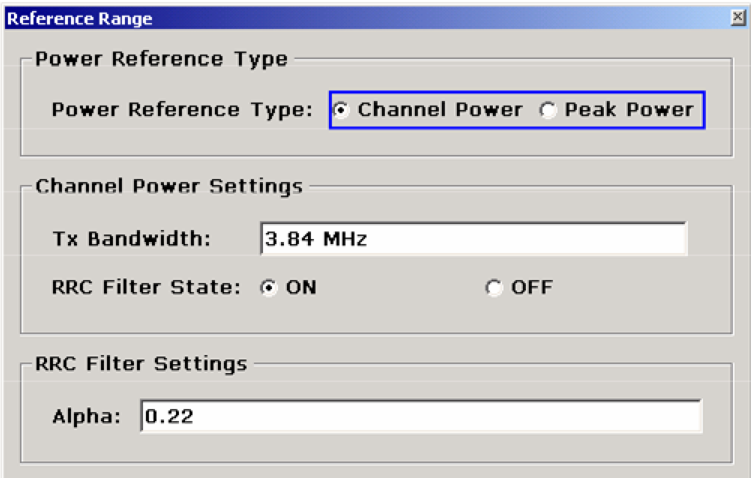
Any changes to the range settings in active "Symmetric Setup" mode lead to symmetrical changes in the other ranges (where possible). In particular, this means:

- Inserting ranges: a symmetrical range is inserted on the other side of the reference range
- Deleting ranges: the symmetrical range on the other side of the reference range is also deleted
- Editing range settings: the settings in the symmetrical range are adapted accordingly

Note: If "Fast SEM" mode is deactivated while "Symmetric Setup" mode is on, "Sym Setup" mode is automatically also deactivated.
If "Fast SEM" mode is activated while "Symmetric Setup" mode is on, not all range settings can be set automatically.

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 6.4.13, "Ranges and Range Settings", on page 197.

Remote command:
[SENSe:]ESPectrum:RTYPe on page 300
[SENSe:]ESPectrum:BWID on page 289
[SENSe:]ESPectrum:FILTer[:RRC][:STATe] on page 290
[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa on page 290

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.

Remote command:
Turning list evaluation on and off:
CALCulate<n>:PEAKsearch|PSEarch:AUTO on page 246
Querying list evaluation results:
TRACe<n>[:DATA]? on page 326

Margin ← List Evaluation ← Spectrum Emission Mask
Opens an edit dialog box to enter the margin used for the limit check/peak search.

Remote command:
CALCulate<n>:PEAKsearch|PSEarch:MARGin on page 246

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.

Remote command:
CALCulate<n>:ESPectrum:PSEarch|:PEAKsearch:PSHow on page 252

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 140).

Remote command:
MMEMory:STORe<n>:LIST on page 353

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 6.4.9, "ASCII File Export Format", on page 188.

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 140).

An example of an output file for Spectrum Emission Mask measurements is given in chapter 6.4.10, "ASCII File Export Format (Spectrum Emission Mask)", on page 188.

Remote command:
`FORMat:DEXPort:DSEParator` on page 351
`MMEMory:STORe<n>:LIST` on page 353

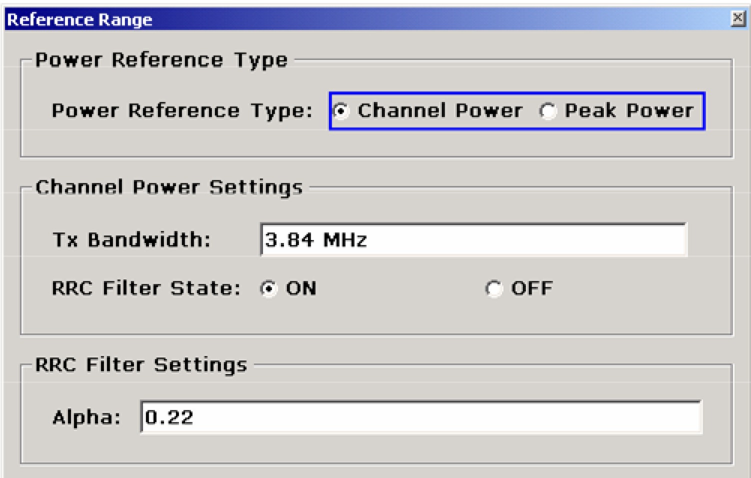
Decim Sep ← Save Evaluation List ← List Evaluation ← Spectrum Emission Mask

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.

Remote command:
`FORMat:DEXPort:DSEParator` on page 351

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"

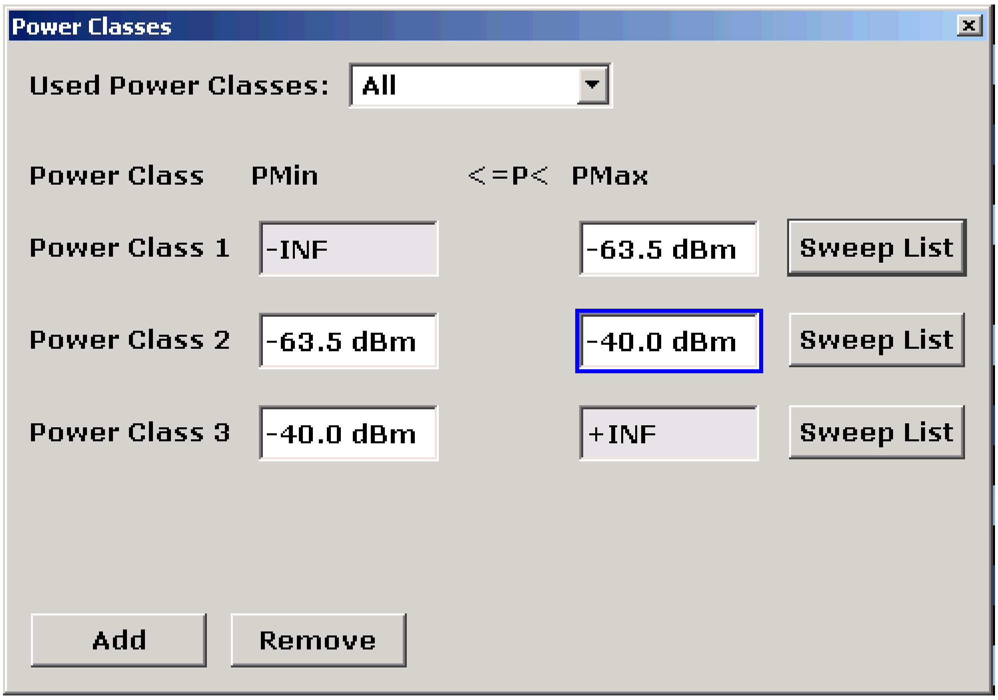
Measures the channel power within the reference range (integral bandwidth method).
If the "Channel Power" reference power type is activated, the dialog box is extended to define additional settings:

- "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 6.4.13, "Ranges and Range Settings", on page 197.

Remote command:
`[SENSe:]ESPectrum:RTYPe` on page 300
`[SENSe:]ESPectrum:BWID` on page 289
`[SENSe:]ESPectrum:FILTer[:RRC][:STATe]` on page 290
`[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa` on page 290

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 142).

Remote command:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive]` on page 236
To define all limits in one step:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe]` on page 237

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:

$P_{min} \leqq P < P_{max}$

Remote command:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum` on page 238
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum` on page 238

Sweep List ← Edit Power Classes ← Spectrum Emission Mask
See "Sweep List" on page 134

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.

Remote command:
`CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive]` on page 236

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 124.

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).

Remote command:
`CONFigure:CDPower[:BTS]:BCLass|BANDclass` on page 254

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 6.4.12, "Provided XML Files for the Spectrum Emission Mask Measurement", on page 194.

Remote command:
`[SENSe:]ESPectrum:PRESet[:STANdard]` on page 291

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 6.4.11, "Format Description of Spectrum Emission Mask XML Files", on page 189.

Remote command:
`[SENSe:]ESPectrum:PRESet:STORe` on page 292

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.

Remote command:
`ABORt` on page 350
`INITiate<n>:ESPectrum` on page 352

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.

Remote command:
`[SENSe:]ESPectrum:PRESet:RESTore` on page 291

Occupied Bandwidth
Activates measurement of the bandwidth assigned to the signal.

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 263
`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` on page 215

% 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.

Remote command:
`[SENSe:]POWer:BANDwidth|BWIDth` on page 316

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 6.4.16, "Optimized Settings for CP/ACLR Test Parameters", on page 201). 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.

Remote command:
`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]` on page 309

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.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 314

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 6.4.16, "Optimized Settings for CP/ACLR Test Parameters", on page 201.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet` on page 313

CCDF
Starts the measurement of the Complementary Cumulative Distribution Function and the Crest factor.

Also opens the CCDF submenu containing the following softkeys:

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 263

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.

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution] on page 301

# 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.

Remote command:
CALCulate<n>:STATistics:NSAMples on page 248

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 72).

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.

Remote command:
CALCulate<n>:STATistics:SCALe:X:RLEVel on page 250

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.

Remote command:
CALCulate<n>:STATistics:SCALe:X:RANGe on page 250

Range Log 100 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 100 dB.

Remote command:
Logarithmic scaling:
DISP:WIND:TRAC:Y:SPAC LOG, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 273
Display range:
DISP:WIND:TRAC:Y 100DB, see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 270

Range Log 50 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 50 dB.

Remote command:
Logarithmic scaling:
DISP:WIND:TRAC:Y:SPAC LOG, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 273
Display range:
DISP:WIND:TRAC:Y 50DB, see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 270

Range Log 10 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 10 dB.

Remote command:
Logarithmic scaling:
DISP:WIND:TRAC:Y:SPAC LOG, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 273
Display range:
DISP:WIND:TRAC:Y 10DB, see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 270

Range Log 5 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 5 dB.

Remote command:
Logarithmic scaling:
DISP:WIND:TRAC:Y:SPAC LOG, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 273
Display range:
DISP:WIND:TRAC:Y 5DB, see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 270

Range Log 1 dB ← x-Axis Range ← Scaling ← CCDF
Sets the level display range to 1 dB.

Remote command:
Logarithmic scaling:
DISP:WIND:TRAC:Y:SPAC LOG, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 273
Display range:
DISP:WIND:TRAC:Y 1DB, see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 270

Range Log Manual ← x-Axis Range ← Scaling ← CCDF
Opens an edit dialog box to define the display range of a logarithmic level axis manually.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273
Display range:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 270

Range Linear % ← x-Axis Range ← Scaling ← CCDF
Selects linear scaling for the level axis in %.

The grid is divided into decadal sections.

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.

Remote command:
`DISP:TRAC:Y:SPAC LIN`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273

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.

Remote command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273

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. The distance between max and min value must be at least one decade.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:UPPer` on page 251

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 softkey. The distance between max and min value must be at least one decade.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:LOWer` on page 250

y-Unit % / Abs ← Scaling ← CCDF
Defines the scaling type of the y-axis. The default value is absolute scaling.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:UNIT` on page 251

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

Remote command:
`CALCulate<n>:STATistics:PRESet` on page 248

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.

Remote command:
`CALCulate<n>:STATistics:SCALe:AUTO ONCE` on page 249

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" on page 148 softkey.

Remote command:
`[SENSe:]SWEep:EGATe` on page 319
`[SENSe:]SWEep:EGATe:SOURce` on page 320

Gate Ranges ← CCDF
Opens a dialog to configure up to 3 gate ranges for each trace.

For details on configuration, see "Defining gated triggering for APD and CCDF measurements" in the base unit description.

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

Remote command:
`SWE:EGAT ON` (see `[SENSe:]SWEep:EGATe` on page 319)
Switches on the external gate mode.
`SWE:EGAT:TRAC1:COMM "SlotA"` (see `[SENSe:]SWEep:EGATe:TRACe<k>:COMMent` on page 321)
Adds a comment to trace 1.
`SWE:EGAT:TRAC1:STAT1 ON` (see `[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>]` on page 322)
Activates tracing for range 1 of trace 1.
`SWE:EGAT:TRAC1:STAR1 3ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range>` on page 321)
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 322)
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 321)
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.

Remote command:
`CALCulate<n>:STATistics:SCALe:AUTO ONCE` on page 249

Power vs Time
Starts the Power vs Time measurement ("1xEV-DO BTS Analysis" mode only). This measurement is required by the standard for the Emission Envelope Mask.

For details on screen layout and default values see the description of Power vs Time.

Remote command:
`CONFigure:CDPower[:BTS]:MEASurement` on page 263

No of HalfSlots ← Power vs Time
Change the number of halfslots used for averaging. The default value is 100.

Remote command:
`[SENSe:]SWEep:COUNt` on page 318

RF:Slot Full Idle ← Power vs Time
Defines the expected signal. Set it to either FULL or IDLE mode. The limit lines and the borders for calculating the mean power are set. The lower and upper limit line are called DOPVTFL/DOPVTFU for FULL and DOPVTIL/DOPVTIU for IDLE mode. It is possible to change these lines with the standard limit line editor.

Remote command:
`CONFigure:CDPower[:BTS]:RFSLot` on page 266

Burst Fit On Off ← Power vs Time
Activate an automatic burst alignment to the center of the diagram. If active the burst fit algorithm searches the maximum and minimum gradient, between them the maximum peak is determined, and from this point the 7 dB down points are searched. If these are within plausible ranges the burst is centered in the screen, otherwise nothing happens. The default setting is OFF.

The softkey is only available if the "RF:Slot" is set to idle mode (see "RF:Slot Full Idle" on page 150).

Remote command:
`CONFigure:CDPower[:BTS]:PVTime:BURSt` on page 264

Reference Mean Pwr ← Power vs Time
The standard asks for the sequence to first measure the FULL slot with the limit line relative to the mean power of the averaged time response. Therefore you should activate the Reference Mean Power for Full slot measurements.

In this mode the mean power is calculated and the limit lines are relative to that mean power.

This value should also be used as the reference for the IDLE slot measurement.

Remote command:
`CALCulate<n>:LIMit<k>:PVTime:REFerence` on page 219

Reference Manual ← Power vs Time
Select the reference value for the limits manually.

Also refer to the description of the Reference Mean Pwr andSet Mean to Manual softkeys.

Remote command:
`CALCulate<n>:LIMit<k>:PVTime:REFerence` on page 219
Remote: `CALC:LIM:PVT:RVAL <numeric value>`

Set Mean to Manual ← Power vs Time
Pressing the softkey leads to the usage of the current mean power value of the averaged time response as the fixed reference value for the limit lines. The mode is switched to Reference Manual. Now the IDLE slot can be selected and the measurement sequence can be finished.

Also refer to the description of the Reference Mean Pwr and Reference Manual softkeys.

Remote command:
`CALCulate<n>:LIMit<k>:PVTime:REFerence` on page 219

Restart on Fail ← Power vs Time
Evaluates the limit line over all results at the end of a single sweep. The sweep restarts if the result is FAIL. On a PASS or MARGIN result, the sweep ends.

This softkey is only available in single sweep mode.

Remote command:
`CONFigure:CDPower[:BTS]:PVTime:FREStart` on page 265

Restore STD Lines ← Power vs Time
Restores the limit lines defined in the standard to the state they were in when the device was supplied. In this way unintended overwriting of the standard lines can be undone.

Remote command:
`CALCulate<n>:LIMit<k>:PVTime:RESTore` on page 219

List Evaluation ← Power vs Time
Opens a table below the measurement screen that shows the averaged, maximum and minimum values for the current measurement.

Adjust Ref Lvl ← Power vs Time
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 R&S FSVR 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.

Remote command:
`[SENSe:]POWer:ACHannel:PRESet:RLEVel` on page 314

6.3.2 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

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.

Remote command:

`[SENSe:]FREQuency:CENTer` on page 305

CF Stepsize

Opens a submenu to set the step size of the center frequency.

The step size defines the value by which the center frequency is increased or decreased when the arrow keys are pressed. When you use the rotary knob the center frequency changes in steps of 10% of the "Center Frequency Stepsize".

The step size can be set to a fraction of the span (span > 0) or a fraction of the resolution bandwidth (span = 0) or it can be set to a fixed value manually.

Apart from the =Center, =Marker and Manual softkeys, the other softkeys are displayed depending on the selected frequency span.

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.

Remote command:

`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305

`FREQ:CENT:STEP:LINK:FACT 10PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 306

0.1*RBW (span > 0) ← CF Stepsize

Sets the step size for the center frequency to 10 % of the resolution bandwidth.

This is the default setting.

Remote command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305
`FREQ:CENT:STEP:LINK:FACT 10PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 306

0.5*Span (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 50 % of the span.

Remote command:
`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305
`FREQ:CENT:STEP:LINK:FACT 50PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 306

0.5*RBW (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 50 % of the resolution bandwidth.

Remote command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305
`FREQ:CENT:STEP:LINK:FACT 50PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 306

x*Span (span > 0) ← CF Stepsize
Opens an edit dialog box to set the step size for the center frequency as a percentage (%) of the span.

Remote command:
`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305
`FREQ:CENT:STEP:LINK:FACT 20PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305

x*RBW (span > 0) ← CF Stepsize
Opens an edit dialog box to set the step size for the center frequency as a percentage (%) of the resolution bandwidth. Values between 1 % and 100 % in steps of 1 % are allowed. The default setting is 10 %.

Remote command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305
`FREQ:CENT:STEP:LINK:FACT 20PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 305

=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 for measurements of the signal harmonics. In this case, 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 for measurements of the signal harmonics. In this case, 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.

Remote command:
[SENSe:]FREQuency:CENTer:STEP on page 305

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.

Remote command:
[SENSe:]FREQuency:STARt on page 307

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.

Remote command:
[SENSe:]FREQuency:STOP on page 307

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 frequency offset. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

Remote command:
[SENSe:]FREQuency:OFFSet on page 306

6.3.3 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" and "Power vs Time" measurements.

Span Manual
Opens an edit dialog box to enter the frequency span. The center frequency remains the same when you change the span.

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.

Remote command:
[SENSe:]FREQuency:SPAN on page 307

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 R&S FSVR 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 or Power vs Time measurements.

Remote command:
SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 323
[SENSe:]SWEep:TIME on page 323

Full Span
Sets the span to the full frequency range of the R&S FSVR specified in the data sheet. This setting is useful for overview measurements.

Remote command:
[SENSe:]FREQuency:SPAN:FULL on page 307

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.

Remote command:
-

6.3.4 Softkeys of the Amplitude Menu for RF Measurements

The following table shows all softkeys available in the "Amplitude" menu for RF measurements except for Power vs Time measurements. The softkeys in the "Amplitude" menu for CDA and Power vs Time measurements are described in chapter 6.2.4, "Softkeys of the Amplitude Menu for CDA Measurements", on page 108.

Ref Level

Opens an edit dialog box to enter the reference level in the current unit (dBm, dBµV, etc).

The reference level 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.

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 272

Range

Opens a submenu to define the display range of the level axis.

This softkey and its submenu are available for RF measurements except for Power vs Time measurements.

Range Log 100 dB ← Range
Sets the level display range to 100 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273
Display range:
`DISP:WIND:TRAC:Y 100DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 270

Range Log 50 dB ← Range
Sets the level display range to 50 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273
Display range:
`DISP:WIND:TRAC:Y 50DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 270

Range Log 10 dB ← Range
Sets the level display range to 10 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273
Display range:
`DISP:WIND:TRAC:Y 10DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 270

Range Log 5 dB ← Range
Sets the level display range to 5 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273
Display range:
`DISP:WIND:TRAC:Y 5DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 270

Range Log 1 dB ← Range
Sets the level display range to 1 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273
Display range:
`DISP:WIND:TRAC:Y 1DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 270

Range Log Manual ← Range
Opens an edit dialog box to define the display range of a logarithmic level axis manually.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273
Display range:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 270

Range Linear % ← Range
Selects linear scaling for the level axis in %.

The grid is divided into decadal sections.

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.

Remote command:
`DISP:TRAC:Y:SPAC LIN`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273

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.

Remote command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273

Preamp On/Off
Switches the preamplifier on and 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 input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:GAIN:STATe` on page 346

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 current reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

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

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

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

Note: As of firmware version 1.63, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display. The increased mixer level allows for an improved signal, but also increases the risk of overloading the instrument!

Remote command:
`INPut:ATTenuation` on page 340

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 input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
`INPut:ATTenuation:AUTO` on page 341

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 input from the R&S Digital I/Q Interface (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.

Remote command:
`INPut:EATT:AUTO` on page 345

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.

Remote command:
`INPut:EATT:AUTO` on page 345
`INPut:EATT` on page 345

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.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 272

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 except for Power vs Time measurements.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition` on page 273

Grid Abs/Rel

Switches between absolute and relative scaling of the level axis (not available with "Linear" range).

Only available for RF measurements except for Power vs Time 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).

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 271

Input (AC/DC)
Toggles the RF input of the R&S FSVR between AC and DC coupling.

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

Remote command:
`INPut:COUPling` on page 341

6.3.5 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.

Bandwidth settings are only available for RF measurements.

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 6.4.7, "Selecting the Appropriate Filter Type", on page 185.

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.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 301
`[SENSe:]BANDwidth|BWIDth[:RESolution]` on page 301

Res BW Auto

Couples the resolution bandwidth to the selected span (for span > 0). If you change the span, the resolution bandwidth is automatically adjusted.

This setting is recommended if you need the ideal resolution bandwidth in relation to a particular span.

This softkey is available for measuring the Adjacent Channel Power, the Occupied Bandwidth and the CCDF. It is also available for Power vs Time measurements.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 301

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 6.4.5, "Detector Overview", on page 182.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth. It is also available for Power vs Time measurements.

Remote command:
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 303
`[SENSe:]BANDwidth|BWIDth:VIDeo` on page 303

Video BW Auto

Couples the video bandwidth to the resolution bandwidth. If you change the resolution bandwidth, 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 result in 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. It is also available for Power vs Time measurements.

Remote command:
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 303

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 R&S FSVR 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 or Power vs Time measurements.

Remote command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 323
`[SENSe:]SWEep:TIME` on page 323

Sweeptime Auto
Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If you change the span, resolution bandwidth or video bandwidth, the sweep time is automatically adjusted.

The R&S FSVR 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.

Remote command:
`[SENSe:]SWEep:TIME:AUTO` on page 323

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 input from the R&S Digital I/Q Interface (option R&S FSV-B17).

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 164
- "FFT" on page 164 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 6.4.7, "Selecting the Appropriate Filter Type", on page 185)
- "Auto" on page 165

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.

Remote command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 324

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. In this case, sweep mode is used.

Remote command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 324

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

Remote command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 324

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.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 302

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.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 302

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 takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 303

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 takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 10`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 303

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 takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 0.1`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 303

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 takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 10`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 303

Span/RBW Auto [100] ← Coupling Ratio
Sets the following coupling ratio:

"resolution bandwidth = span/100"

This coupling ratio is the default setting of the R&S FSVR.

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

Remote command:
`BAND:VID:RAT 0.001`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 303

Span/RBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

The span/resolution bandwidth ratio can be set in the range 1 to 10000.

Remote command:
`BAND:RAT 0.1`, see [SENSe:]BANDwidth|BWIDth[:RESolution]:RATio on page 302

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.*

This softkey is available for Power vs Time measurements.

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO on page 301
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 303
[SENSe:]SWEep:TIME:AUTO on page 323

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 (3 dB)
- CISPR (6 dB)
- MIL Std (6 dB)
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel
- RRC
- 5-Pole (not available for sweep type "FFT")

For detailed information on filters see chapter 6.4.7, "Selecting the Appropriate Filter Type", on page 185 and chapter 6.4.8, "List of Available RRC and Channel Filters", on page 186.

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE on page 302

6.3.6 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

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 112).

Remote command:

`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 352

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.

Remote command:

`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 352

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.

Remote command:

`INITiate<n>:CONMeas` on page 351

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 R&S FSVR 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 or Power vs Time measurements.

Remote command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 323
`[SENSe:]SWEep:TIME` on page 323

Sweeptime Auto
Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If you change the span, resolution bandwidth or video bandwidth, the sweep time is automatically adjusted.

The R&S FSVR 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.

Remote command:
`[SENSe:]SWEep:TIME:AUTO` on page 323

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 input from the R&S Digital I/Q Interface (option R&S FSV-B17).

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 164
- "FFT" on page 164 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 6.4.7, "Selecting the Appropriate Filter Type", on page 185)
- "Auto" on page 165

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.

Remote command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 324

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. In this case, sweep mode is used.

Remote command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 324

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

Remote command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 324

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.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 302

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.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 302

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.

Remote command:
`[SENSe:]SWEep:COUNt` on page 318

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.

Remote command:
`[SENSe:]SWEep:POINts` on page 323

6.3.7 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 6.2.9, "Softkeys of the Input/Output Menu for CDA Measurements", on page 117.

Input (AC/DC)
Toggles the RF input of the R&S FSVR between AC and DC coupling.

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

Remote command:
`INPut:COUPling` on page 341

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

Remote command:
`DIAGnostic<n>:SERVice:NSOurce` on page 350

Video Output
Turns output on the IF / Video output available with option R&S FSV-B5 on and off.

When you turn on the output, you can select to output either the intermediate frequency or the video signal.

Note: Video output does not return valid values in IQ or FFT mode.

Remote command:
`OUTP:IF VID` , see `OUTPut:IF[:SOURce]` on page 354

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 R&S FSVR 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.

Remote command:
`OUTPut:TRIGger` on page 354

6.4 Further Information

6.4.1 Predefined Channel Tables

Predefined channel tables offer access to a quick configuration for the channel search. The "1xEV-DO BTS Analysis" option provides the following set of channel tables compliant with the 1xEV-DO specification:

- DOQPSK:
  Channel table with channel types PILOT/MAC/PREAMBLE/DATA with modulation type QPSK in channel type DATA and the following listed active codes in channel types.
- DO8PSK:
  Channel table with channel types PILOT/MAC/PREAMBLE/DATA with modulation type 8-PSK in channel type DATA and the following listed active codes in channel types.
- DO16QAM:
  Channel table with channel types PILOT/MAC/PREAMBLE/DATA with modulation type 16-QAM in channel type DATA and the following listed active codes in channel types.
- DO_IDLE:
  Channel table with channel types PILOT/MAC – known as IDLE slot, since it does not contain any active channels in the DATA channel type.
- PICH (MS mode only)
  Channel table with the pilot channel as it exists in Access mode at least during the first slot 16.
- PICHRRI (MS mode only)
  Channel table with pilot channel and RRI with the name PICHRRI. The channels are active on the same code but at different times. If the RRI and the PICH are active, it is assumed that for the first 256 chips (1/4 of the half slot, 1/8 of the entire slot) only the RRI and then the PICH is active in this half slot. If only the PICH is active (RRI activity 0), the PICH is active for the entire 1024 chips of the half slot.
- 5CHANS (MS mode only)
  Channel table with 5 channels: PICH/RRI/DRC/ACK/DATA

Table 6-3: Base station channel table DOQPSK with QPSK modulation in DATA area

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Modulation/ Mapping
Pilot	1	0.32	BPSK-I
Mac	5	2.64 (RA) 3.64 4.64 34.64 35.64	BPSK-I BPSK-I BPSK-I BPSK-Q BPSK-Q

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Modulation/ Mapping
Preamble (64 chips long)	1	3.32	BPSK-I
Data	16	0.16 1.16 2.16 … 13.16 14.16 15.16	QPSK QPSK QPSK QPSK QPSK QPSK

Table 6-4: Base station channel table DO8PSK with 8-PSK modulation in DATA area

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Modulation/ Mapping
Pilot	1	0.32	BPSK-I
Mac	5	2.64 (RA) 3.64 4.64 34.64 35.64	BPSK-I BPSK-I BPSK-I BPSK-Q BPSK-Q
Preamble (64 chips long)	1	3.32	BPSK-I
Data	16	0.16 1.16 2.16 … 13.16 14.16 15.16	8-PSK 8-PSK 8-PSK 8-PSK 8-PSK 8-PSK

Table 6-5: Base station channel table DO16QAM with 16QAM modulation in DATA area

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Modulation/ Mapping
Pilot	1	0.32	BPSK-I
Mac	5	2.64 (RA) 3.64 4.64 34.64 35.64	BPSK-I BPSK-I BPSK-I BPSK-Q BPSK-Q

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Modulation/ Mapping
Preamble (64 chips long)	1	3.32	BPSK-I
Data	16	0.16 1.16 2.16 ... 13.16 14.16 15.16	16QAM 16QAM 16QAM 16QAM 16QAM 16QAM

Table 6-6: Base station test model DO_IDLE for idle slot configuration

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Modulation/ Mapping
Pilot	1	0.32	BPSK-I
Mac	5	2.64 (RA)	BPSK-I

Table 6-7: Mobile station channel table PICH

Channel type	Code channel (Walsh Code.SF)	Mapping	Activity
PICH	0.16	I	1111 1111 1111 1111

Table 6-8: Mobile station channel table PICHRRI

Channel type	Code channel (Walsh Code.SF)	Mapping	Activity
PICH	0.16	I	1111 1111 1111 1111
RRI	0.16	I	1010 1010 1010 1010

Table 6-9: Mobile station channel table 5CHANS

Channel type	Code channel (Walsh Code.SF)	Mapping	Activity
PICH	0.16	I	1111 1111 1111 1111
RRI	0.16	I	1010 1010 1010 1010
DATA	2.4	Q	1111 1111 1111 1111
ACK	4.8	I	0000 0000 0000 1000
DRC	8.16	Q	0110 0000 0000 0000

6.4.2 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 Add Channel 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 softkey. The R&S FSVR automatically adds the channels of the current signal to the channel table.
   Refer to "New/Copy/Edit" on page 78 for a description of all parameters relating to a channel.
8. Save your table by pressing the Save 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 Edit 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 softkey. The R&S FSVR sorts the channels according to the rules listed in the Sort softkey description.
5. Add a new channel by pressing the Add Channel softkey.
   a) Select a channel type, e.g. a data channel.
   b) In the "Channel Type" field select "CHAN" from the dropdown menu.
   c) Specify 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.

6. You can delete a channel with the Delete Channel softkey. Note that a channel is deleted without further notice.
7. If you want to discard your changes, you can restore the original table with the Reload softkey. All your changes will be lost.
You can also restore the default channel tables delivered with the R&S FSVR with the Restore Default Tables softkey. 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 "Channel Table Settings" on page 77.

6.4.3 Channel Type Characteristics

The following table provides an overview of channel type characteristics for the "1xEV-DO BTS Analysis" option (K84).

Channel Type	Spreading Factor	Symbol Rate	Modulation Type	Chips per Slot	Symbols per Slot and Code	Bits per slot and Code	
						Mapping I or Q	Mapping Complex
PILOT	32	38.4 ksps	BPSK-I	96*2=192	6	6	12
MAC	Subt. 0/1: 64	19.2 ksps	BPSK-I, BPSK-Q, OOK-ACK-I, OOK-ACK-Q, OOK-NAK-I, OOK-NAK-Q	64*4=256	4	4	8
	Subt. 2/3: 128	9.6 ksps			2	2	4
PREAMBLE	Subt. 0/1: 32	38.4 ksps	BPSK-I	Preamble length 64 128 256 512 1024	2 4 8 16 32	2 4 8 16 32	4 8 16 32 64
	Subt. 2: 64	19.2 ksps	BPSK-I	64 128 256 512 1024	1 2 4 8 16	1 2 4 8 16	2 4 8 16 32

Channel Type	Spreading Factor	Symbol Rate	Modulation Type	Chips per Slot	Symbols per Slot and Code	Bits per slot and Code			
						Mapping I or Q		Mapping Complex	
	Subt. 3: 128	9.6 ksps	BPSK-I or BPSK-Q	64	0.5	0.5		1	
				128	1	1		2	
				256	2	2		4	
				512	4	4		8	
				1024	8	8		16	
DATA	Subt. 0/1/2: 16	76.8 ksps	QPSK, 8-PSK, 16QAM	400*4 -PreambleChips =DataNettoChips		Mapping always Complex Modulation Type			
	Subt. 3: 16	76.8 ksps	64QAM			QPSK	8-PSK	16QAM	64QAM
				1600-0 =1600	100	200	300	400	500
				1600-64 =1536	96	192	288	384	480
				1600-128 =1472	92	184	276	368	460
				1600-256 =1344	84	168	252	336	420
				1600-512 =1088	68	136	204	272	340
				1600-1024=576	36	72	104	144	180

6.4.4 Working with the Frequency Mask Trigger

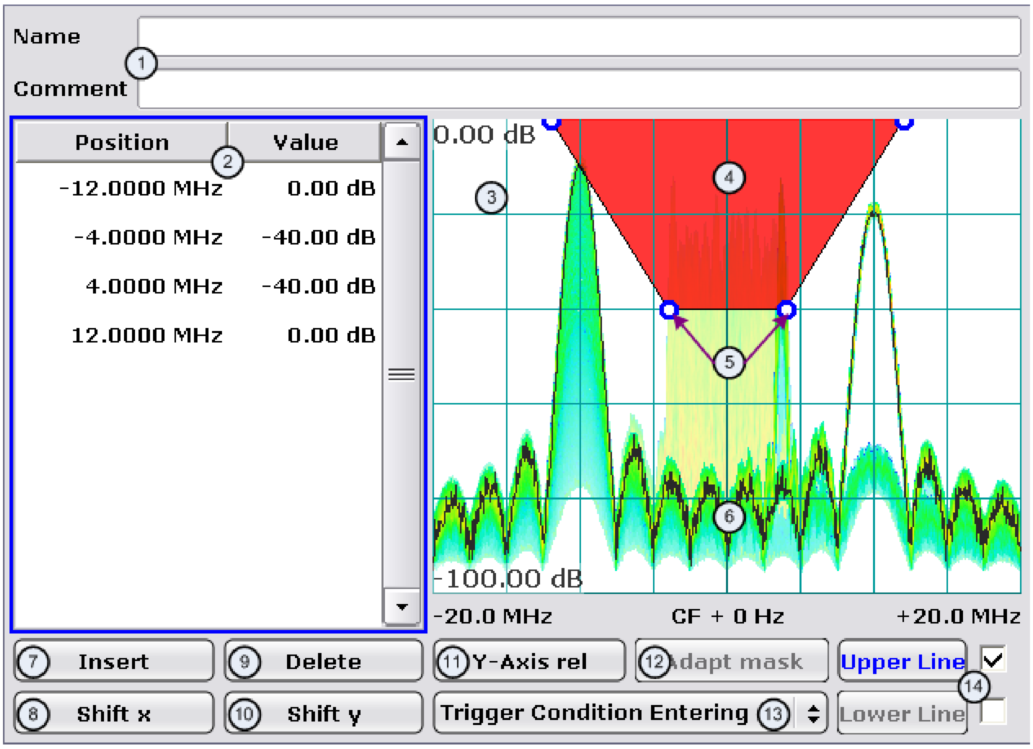
The Frequency Mask Trigger (FMT) is a trigger designed to trigger measurements if the signal violates certain conditions with respect to a frequency mask that you can define prior to the measurement.

Availability of the frequency mask trigger

Note that the frequency mask trigger is available for code domain analysis only.

To create and edit a frequency mask, you can access the corresponding dialog box via the "Frequency Mask" softkey in the trigger menu.

Opening the dialog box also opens a softkey submenu that contains various functionality to work with frequency masks.



1 = Name and description of the frequency mask
2 = Mask point table: table containing all mask points
3 = Preview pane
4 = Frequency mask preview: the area the frequency mask currently covers is red
5 = Frequency mask data points: define the shape of the frequency mask
6 = Preview of the current measurement trace; type and shape depend on currently selected measurement
7 = Insert button: insert a new data points
8 = Shift X button: shifts the complete frequency mask horizontally
9 = Delete button: deletes an existing data points
10 = Shift Y button: shifts the complete frequency mask vertically
11 = Y-Axis Rel/Abs button: switches between relative (dB) and absolute (dBm) amplitude values
12 = Adapt Mask button: creates a frequency mask automatically
13 = Trigger Condition menu: sets the trigger condition
14 = Activate Line buttons: select the upper and lower frequency mask; check marks next to the buttons activate and deactivate a line

6.4.4.1 Creating a Frequency Mask

Upon opening the "Edit Frequency Mask" dialog box, the R&S FSVR already provides a basic structure of an upper frequency mask in the live preview window.

It is also possible to create a new mask by pressing the "New Mask" softkey. The "New Mask" softkey resets the current shape of the mask to its default state.

Labelling a frequency mask

Assign a name to the frequency mask in the "Name" field. Activate the input in the "Name" field either by touching it or via the "Edit Name" softkey. This is also the save name of the frequency mask.

In addition to naming the mask, you can also comment on the frequency mask you are working on in the "Comment" field. Again, activate the input either by touching it or with the "Edit Comment" softkey.

Remote command:
`CALCulate<n>:MASK:COMMent` on page 241
`CALCulate<n>:MASK:NAME` on page 244

Defining the frequency mask span
Define the span of the frequency mask.

The span defines the range that the frequency mask covers on the frequency axis.

Remote command:
`CALCulate<n>:MASK:SPAN` on page 244

Working with upper and lower lines
A frequency mask may have an upper and a lower threshold, with the signal in between. The checkboxes next to the "Upper Line" and "Lower Line" buttons activate or deactivate the corresponding line. Note that it is not possible to deactivate both lines.

You can select the line you want to edit with the "Upper Line" / "Lower Line" buttons or by touching the corresponding area in the preview to apply any changes. The buttons turn blue if a line is selected and the R&S FSVR shows the data points in the area covered by the mask in the preview pane.

Remote command:
`CALCulate<n>:MASK:LOWer[:STATe]` on page 243
`CALCulate<n>:MASK:UPPer[:STATe]` on page 245

Setting the trigger condition
To make the trigger work, you need to set a trigger condition with the "Trigger Condition" button. The R&S FSVR supports four conditions.

"Entering" Activates the trigger as soon as the signal enters the frequency mask.
To arm the trigger, the signal initially has to be outside the frequency mask.

"Leaving" Activates the trigger as soon as the signal leaves the frequency mask.
To arm the trigger, the signal initially has to be inside the frequency mask.

Remote command:
`TRIGger<n>[:SEQuence]:MASK:CONDition` on page 349

6.4.4.2 Editing Mask Points

You can adjust the frequency mask any way you want by adding, removing and repositioning frequency mask data points.

Data points define the shape of the frequency mask. In the preview pane, the R&S FSVR visualizes data points as blue circles. In addition, all data point positions are listed in the data point table. The number of data points is limited to 801.

Data points are defined by two values. The first value defines the position of the data point on the horizontal (frequency) axis. Frequency information is relative to the center frequency.

Note that in realtime mode, the span depends on the realtime bandwidth. That also means that the distance of a data point to the center frequency can never exceed 20 MHz as the maximum realtime bandwidth is 40 MHz.

The second value defines the position of the data point on the vertical (level) axis. By default, level information is relative to the reference level. You can, however, turn the level axis to absolute scaling with the "Y-Axis Abs/Rel" button. This also changes the unit of the vertical axis (dB for relative data points, dBm for absolute data points).

Adding data points

To add a new data point, press the "Insert" button or the "Insert Value Above" softkey. The R&S FSVR always adds the data point to the left (or in case of the table, above) of the currently selected data point. The currently selected data point is highlighted gray in the table. If no data point was selected previously, the buttons add a new point next to the very first one.

Deleting data points

The "Delete" button or the "Delete Value" softkey remove a data point from the mask. The R&S FSVR deletes the currently selected data point. If no data point is selected, it deletes the first one. The "Delete" button is inactive in that case.

Positioning data points

There are two ways to move a single data point.

In the preview pane, you can drag around the data points on the touchscreen or with a mouse and position it roughly in the place you want it to be. A more exact method is to edit the data point table itself end enter the frequencies and levels as you need.

Remote command:

`CALCulate<n>:MASK:LOWer[:DATA]` on page 243

`CALCulate<n>:MASK:UPPer[:DATA]` on page 245

Shifting mask points as a whole

With the "Shift X" and "Shift Y" buttons you are able to move all mask points of a frequency mask as one. The "Shift X" button moves the mask point set horizontally, while the "Shift Y" button moves them vertically. This is an easy method to move mask points if the relative position of mask points to each other is alright already without adjusting each one by itself.

Remote command:

`CALCulate<n>:MASK:LOWer:SHIFt:X` on page 242

`CALCulate<n>:MASK:LOWer:SHIFt:Y` on page 242

`CALCulate<n>:MASK:UPPer:SHIFt:X` on page 244

`CALCulate<n>:MASK:UPPer:SHIFt:Y` on page 245

Automatic alignment of the frequency mask
Instead of defining the position of every data point by hand, the R&S FSVR is able to shape the frequency mask according to the shape of the current signal. On pressing the "Auto Set Mask" button, the R&S FSVR forms the frequency mask around the current spectrum.

Note the the automatic alignment of the frequency mask works only for the upper frequency mask.

Remote command:
`CALCulate<n>:MASK:UPPer[:DATA]` on page 245

6.4.4.3 Managing Frequency Masks

To be able to reuse or edit a frequency mask that you have defined later, you can save and restore particular frequency mask configurations.

The R&S FSVR stores files that contain such configurations on its internal hard disk.

Save Mask
The "Save" softkey opens a dialog box to save the current frequency mask configuration in a file.

If you do not name the file in the dialog box, the R&S FSVR names the file like the name of the frequency mask itself.

Load Mask
The "Load" softkey opens a dialog box to restore a frequency mask.

The dialog box contains all frequency masks already on the hard disk of the R&S FSVR. Select the mask you need and confirm the selection with the "Load" button.

Remote command:
Path selection:
`CALCulate<n>:MASK:CDIRectory` on page 241
Load mask:
`CALCulate<n>:MASK:NAME` on page 244

Delete Mask
The Delete softkey opens a dialog box to delete a previously saved frequency mask.

The "Delete" button deletes the file. Note that you have to confirm the deletion process.

Remote command:
`CALCulate<n>:MASK:DELete` on page 242

6.4.5 Detector Overview

The measurement detector for the individual display modes can be selected directly by the user or set automatically by the R&S FSVR. The detector activated for the specific trace is indicated in the corresponding trace display field by an abbreviation.

The detectors of the R&S FSVR 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 6-10: 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

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 R&S FSVR 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.

6.4.6 Trace Mode Overview

The traces can be activated individually for a measurement or frozen after completion of a measurement. Traces that are not activate are hidden. Each time the trace mode is changed, the selected trace memory is cleared.

The R&S FSVR 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.

Remote command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

Max Hold
The maximum value is determined over several sweeps and displayed. The R&S FSVR 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.

Remote command:
`DISP:TRAC:MODE MAXH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

Min Hold
The minimum value is determined from several measurements and displayed. The R&S FSVR saves 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.

Remote command:
`DISP:TRAC:MODE MINH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 269

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 6.4.5, "Detector Overview", on page 182).

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE AVER, see DISPlay[:WINDow<n>]:TRACe<t>:MODE
on page 269

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

Note: 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 displayed trace no longer matches the current instrument setting is indicated by the icon on the tab label.

If the level range or reference level is changed, the R&S FSVR 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.

Remote command:
DISP:TRAC:MODE VIEW, see DISPlay[:WINDow<n>]:TRACe<t>:MODE
on page 269

Blank
Hides the selected trace.

Remote command:
DISP:TRAC OFF, see DISPlay[:WINDow<n>]:TRACe<t>[:STATe] on page 270

6.4.7 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.
- CISPR (6 dB) filters
- MIL Std (6 dB) filters
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel filters
  For details see chapter 6.4.8, "List of Available RRC and Channel Filters", on page 186 .
  Channel filters do not support FFT mode.
- RRC filters

For details see chapter 6.4.8, "List of Available RRC and Channel Filters", on page 186 .
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.

6.4.8 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table). The indicated filter bandwidth is the 3 dB bandwidth. For RRC filters, the fixed roll-off factor (a) is also indicated.

Table 6-11: Filter types

Filter Bandwidth	Filter Type	Application
100 Hz	CFILter	
200 Hz	CFILter	A0
300 Hz	CFILter	
500 Hz	CFILter	
1 kHz	CFILter	
1.5 kHz	CFILter	
2 kHz	CFILter	
2.4 kHz	CFILter	SSB
2.7 kHz	CFILter	
3 kHz	CFILter	
3.4 kHz	CFILter	
4 kHz	CFILter	DAB, Satellite
4.5 kHz	CFILter	
5 kHz	CFILter	
6 kHz	CFILter	
6 kHz, a=0.2	RRC	APCO
8.5 kHz	CFILter	ETS300 113 (12.5 kHz channels)
9 kHz	CFILter	AM Radio
10 kHz	CFILter	
12.5 kHz	CFILter	CDMAone
14 kHz	CFILter	ETS300 113 (20 kHz channels)

Filter Bandwidth	Filter Type	Application
15 kHz	CFILter	
16 kHz	CFILter	ETS300 113 (25 kHz channels)
18 kHz, a=0.35	RRC	TETRA
20 kHz	CFILter	
21 kHz	CFILter	PDC
24.3 kHz, a=0.35	RRC	IS 136
25 kHz	CFILter	
30 kHz	CFILter	CDPD, CDMAone
50 kHz	CFILter	
100 kHz	CFILter	
150 kHz	CFILter	FM Radio
192 kHz	CFILter	PHS
200 kHz	CFILter	
300 kHz	CFILter	
500 kHz	CFILter	J.83 (8-VSB DVB, USA)
1 MHz	CFILter	CDMAone
1.228 MHz	CFILter	CDMAone
1.28 MHz, a=0.22	RRC	
1.5 MHz	CFILter	DAB
2 MHz	CFILter	
3 MHz	CFILter	
3.75 MHz	CFILter	
3.84 MHz, a=0.22	RRC	W-CDMA 3GPP
4.096 MHz, a=0.22	RRC	W-CDMA NTT DOCoMo
5 MHz	CFILter	
20 MHz	CFILter	
28 MHz	CFILter	
40 MHz	CFILter	

6.4.9 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;FSVR;	
Version;1.45;	
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
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

6.4.10 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 6.4.9, "ASCII File Export Format", on page 188.

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 138
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)>;

6.4.11 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 R&S FSVR can only interpret XML files of a known structure. For example files look in the `C:\r_s\instr\sem_std` directory.

Spectrum Emission Mask   Standard: W-CDMA 3GPP (39,43)dBm DL

Tx Power -47.93 dBm   Tx Bandwidth 3.840 MHz   RBW 30.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-12.750 MHz	-8.000 MHz	1.000 MHz	14.99094 GHz*	-74.76 dBm*	-26.83 dB*	27.67 dB*
-8.000 MHz	-4.000 MHz	1.000 MHz	14.99598 GHz	-36.79 dBm	11.14 dB	-25.29 dB
-4.000 MHz	-3.515 MHz	30.000 kHz	14.99628 GHz	-100.18 dBm	-52.25 dB	-75.68 dB
-3.515 MHz	-2.715 MHz	30.000 kHz	14.99648 GHz	-103.55 dBm	-55.63 dB	-79.05 dB
-2.715 MHz	-2.515 MHz	30.000 kHz	14.99747 GHz	-108.91 dBm	-60.98 dB	-96.41 dB
2.515 MHz	2.715 MHz	30.000 kHz	15.00251 GHz	-48.25 dBm	-0.32 dB	-35.75 dB
2.715 MHz	3.515 MHz	30.000 kHz	15.00272 GHz	-52.48 dBm	-4.56 dB	-39.98 dB
3.515 MHz	4.000 MHz	30.000 kHz	15.00398 GHz	-74.53 dBm	-26.60 dB	-50.03 dB
4.000 MHz	8.000 MHz	1.000 MHz	15.00769 GHz	-74.76 dBm	-26.83 dB	-63.26 dB
8.000 MHz	12.750 MHz	1.000 MHz	15.01273 GHz*	-36.79 dBm*	11.14 dB*	65.64 dB*

Fig. 6-29: Example Spectrum emission mask standard file (PowerClass_39_43.xml)

Be sure to follow the structure exactly as shown below or else the R&S FSVR 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) and edit the copy of the file.

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:

- The "BaseFormat" element
- The "PowerClass" element
- The "Range" element

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 6-12.

In the example above (`PowerClass_39_43.xml` under `C:\r_s\instr\sem_std\WCDMA\3GPP`, see figure 6-29), 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 134) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 6-13.

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 R&S FSVR 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 134) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 6-14.

The following tables show the child nodes and attributes of each element and show if a child node or attribute is mandatory for the R&S FSVR 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 R&S FSVR 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 6-13 -->
    <!-- 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 6-14 -->
    <!-- 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 6-12: 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
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 6-13: 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 6-14: 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
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

Child Node	Attribute	Value	Parameter Description	Mand.
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 135	Yes
	Type	NORM | PULS | CFIL | RRC		No
VBW	Bandwidth	<bandwidth in Hz>	"VBW" on page 135	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 135	Yes
	Time	<time in sec>	"Sweep Time" on page 135	No
Amplitude				No
ReferenceLevel	Value	<power in dBm>	"Ref. Level" on page 135	Yes, if the ReferenceLevel child node is used
	Unit	dBm	Defines dBm as unit	Yes, if the ReferenceLevel node is used
RFAttenuation	Mode	Manual | Auto	"RF Att. Mode" on page 135	Yes, if the ReferenceLevel child node is used
Preamplifier		ON | OFF	"Preamp" on page 136	Yes

6.4.12 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 6-15. You can also create and use your own XML files (for details see chapter 6.4.11, "Format Description of Spectrum Emission Mask XML Files", on page 189). 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 143).

Table 6-15: 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
	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

Path	XML file name	Displayed standard characteristics*
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
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

Path	XML file name	Displayed standard characteristics*
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

6.4.13 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
- 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 134.

For details on defining the limits (masks) see the base unit description "Working with Lines in SEM".

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).
- 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.
- Frequency values for each range have to be defined relative to the center frequency.

In order to change the start frequency of the first range or the stop frequency of the 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.

Symmetrical ranges

You can easily define a sweep list with symmetrical range settings, i.e. the ranges to the left and right of the center range are defined symmectrically. In the "Sweep List" menu, select the "Symmetrical Setup" softkey to activate symmetrical setup mode. The current sweep list configuration is changed to define a symmetrical setup regarding the reference range. The number of ranges to the left of the reference range is reflected to the right, i.e. any missing ranges on the right are inserted, while superfluous ranges are removed. The values in the ranges to the right of the reference range are adapted symmetrically to those in the left ranges.

For details see "Symmetric Setup" on page 138.

Symmetrical ranges fulfull the conditions required for "Fast SEM" mode (see chapter 6.4.14, "Fast Spectrum Emission Mask Measurements", on page 198).

6.4.14 Fast Spectrum Emission Mask Measurements

In order to improve the performance of the R&S FSVR 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 135
  - "RBW", see "RBW" on page 135
  - "VBW", see "VBW" on page 135
  - "Sweep Time Mode", see "Sweep Time Mode" on page 135
  - "Ref Level", see "Ref. Level" on page 135

– "Rf Att. Mode", see "RF Att. Mode" on page 135
– "RF Attenuator", see "RF Att. Mode" on page 135
– "Preamp", see "Preamp" on page 136

Activating Fast SEM mode

"Fast SEM" mode is activated in the sweep list (see "Fast SEM" on page 134) 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 290

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.

If "Symmetrical Setup" mode is active when "Fast SEM" mode is activated, not all sweep list settings can be configured symmetrically automatically (see also "Symmetric Setup" on page 138).

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

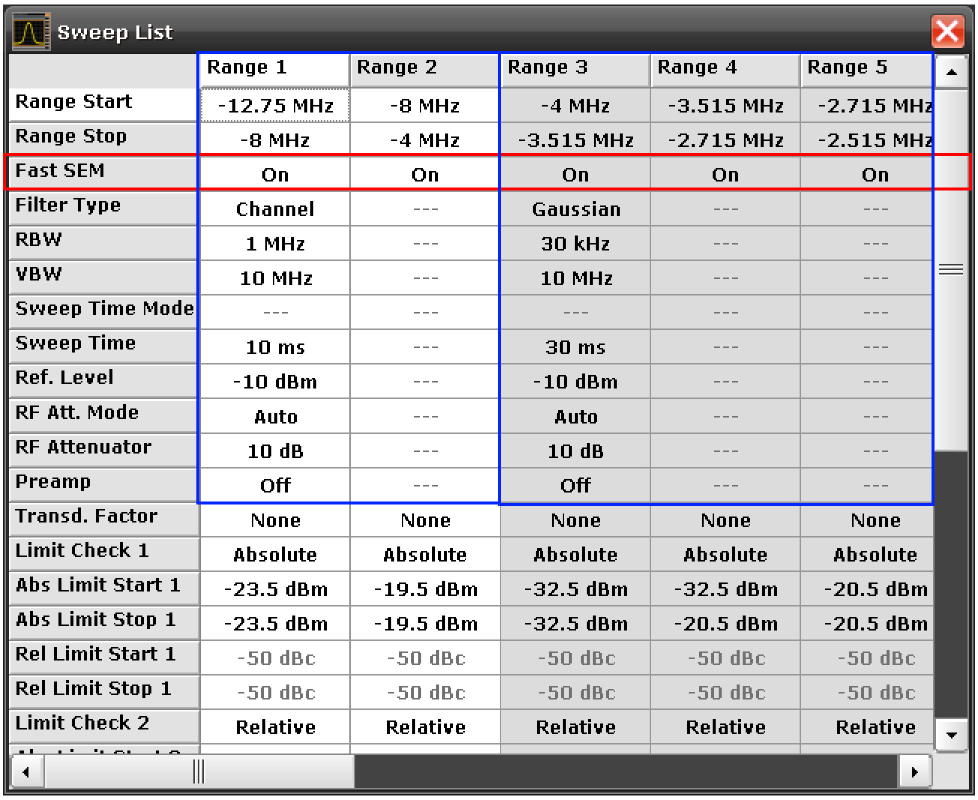


Fig. 6-30: Sweep list using Fast SEM mode

In figure 6-30, a sweep list is shown for which Fast SEM is activated. The formerly 5 separately defined ranges are combined to 2 sweep ranges internally.

6.4.15 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.

Predefined standards are selected using the "CP/ACLR Standard" softkey or the `CALC:MARK:FUNC:POW:PRES` command.

Standard	GUI-Parameter	SCPI-Parameter
EUTRA/LTE Square	EUTRA/LTE Square	EUTRa
EUTRA/LTE Square/RRC	EUTRA/LTE Square/RRC	REUTRa
W-CDMA 3.84 MHz forward	W-CDMA 3GPP FWD	FW3G
W-CDMA 3.84 MHz reverse	W-CDMA 3GPP REV	RW3G

Standard	GUI-Parameter	SCPI-Parameter
CDMA IS95A forward	CDMA IS95A FWD	F8CD | FIS95a
CDMA IS95A reverse	CDMA IS95A REV	R8CD | RIS95a
CDMA IS95C Class 0 forward***)**	CDMA IS95C Class 0 FWD	FIS95c0
CDMA IS95C Class 0 reverse***)**	CDMA IS95C Class 0 REV	RIS95c0
CDMA J-STD008 forward	CDMA J-STD008 FWD	F19C | FJ008
CDMA J-STD008 reverse	CDMA J-STD008 REV	R19C | RJ008
CDMA IS95C Class 1 forward***)**	CDMA IS95C Class 1 FWD	FIS95c1
CDMA IS95C Class 1 reverse***)**	CDMA IS95C Class 1 REV	RIS95c1
CDMA 2000	CDMA 2000	S2CD
TD-SCDMA forward	TD SCDMA FWD	FTCD | TCDMa
TD-SCDMA reverse	TD SCDMA REV	RTCD
WLAN 802.11A	WLAN 802.11A	AWLan
WLAN 802.11B	WLAN 802.11B	BWLan
WiMAX	WiMAX	WiMAX
WIBRO	WIBRO	WIBRO
GSM	GSM	GSM
RFID 14443	RFID 14443	RFID14443
TETRA	TETRA	TETRA
PDC	PDC	PDC
PHS	PHS	PHS
CDPD	CDPD	CDPD
APCO-25 Phase 2	APCO-25 P2	PAPCo25

For the R&S FSVR, 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 R&S FSVR if the standards marked with an asterisk ***)** are selected.

6.4.16 Optimized Settings for CP/ACLR Test Parameters

The "Adjust Settings" softkey (see "Adjust Settings" on page 131) 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 124).

7 Remote Commands of the 1xEV-DO Analysis

This chapter describes the remote commands specific to the "1xEV-DO Analysis" options (R&S FSV-K84/-K85). The abbreviation EVDO stands for the operating mode of this option. For details on conventions used in this chapter refer to chapter 7.1, "Notation", on page 206.

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 7.2, "CALCulate Subsystem", on page 208)
- DISPlay subsystem
- FORMat subsystem
- INITiate subsystem
- INPut subsystem
- MMEM subsystem
- OUTput subsystem
- SENSe subsystem (except for the specific commands described in chapter 7.6, "SENSe Subsystem", on page 276)
- TRIGger subsystem

7.1 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	spectrum analysis
A-F	spectrum analysis – span > 0 only (frequency mode)
A-T	spectrum 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)
RT	Realtime mode
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 spectrum analysis 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. 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.

For details see the chapter "SCPI Command Structure" in the base unit description.

<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.

7.2 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.

7.2.1 CALCulate:FEED Subsystem

The CALCulate:FEED subsystem selects the type of evaluation for the measurement data. This corresponds to the result display selection in manual operation.

CALCulate<n>:FEED <ResultDisplay>

This command selects the result display for the measured data.

For details on result displays see chapter 6.1, "Measurements and Result Displays", on page 32.

Suffix:

<n>	1...4 window

Parameters:

<ResultDisplay> XPOW:CDP | XPOW:CDP:ABS | XPOW:CDP:RAT | XPOW:CDEP | XTIM:CDP:ERR:CTABle | XTIM:CDP:PVChip | XTIM:CDP:ERR:SUMM | XTIM:CDP:MACCuracy | XTIM:CDP:ERR:PCDomain | XTIM:CDP:SYMB:CONSt | XTIM:CDP:SYMB:EVM | XTIM:CDP:BSTReam | XTIM:CDP:COMP:CONSt | XTIM:CDP:PVSYmbol | 'XTIMe:CDPower:CHIP:MAGNitude' | 'XTIMe:CDPower:CHIP:PHASe' | 'XTIMe:CDPower:SYMBol:EVM:PHASe' | 'XTIMe:CDPower:SYMBol:EVM:MAGNitude'

XPOW:CDP | XPOW:CDP:ABS
Code Domain Power (CDP) result display (absolute)

XPOW:CDP:RAT
Code Domain Power (CDP) result display (relative)

XPOW:CDEP
Code Domain Error Power (CDEP) result display

XTIM:CDP:BSTReam
Channel Bitstream result display

XTIM:CDP:CBSTReam
Channel Bitstream result display for composite data (MS only)

XTIM:CDP:COMP:CONSt
Composite Constellation result display

XTIM:CDP:COMP:EVM
Composite EVM (RMS) result display

XTIM:CDP:ERR:CTABle
Channel Table result display

XTIM:CDP:ERR:PCDomain
Peak Code Domain Error result display

XTIM:CDP:ERR:SUMM
Result Summary result display

XTIM:CDP:MACCuracy
Composite EVM result display

XTIM:CDP:PVChip
Power vs Chip result display

XTIM:CDP:PVSLot
Power vs Slot result display

XTIM:CDP:PVSYmbol
Power versus Symbol result display

XTIM:CDP:SYMB:CCONst
Channel Constellation result display for composite data (MS mode only)

XTIM:CDP:SYMB:CEVM
Symbol Error Vector Magnitude result display for composite data (MS mode only)

XTIM:CDP:SYMB:CONSt

Channel Constellation result display

XTIM:CDP:SYMB:EVM
Symbol Error Vector Magnitude result display

'XTIMe:CDPower:SYMBol:EVM:MAGNitude'
Result display of the symbol magnitude error

'XTIMe:CDPower:SYMBol:EVM:PHASe'
Result display of the symbol phase error

'XTIMe:CDP:CHIP:MAGNitude'
Result display magnitude error versus chip

'XTIMe:CDPower:CHIP:PHASe'
Result display phase error versus chip

*RST: 'XPOW:CDP:RAT'

Example: `CALC:FEED 'XTIM:CDP:MACC'`
Selects the Composite EVM result display.

Mode: EVDO

Manual operation: See "Code Power" on page 85
See "Code Power" on page 104

7.2.2 CALCulate:MARKer:FUNCtion Subsystem

The CALCulate:MARKer:FUNCtion subsystem checks the marker functions in the instrument.

CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult? <ResultType>

This command queries the measured and calculated values of the Code Domain Power analysis. The channel type can be set by means of the `[SENSe:]CDPower:CTYPe` command, the slot number by means of the `[SENSe:]CDPower:SLOT` command and the code number by means of the `[SENSe:]CDPower:CODE` command.

Suffix:

<n> 1...4
window

<m> irrelevant

Query parameters:

<ResultType> ACTive | CDEPeak | CDERms | CDPabsolute | CDPRelative | CERRor | CHANnel | CODMulation | CODPower | DACtive | DMTYPe | DRPich | EVMPeak | EVMRms | FERRor | FERPpm | IQIMbalance | IQOFfset | MACCuracy | MACTive | MTYPe | PCDerror | PDATa | PLENGth | PMAC | POFFset | PPICh | PPILot | PPReamble | PRRI | PTOTal | RHO | RHOData | RHOMac | RHOVerall | RHOPilot | RHO1 | RHO2 | SFACtor | SLOT | SRATe | TFRame | TOFFset

ACTive
Number of active channels

CDEPeak
Peak value of EVM (error vector magnitude) of composite data channel (MS mode only)

CDERms
RMS value of EVM (error vector magnitude) of composite data channel (MS mode only)

CDPabsolute
channel power absolute in dBm

CDPRelative
channel power relative in dB

CERRor
chip rate error in ppm

CHANnel
channel number

CODMulation
modulation type of the composite data channel (MS mode only)

CODPower
power of the composite data channel (MS mode only)

DACtive
number of active DATA channels

DMTYPe
modulation type of the DATA channel type
(2=QPSK, 3=8-PSK, 4=16QAM)

DRPich
Delta RRI/PICH in dB

EVMPeak
error vector magnitude peak in %

EVMRms
error vector magnitude rms in %

FERRor
frequency error in Hz

FERPpm
frequency error in ppm

IQIMbalance

I/Q imbalance in %

IQOFfset
I/Q offset in %

MACCuracy
composite EVM in %

MACTive
number of active MAC channels

MTYPe
modulation type of the channel type
(0=BPSK-I, 1=BPSK-Q, 2=QPSK, 3=8-PSK, 4=16QAM, 5=2BPSK)

PCDerror
peak code domain error in dB

PDATa
absolute power in the DATA channel type

PLENGth
Length of preamble in chips

PMAC
absolute power in the MAC channel type

POFFset
phase offset in rad

PPICh
Pilot power in dBm (MS mode only)

PPILot
absolute power in the PILOT channel type

PPReamble
absolute power in the PREAMBLE channel type

PRRI
RRI power in dBm

PTOTal
total power

RHO
RHO value for the selected channel type/slot

RHOData
RHO over all slots for the DATA area

RHOMac
RHO over all slots for the MAC area

RHOPilot
RHO over all slots for the pilot area

RHOVerall
RHO overall

RHO1
RHOoverall-1 over all slots over all chips with start of averaging at the half-slot limit

RHO2

RHOoverall-2 over all slots over all chips with start of averaging at the quarter-slot limit

SFACtor
spreading factor of the channel

SLOT
half-slot number (MS mode only)

SRATe
symbol rate in ksps

TFRame
trigger to frame in sec

TOFFset
timing offset in s

The Trigger to Frame value (TFRame) supplies a '9' if the trigger is at Free Run.
The Timing/Phase Offset values (TOFFset/POFFset) supply a '9' if timing and phase measurement is disabled (refer to `[SENSe:]CDPower:TPMeas` on page 286) or the number of active channels is higher than 50.

Example: `CALC:MARK:FUNC:CDP:RES? CDP`
Reads out total power.

Usage: Query only

Mode: EVDO

CALCulate<n>:MARKer<m>:FUNCtion:CENTer

This command matches the center frequency to the frequency of a marker.

If you use the command in combination with a delta marker, that delta marker is turned into a normal marker.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:FUNC:CENT`
Sets the center frequency to the frequency of marker 2.

CALCulate<n>:MARKer<m>:FUNCtion:PICH

This command sets marker 1 to the pilot channel 0.16.

Suffix:

<n> 1...4
window

<m> irrelevant

Example: `INST:SEL MDO"`
'Activate 1xEV–DO MS; implicitly 'CDP relative' is displayed on Screen A and 'Result Summary' is active on Screen B
`"INIT:CONT OFF"`
'Select single sweep
`"INIT;*WAI"`
'Start measurement with synchronization
`"CALC:MARK:FUNC:PICH"`
'Activate marker and set to pilot
`"CALC:MARK:Y?"`
'Query value of the CDP relative to the PICH

Usage: Event

Mode: EVDO

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> Selects the measurement window.

<m> Selects the marker.

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.

Manual operation: See "Clear/Write" on page 131
See "Max Hold" on page 131

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> Selects the measurement window.

<m> Selects the marker.

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.

Manual operation: See "Power" on page 123
See "Ch Power ACLR" on page 124
See "Occupied Bandwidth" on page 143

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ <State>

This command switches the query response of the power measurement results 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> Selects the measurement window.

<m> Selects the marker.

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 215.

Manual operation: See "Chan Pwr/Hz" on page 130

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> Selects the measurement window.

<m> Selects the marker.

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.

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: WCDMA

7.2.3 CALCulate:LIMit:PVTime Subsystem

The CALCulate:LIMit:PVTime subsystem defines the limit check for power vs time measurement.

CALCulate<n>:LIMit<k>:PVTime:REFerence <Mode>

This command sets the reference value. The standard asks for the sequence to first measure the FULL slot with the limit line relative to the mean power of the averaged time response. Therefore the parameter AUTO in a FULL slot measurement should be selected. In this mode the mean power is calculated and the limit lines are relative to that mean power value. This value should be used also as the reference for the IDLE slot measurement. With the parameter ONCE the current mean power value of the averaged time response is used to set as the fixedreference value for the limit lines. The mode is switched from AUTO to MANUAL. Now the IDLE slot can be selected and the measurement sequence can be finished.

Suffix:

<n> irrelevant

<k> irrelevant

Parameters:

<Mode> AUTO | ONCE | MANual

*RST: AUTO

Example:

`CALC:LIM:PVT:REF AUTO`
Automatic reference value for limit lines. The value should be set to mean power
`CALC:LIM:PVT:REF MAN`
Manual reference value for limit lines
`CALC:LIM:PVT:RVA -33.5`
Set manual reference value to -33.5
`CALC:LIM:PVT:REF ONCE`
Set reference value to mean power
`CALC:LIM:PVT:RVA?`
Query reference value for limit lines. The value should be set to mean power value

Mode: EVDO

Manual operation: See "Reference Mean Pwr" on page 150
See "Reference Manual" on page 150
See "Set Mean to Manual" on page 150

CALCulate<n>:LIMit<k>:PVTime:RESTore

This command restores the standard limit lines for the power versus time measurement. All changes made to the standard limit lines are lost and the state of these limit lines as they left the factory is restored.

Suffix:

<n> irrelevant

<k> irrelevant

Example: `CALC:LIM:PVT:REST`
Reset the PVT limit lines to their default setting

Mode: EVDO

Manual operation: See "Restore STD Lines" on page 151

CALCulate<n>:LIMit<k>:PVTime:RVALue <RefLevel>

This command sets the reference level in dBm for calculating the limit lines. Precondition is that the automatic mode of power calculation is switched off via the commands `CALCulate<n>:LIMit<k>:PVTime:REFerence` on page 219 ONCE or `CALCulate<n>:LIMit<k>:PVTime:REFerence` on page 219 MAN.

Suffix:
<n> irrelevant

<k> irrelevant

Parameters:
<RefLevel> Range: -200 to 200
*RST: -20dBm
Default unit: dBm

Example: `CALC:LIM:PVT:REF MAN`
Manual reference value for limit lines
`CALC:LIM:PVTime:RVA -33.5`
Set manual reference value to -33.5

Mode: EVDO

7.2.4 Other CALCulate Commands Referenced in this Manual

7.2.4.1 CALCulate:DELTamarker subsystem

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X <Reference>

This command defines the horizontal position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the frequency reference for delta marker 2.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<Reference>	Numeric value that defines the horizontal position of the reference. For frequency domain measurements, it is a frequency in Hz. For time domain measurements, it is a point in time in s. *RST: Fixed reference: OFF

Example:

```
CALC:DELT:FUNC:FIX:RPO:X 128 MHz
```

Sets the frequency reference to 128 MHz.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y <RefPointLevel>

This command defines the vertical position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the level reference for delta marker 2.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<RefPointLevel> Numeric value that defines the vertical position of the reference. The unit and value range is variable.

*RST: Fixed reference: OFF

Example: `CALC:DELT:FUNC:FIX:RPO:Y -10dBm`
Sets the reference point level for delta markers to -10 dBm.

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 as long as the function is active.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

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.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO <State>

This command turns an automatic peak search for the fixed reference marker at the end of a sweep on and off.

Suffix:

<n> Selects the measurement window.

<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.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>

This command turns the phase noise measurement at the delta marker position on and off.

The correction values for the bandwidth and the log amplifier are taken into account in the measurement.

The reference marker for phase noise measurements is either a normal marker or a fixed reference. If necessary, the command turns on the reference marker

A fixed reference point can be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` commands independent of the position of marker 1 and of a trace.

Suffix:

<n> Selects the measurement window.

<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

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> Selects the measurement window.

<m> 1
irrelevant

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:DELT:LINK ON`

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command positions the delta marker to the next smaller trace maximum on the left of the current value (i.e. descending X values). 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>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT:MAX:LEFT`
Sets delta marker 1 to the next smaller maximum value to the left of the current value.

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command positions the delta marker to the next smaller trace maximum. 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>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT2:MAX:NEXT`
Sets delta marker 2 to the next smaller maximum value.

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command positions the delta marker to the current trace maximum. If necessary, the corresponding delta marker is activated first.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT3:MAX`
Sets delta marker 3 to the maximum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command positions the delta marker to the next smaller trace maximum on the right of the current value (i.e. ascending X values). 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>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT:MAX:RIGH`
Sets delta marker 1 to the next smaller maximum value to the right of the current value.

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command positions the delta marker to the next higher trace minimum on the left of the current value (i.e. descending X values). 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>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT:MIN:LEFT`
Sets delta marker 1 to the next higher minimum to the left of the current value.

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command positions the delta marker to the next higher trace minimum. 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>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT2:MIN:NEXT`
Sets delta marker 2 to the next higher minimum value.

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command positions the delta marker to the current trace minimum. The corresponding delta marker is activated first, if necessary.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT3:MIN`
Sets delta marker 3 to the minimum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command positions the delta marker to the next higher trace minimum on the right of the current value (i.e. ascending X values). 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> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT:MIN:RIGH`
Sets delta marker 1 to the next higher minimum value to the right of the current value.

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command turns delta markers on and off.

If the corresponding marker was a normal marker, it is turned into a delta marker.

No suffix at DELTamarker turns on delta marker 1.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:DELT1 ON`
Switches marker 1 to delta marker mode.

CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>

This command selects the trace a delta marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

In the persistence spectrum result display, the command also defines if the delta marker is positioned on the persistence trace or the maxhold trace.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<TraceNumber> **1 ... 6**
Trace number the marker is positioned on.
MAXHold
Defines the maxhold trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.
WRITe
Defines the persistence trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.

Example: `CALC:DELT3:TRAC 2`
Assigns delta marker 3 to trace 2.

CALCulate<n>:DELTamarker<m>:X <Position>

This command positions a delta marker on a particular coordinate on the x-axis.

The position is an absolute value.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<Position> 0 to maximum frequency or sweep time

Example: `CALC:DELT:X?`
Outputs the absolute frequency/time of delta marker 1.

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`). The command activates the corresponding delta marker, if necessary.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT3:X:REL?`
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Usage: Query only

CALCulate<n>:DELTamarker<m>:Y

This command queries the measured value of a delta marker. 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 get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Depending on the unit defined with `CALC:UNIT:POW` or on the activated measuring functions, the query result is output in the units below:

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

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.

7.2.4.2 CALCulate:LIMit subsystem

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> Selects the measurement window.

<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.

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> Selects the measurement window.

<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.

Manual operation: See "Absolute Limit" on page 130

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>	Selects the measurement window.
<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.

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>	Selects the measurement window.
<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.

Manual operation: See "Limit Checking" on page 129

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> Selects the measurement window.

<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.

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>	Selects the measurement window.
<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.

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>	Selects the measurement window.
<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.

Manual operation: See "Limit Checking" on page 129

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>	Selects the measurement window.
<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.

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> Selects the measurement window.

<k> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example:

`CALC:LIM:ACP ON`
Switches on the ACLR limit check.

Manual operation:

See "Limit Checking" on page 129
See "Relative Limit" on page 130
See "Absolute Limit" on page 130

CALCulate<n>:LIMit<k>:FAIL?

This command queries the result of a limit check.

Note that for SEM measurements, the limit line suffix <k> is irrelevant, as only one specific SEM limit line is checked for the currently relevant power class.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:

<n>	irrelevant
<k>	limit line

Return values:

<Result>
0
PASS
1
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.

Usage: Query only

Manual operation: See "Spectrum Emission Mask" on page 134
See "Limit Check 1-4" on page 136

7.2.4.3 CALCulate:LIMit:ESPectrum subsystem

The `CALCulate:LIMit:ESPectrum` subsystem defines the limit check for the Spectrum Emission Mask.

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`

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 chapter 7.2.4.3, "CALCulate:LIMit:ESPectrum subsystem", on page 235 command.

*RST: AUTO

Example:

`CALC:LIM:ESP:MODE AUTO`

Activates automatic selection of the limit line.

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.

Manual operation: See "Used Power Classes" on page 141
See "Add/Remove" on page 142

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.

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`

Manual operation: See "Used Power Classes" on page 141

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.

Manual operation: See "PMin/PMax" on page 142

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.

Manual operation: See "PMin/PMax" on page 142

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.

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.

7.2.4.4 CALCulate:MASK Subsystem

The commands of the CALCulate:MASK subsystem configure the frequency mask trigger.

Programming example

```
TRIG:SOUR MASK
//Selects the frequency mask as a trigger source.
MMEM:MDIR 'C:\R_S\instr\freqmask\MyMasks'
CALC:MASK:CDIR 'MyMasks'
//Creates a directory on C:\ called 'FreqMasks' and selects it as the frequency
//mask directory.
//Defining the shape of a lower frequency mask
CALC:MASK:NAME 'MyMask'
//Creates or loads a frequency mask called 'MyMask'.
CALC:MASK:COMM 'Customized Frequency Mask'
//Adds a comment to the frequency mask.
TRIG:MASK:COND ENT
//Triggers the measurement when the signal enters the frequency mask.
CALC:MASK:MODE ABS
//Selects absolute power level values.
CALC:MASK:LOW -10MHZ,-10,-4MHZ,-10,-4MHZ,-20,4MHZ,-20,4MHZ,-10,10MHZ,-10
//Defines a lower frequency mask with 6 data points.
//The first data point position is at -10 MHz from the center frequency
//and at -10 dBm, the second at -4 MHz from the center frequency etc.
CALC:MASK:LOW:SHIF:X 1MHZ
CALC:MASK:LOW:SHIF:Y 10
//Shifts the lower frequency mask by 1 MHz to the right and 10 dB up.
CALC:MASK:LOW:STAT ON
//Turns the lower frequency mask on.

//Defining the shape of an upper frequency mask
CALC:MASK:NAME 'AnotherMask'
//Creates or loads a frequency mask called 'AnotherMask'
CALC:MASK:MODE ABS
//Selects absolute power level values.
CALC:MASK:UPP -10MHZ,-10,-4MHZ,-10,-4MHZ,-20,4MHZ,-20,4MHZ,-10,10MHZ,-10
//Defines an upper frequency mask with 6 data points.
CALC:MASK:UPP:SHIF:X -1MHZ
CALC:MASK:UPP:SHIF 10
//Shift the upper frequency mask 1 MHz to the left and 10 dB up.
CALC:MASK:UPP:STAT ON
//Turns the upper frequency mask on.
//Alternatively, you can create an upper frequency mask automatically.
CALC:MASK:UPP:AUTO
```

```
//Automatically defines the shape of an upper frequency mask.

CALC:MASK:DEL
//Deletes the frequency mask called 'MyMask' in C:\FreqMasks.
```

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 244.

Compared to manual configuration of frequency masks, any changes made to a frequency mask via remote control are saved after the corresponding command has been sent.

CALCulate<n>:MASK:CDIRectory <Subdirectory>

This command selects the directory the R&S FSVR stores frequency masks in.

Parameters:

<Subdirectory> String containing the path to the directory. The directory has to be a subdirectory of the default directory. Thus the path is always relative to the default directory (C:\R_S\INSTR\FREQ-MASK).
An empty string selects the default directory.

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Load Mask" on page 182

CALCulate<n>:MASK:COMMent <Comment>

This command defines a comment for the frequency mask that you have selected with `CALCulate<n>:MASK:NAME` on page 244.

Parameters:

<Comment> String containing the comment for the frequency mask.

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Labelling a frequency mask" on page 179

CALCulate<n>:MASK:DELete

This command deletes the currently selected frequency mask.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 244.

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Usage: Event

Manual operation: See "Delete Mask" on page 182

CALCulate<n>:MASK:LOWer:SHIFt:X <Frequency>

This command shifts the lower frequency mask horizontally by a specified distance. Positive values move the mask to the right, negative values shift the mask to the left.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 244.

Parameters:

<Frequency> Defines the distance of the shift.

Default unit: Hz

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Shifting mask points as a whole" on page 181

CALCulate<n>:MASK:LOWer:SHIFt:Y <Level>

This command shifts the lower frequency mask vertically by a specified distance. Positive values move the mask upwards, negative values shift the mask downwards.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 244.

Parameters:

<Level> Defines the distance of the shift. The shift is relative to the current position.

Default unit: dB

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Shifting mask points as a whole" on page 181

CALCulate<n>:MASK:LOWer[:STATe] <State>

This command turns the lower frequency mask on and off.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 244.

Parameters:

<State> **ON | OFF**

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Working with upper and lower lines" on page 180

CALCulate<n>:MASK:LOWer[:DATA] <Frequency>,<Level>,...

This command defines the shape of the lower frequency mask.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 244.

The unit of the power levels depends on `CALCulate<n>:MASK:MODE` on page 243.

If you are using the command with the vector network analysis option (R&S FSV-K70), you can only use this command as a query.

Parameters:

<Frequency>, <Level> [N] pairs of numerical values. [N] is the number of data points the mask consists of.
Each data point is defined by the frequency (in Hz) and the level (in dB or dBm). All values are separated by commas.
Note that the data points have to be inside the current span.

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Positioning data points" on page 181

CALCulate<n>:MASK:MODE <Mode>

This command defines the scaling of the level axis for frequency masks.

Parameters:

<Mode> **ABSolute**
absolute scaling of the level axis.

RELative
relative scaling of the level axis.

*RST: RELative

CALCulate<n>:MASK:NAME <Name>

This command creates or selects a frequency mask with the name that you specify by the parameter. When you use it as a query, the command returns the name of the mask currently in use.

Parameters:

<Name> String containing the name of the mask.
Note that an empty string does not select a frequency mask.

Manual operation: See "Labelling a frequency mask" on page 179
See "Load Mask" on page 182

CALCulate<n>:MASK:SPAN <Span>

This command defines the frequency span of the frequency mask.

Parameters:

<Span> Range: 100 Hz to 40 MHz
*RST: 40 MHz

Example: `CALC:MASK:SPAN 10 MHz`
Defines a span of 10 MHz.

Manual operation: See "Defining the frequency mask span" on page 180

CALCulate<n>:MASK:UPPer:AUTO

This command automatically defines the shape of an upper frequency mask according to the spectrum that is currently measured.

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Usage: Event

CALCulate<n>:MASK:UPPer:SHIFt:X <Frequency>

This command shifts the lower frequency mask horizontally by a specified distance. Positive values move the mask to the right, negative values shift the mask to the left.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 244.

Parameters:

<Frequency> Defines the distance of the shift.

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Shifting mask points as a whole" on page 181

CALCulate<n>:MASK:UPPer:SHIFt:Y <Level>

This command shifts the upper frequency mask vertically by a specified distance. Positive values move the mask upwards, negative values shift the mask downwards.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 244.

Parameters:

<Level> Defines the distance of the shift. The shift is relative to the current position.

Default unit: dB

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Shifting mask points as a whole" on page 181

CALCulate<n>:MASK:UPPer[:STATe] <State>

This command turns the upper frequency mask on and off.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 244.

Parameters:

<State> **ON | OFF**

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Working with upper and lower lines" on page 180

CALCulate<n>:MASK:UPPer[:DATA] <Frequency>,<Level>,...

This command activates and defines the shape of the upper frequency mask trigger mask.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 244.

The unit of the power levels depends on `CALCulate<n>:MASK:MODE` on page 243.

If you are using the command with the vector network analysis option (R&S FSV-K70), you can only use this command as a query.

Parameters:

<Frequency>, <Level> [N] pairs of numerical values. [N] is the number of data points the mask consists of.
Each data point is defined by the frequency (in Hz) and the amplitude (in dB or dBm). All values are separated by commas.
Note that the data points have to be inside the current span.

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Positioning data points" on page 181
See "Automatic alignment of the frequency mask" on page 182

7.2.4.5 CALCulate:PSE subsystem

CALCulate<n>:PEAKsearch|PSEarch[:IMMediate]

This command switches the spurious limit check off.

If you want to read out the values peak values including the delta to a limit, you have to switch on the limit again.

This command is only for FSP compatibility, and not necessary to use on the R&S FSVR.

Suffix:
<n> irrelevant

Example: `CALC:PSE`
Starts to determine the list.

CALCulate<n>:PEAKsearch|PSEarch:AUTO <State>

This command activates or deactivates the list evaluation.

Suffix:
<n> Selects the measurement window.

Parameters:
<State> ON | OFF
*RST: ON

Example: `CALC:ESP:PSE:AUTO OFF`
Deactivates the list evaluation.

Manual operation: See "List Evaluation (On/Off)" on page 139

CALCulate<n>:PEAKsearch|PSEarch:MARGin <Margin>

This command sets the margin used for the limit check/peak search.

Suffix:
<n> Selects the measurement window.

Parameters:
<Margin> -200 to 200 dB
*RST: 200 dB

Example: `CALC:ESP:PSE:MARG 100`
Sets the margin to 100 dB.

Manual operation: See "Margin" on page 139

CALCulate<n>:PEAKsearch|PSEarch:PSHow

This command marks all peaks with blue squares in the diagram.

Suffix:
<n> Selects the measurement window.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:ESP:PSE:PSH ON`
Marks all peaks with blue squares.

CALCulate<n>:PEAKsearch|PSEarch: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.

7.2.4.6 CALCulate:STATistics subsystem

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.

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.

Manual operation: See "# of Samples" on page 145

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

Manual operation: See "Default Settings" on page 148

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

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.

Manual operation: See "Adjust Settings" on page 148

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`

Manual operation: See "x-Axis Range" on page 145

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`

Manual operation: See "x-Axis Ref Level" on page 145

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`

Manual operation: See "y-Axis Min Value" on page 147

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.

Manual operation: See "y-Unit % / Abs" on page 148

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:SCAL:Y:UPP 0.01`

Manual operation: See "y-Axis Max Value" on page 147

7.2.4.7 Other Referenced CALCulate Commands

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command selects the trace a marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

If necessary, the corresponding marker is switched on prior to the assignment.

In the persistence spectrum result display, the command also defines if the marker is positioned on the persistence trace or the maxhold trace.

Suffix:
<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Parameters:

<Trace> **1 ... 6**
Trace number the marker is positioned on.

MAXHold
Defines the maxhold trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.

WRITe
Defines the persistence trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.

Example: `CALC:MARK3:TRAC 2`
Assigns marker 3 to trace 2.

CALCulate<n>:ESPectrum:PSEarch|:PEAKsearch:PSHow <State>

This command marks all peaks with blue squares in the diagram.

Suffix:

<n> Selects the measurement window.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:ESP:PSE:PSH ON`
Marks all peaks with blue squares.

Manual operation: See "Show Peaks" on page 139

CALCulate<n>:THReshold <Threshold>

This command defines a threshold value for the marker peak search.

A threshold line is automatically turned on.

Suffix:

<n> irrelevant

Parameters:

<Threshold> The unit depends on `CALCulate<n>:UNIT:POWer`.
*RST: (STATe to OFF)

Example: `CALC:THR -82DBM`
Sets the threshold value to -82 dBm.

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit of the y-axis.

The unit applies to all measurement 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.

7.3 CONFigure Subsystem

The CONFigure subsystem contains commands for configuring the measurements.

7.3.1 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]:BCLass|BANDclass <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 124.

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 124.

22
(3C) JTACS band, see "Bandclass" on page 124.

*RST: 0

Example: `CONF:CDP:BCL 1`
Selects band class 1, 1900 MHz

Mode: CDMA, EVDO

Manual operation: See "Bandclass" on page 124
See "Bandclass" on page 142

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

Manual operation: See "Channel Search Mode" on page 77

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

Manual operation: See "Channel Tables" on page 78

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

Manual operation: See "New/Copy/Edit" on page 78

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 259.

Before using this command, you must set the name of the channel table using the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

For a detailed description of the parameters refer to "New/Copy/Edit" on page 78.

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

Manual operation: See "Add Channel" on page 80

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 257.

Before using this command, you must set the name of the channel table using the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

For a detailed description of the parameters refer to "New/Copy/Edit" on page 78.

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 7-1.

<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 7-1: 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

Manual operation: See "New/Copy/Edit" on page 78

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

Manual operation: See "Channel Search Mode" on page 77

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

Manual operation: See "Multi-Carrier" on page 83
See "Multi-Carrier" on page 96

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

Manual operation: See "Multi-Carrier Filter" on page 84
See "Filter Type" on page 84
See "Multi Carrier Filter" on page 96

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

Manual operation: See "Cut Off Frequency" on page 85
See "Cut Off Frequency" on page 97

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

Manual operation: See "Roll-Off Factor" on page 84
See "Roll-Off Factor" on page 97

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 262 and `CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency` on page 261 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

Manual operation:
See "Roll-Off Factor" on page 84
See "Cut Off Frequency" on page 85
See "Filter Type" on page 96
See "Roll-Off Factor" on page 97
See "Cut Off Frequency" on page 97

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

Manual operation:
See "Enhanced Algorithm" on page 83
See "Enhanced Algorithm" on page 96

CONFigure:CDPower[:BTS]:MEASurement <Measurement>

This command selects the measurement type.

Parameters:
<Measurement> ACLR | CCDF | CDPower | ESPectrum | OBWidth | POWer

ACLR
Adjacent-Channel Power measurement

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

PVTime
measurement of power versus time

*RST: CDPower

Example: `CONF:CDP:MEAS POW`
Selects Signal Channel Power measurement.

Mode: CDMA, EVDO

Manual operation: See "Code Domain Analyzer" on page 123
See "Power" on page 123
See "Ch Power ACLR" on page 124
See "Spectrum Emission Mask" on page 134
See "Occupied Bandwidth" on page 143
See "CCDF" on page 144
See "Power vs Time" on page 149

CONFigure:CDPower[:BTS]:PVTime:BURSt <State>

This command activates an automatic burst alignment to the center of the diagram.

Parameters:
<State> ON | OFF

*RST: OFF

Example: `CONF:CDP:PVT:BURS ON`
Activates the automatic alignment

Mode: EVDO

Manual operation: See "Burst Fit On Off" on page 150

CONFigure:CDPower[:BTS]:PVTime:FREStart <State>

If switched on, this command evaluates the limit line over all results at the end of a single sweep. The sweep is restarted if this result is FAILED.

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CONF:CDP:PVT:FRES ON` Restarts a single sweep if the result evaluation is failed.
Mode:	EVDO
Manual operation:	See "Restart on Fail" on page 151

CONFigure:CDPower[:BTS]:PVTime:LIST[:STATe] <State>

With this command the list evaluation which is off by default for backwards compatibility reasons can be turned on.

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CONF:CDP:PVT:LIST[:STATe] ON`
Mode:	EVDO

CONFigure:CDPower[:BTS]:PVTime:LIST:RESult?

Queries the list evaluation results. The results are a comma-separated list containing the following values for each list range:

Return values:

<RangeNo>	consecutive number of list range
<StartTime>	Start time of the individual list range
<StopTime>	Stop time of the individual list range
<AverageDBM>	Average power level in list range in dBm.
<AverageDB>	Average power level in list range in dB.
<MaxDBM>	Maximum power level in list range in dBm.
<MaxDB>	Maximum power level in list range in dB.
<MinDBM>	Minimum power level in list range in dBm.
<MinDB>	Minimum power level in list range in dB.

<LimitCheck> Result of limit check for the list range.

0
Passed

1
Failed

<Reserved1> 0; currently not used

<Reserved2> 0; currently not used

Usage: Query only

CONFigure:CDPower[:BTS]:REVision <SignalType>

With this command you define which revision type the signal to be analyzed has.

Note that this command is maintained for compatibility reasons only. For newer programs and for subtype 3 use the `CONFigure:CDPower[:BTS]:SUBType` on page 267 command.

Parameters:

<SignalType> 0 | A

0
subtype 0/1

A
subtype 2

*RST: 0

Example: `CONF:CDP:REV 0`
Revision 0 signal is analyzed

Mode: EVDO

CONFigure:CDPower[:BTS]:RFSLot <Slot>

This command defines the expected signal: FULL slot or IDLE slot. Accordingly the limit lines and the borders for calculating the mean power are set. The lower and upper limit line are called DOPVTFL/DOPVTFU for FULL and DOPVTIL/DOPVTIU for IDLE mode. It is possible to change these lines with the standard limit line editor.

Parameters:

<Slot> FULL | IDLE

*RST: FULL

Example: `CONF:CDP:RFSL FULL`
Use limit line for FULL slot and connect FULL slot signal

Mode: EVDO

Manual operation: See "RF:Slot Full Idle" on page 150

CONFigure:CDPower[:BTS]:SUBType <Subtype>

Selects the subtype of the standard to be used for the measurements.

Parameters:

<Subtype> 0 | 1 | 2 | 3

0 | 1
subtype 0/1

2
subtype 2

3
subtype 3

*RST: 0

Example: `CONF:CDP:SUBT 3`
Subtype 3 signal is analyzed

Mode: EVDO

Manual operation: See "Subtype" on page 82
See "Subtype" on page 102

7.4 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:MTABle <DisplayMode>

This command turns the marker table on and off.

Parameters:

<DisplayMode>

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?`

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. 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 6.4.6, "Trace Mode Overview", on page 184.

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.

Manual operation: See "Clear Write" on page 114
See "Max Hold" on page 114
See "Min Hold" on page 114
See "Average" on page 115
See "View" on page 115

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command switches on or off the display of the corresponding trace. 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`

Manual operation: See "Blank" on page 185

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis with logarithmic scaling.

The command works only for a logarithmic scaling. You can select the scaling with `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 273.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Range> Range: 10 to 200
*RST: 100
Default unit: dB

Example: `DISP:TRAC:Y 110dB`

Manual operation: See "Range Log 100 dB" on page 145
See "Range Log 50 dB" on page 146
See "Range Log 10 dB" on page 146
See "Range Log 5 dB" on page 146
See "Range Log 1 dB" on page 146
See "Range Log Manual" on page 147

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO <Mode>

This command turns automatic scaling of the y-axis on and off.

If on, the R&S FSVR determines the ideal scale of the y-axis for the current 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
Automatic scaling is on.

OFF
Automatic scaling is off.

ONCE
Automatic scaling is performed once.

*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

Manual operation: See "Auto Scale Once" on page 108

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>

This command selects the type of scaling of the y-axis.

When `SYSTem:DISPlay:UPDate` is turned off, this command has no immediate effect on the screen.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Mode>

ABSolute
absolute scaling of the y-axis

RELative
relative scaling of the y-axis

*RST: ABS

Example: `DISP:TRAC:Y:MODE REL`

Manual operation: See "Grid Abs/Rel " on page 160

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 <ReferenceLevel>

This command defines the reference level.

With the reference level offset ≠ 0, the value range of the reference level is modified by the offset.

Suffix:

<n>	irrelevant.
<t>	irrelevant

Parameters:

<ReferenceLevel> The unit is variable.
Range: see datasheet
*RST: -10dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Manual operation: See "Ref Level" on page 72

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command defines a reference level offset.

Suffix:

<n>	irrelevant.
<t>	irrelevant

Parameters:

<Value> Range: -200 to 200
*RST: 0
Default unit: dB

Example: `DISP:TRAC:Y:RLEV:OFFS -10dB`

Manual operation: See "Ref Level Offset" on page 73

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This command defines the position of the reference level on the display grid..

Suffix:

<n> Selects the measurement window.

<t> irrelevant

Parameters:

<Position> 0 PCT corresponds to the lower display border, 100% corresponds to the upper display border.

Range: 0 to 100
*RST: Spectrum mode: 100 PCT
Default unit: PCT

Example: `DISP:TRAC:Y:RPOS 50PCT`

Manual operation: See "Ref Level Position" on page 160

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>

The command defines the power value assigned to the reference position in the grid.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> *RST: 0 dB, coupled to reference level

Example: `DISP:TRAC:Y:RVAL -20dBm`
Defines a reference position of -20 dBm.

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling of the y-axis.

Suffix:

<n> Selects the measurement window.

<t> irrelevant

Parameters:

<ScalingType>

LOGarithmic
Logarithmic scaling.

LINear
Linear scaling in %.

LDB
Linear scaling in dB.

*RST: LOGarithmic

Example:
`DISP:TRAC:Y:SPAC LIN`
Select a linear scale.

Manual operation:
See "Range Log 100 dB" on page 145
See "Range Log 50 dB" on page 146
See "Range Log 10 dB" on page 146
See "Range Log 5 dB" on page 146
See "Range Log 1 dB" on page 146
See "Range Log Manual" on page 147
See "Range Linear %" on page 147
See "Range Lin. Unit" on page 147

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

Manual operation: See "Y-Axis Maximum" on page 109

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

Manual operation: See "Y-Axis Minimum" on page 109

7.5 INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

INSTrument[:SELect] <InstrName>

Parameters:

<InstrName> Selects the operating mode.

BDO
1xEV-DO BTS Analysis option, R&S FSV-K84

MDO
1xEV-DO MS Analysis option, R&S FSV-K85

INSTrument:NSELect <InstrNo>

Parameters:

<InstrNo> Selects the operating mode.

14
1xEV-DO BTS Analysis option, R&S FSV-K84

15
1xEV-DO MS Analysis option, R&S FSV-K85

7.6 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.

7.6.1 SENSe:CDPower Subsystem

This subsystem sets the parameters for the code domain measurements mode.

[SENSe:]CDPower:AVERage <State>

This command can be precisely enabled by means of ON when the Code Domain Power analysis is active (refer to `CALCulate<n>:FEED` on page 209). If averaging is active, the CDP is calculated over all slots and displayed as called for by the 1xEV-DO standard.

Parameters:

<State> ON | OFF

*RST: 0

Example: `CDP:AVER ON`

Activate averaging CDP relative over all slots and display on screen A.

Mode: EVDO

Manual operation: See "CDP Average" on page 85

See "CDP Average" on page 104

[SENSe:]CDPower:CODE <CodeNumber>

This command selects the code number. The maximum number depends on the channel type.

Parameters:

<CodeNumber> Code number depending on the channel type as described in the table below.

*RST: 0

Example: `CDP:CODE 11`

Selects code number 11.

Mode: EVDO

Manual operation: See "Select" on page 87

See "Select" on page 106

Channel Type	Spreading factor	Code number
PILOT	32	0...31
MAC	REV 0 64 REV A 128	0...63 0...127
PREAMBLE	REV 0 32 REV A 64	0...31 0...63
DATA	64	0...31

[SENSe:]CDPower:CTYPe <ChannelType>

This command is used to select the channel type. The number of results then changes in most analyses, such as code domain power, symbol EVM, and bit stream, because either a different spreading factor or a different number of symbols is available for the analysis.

Parameters:

<ChannelType>	PILot | MAC | PREamble | DATA *RST: PILOT
Example:	`CDP:CTYP MAC` Select MAC channel type.
Mode:	EVDO
Manual operation:	See "Channel Type" on page 76

[SENSe:]CDPower:ICTReshold <ThresholdLevel>

This command defines the minimum power which 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 to 10 *RST: -40 dB Default unit: dB
Example:	`CDP:ICTR -10` Sets the minimum power threshold to -10 dB.
Mode:	EVDO
Manual operation:	See "Inactive Channel Threshold" on page 78

[SENSe:]CDPower:IQLength <CaptureLength>

This command sets the capture length in multiples of the slot.

Parameters:

<CaptureLength>	Range: 2 to 12 *RST: 3
Example:	`CDP:IQL 10` Sets the capture length to 10.
Mode:	EVDO
Manual operation:	See "Capture Length" on page 74

[SENSe:]CDPower:LCODe:I <Mask>

Defines the long code mask of the I branch of the mobile in hexadecimal form.

Parameters:

<Mask> Range: #H0 to #H4FFFFFFFFFF
*RST: #H0

Example: `CDP:LCOD:I '#HF'`
'Define long code mask

Mode: CDMA, EVDO

Manual operation: See "Long Code Mask I" on page 95

[SENSe:]CDPower:LCODe:Q <Mask>

Defines the long code mask of the Q branch of the mobile in hexadecimal form.

Parameters:

<Mask> Range: #H0 to #H4FFFFFFFFFF
*RST: #H0

Example: `CDP:LCOD:Q '#HF'`
'Define long code mask

Mode: CDMA, EVDO

Manual operation: See "Long Code Mask Q" on page 95

[SENSe:]CDPower:LEVel:ADJust

This command adjusts the reference level of the R&S FSVR 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 R&S FSVR or limiting the dynamic response by a too low signal-to-noise ratio.

Example: `CDP:LEV:ADJ`
Adjusts the reference level to the measured channel power.

Usage: Event

Mode: EVDO

[SENSe:]CDPower:MAPPing <Branch>

This command selects, when the mapping mode is not Complex, whether the I or Q branch should be analyzed.

Parameters:

<Branch> I | Q
*RST: I

Example: `CDP:MAPP Q`
Selects the Q branch.

Mode: EVDO

[SENSe:]CDPower:MMODe <Mode>

This command defines the mapping mode either automatically or user-defined for all channel types.

Parameters:

<Mode> AUTO | IOQ | COMPlex

IOQ
I or Q mapping

COMPlex
Complex mapping

AUTO
Data channel type: Complex; PILOT, MAC and PREAMBLE channel types: IOQ

*RST: AUTO

Example: `CDP:MMODe COMP`
The pilot channel type (and all other channel types) is analyzed in complex mode

Mode: EVDO

Manual operation: See "Mapping Type" on page 76
See "Mapping Auto" on page 76

[SENSe:]CDPower:NORMalize <State>

This command activates or deactivates the elimination of the IQ offset from the signal.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CDPower:NORMalize ON`
Activates the elimination of the I/Q offset.

Mode: EVDO

Manual operation: See "Normalize" on page 83
See "Normalize" on page 103

[SENSe:]CDPower:OPERation <Mode>

The operation mode is used for the channel search.

Parameters:

<Mode> ACCess | TRAFfic

ACCess
Only PICH (always available) and DATA channels can exist.

TRAFfic
All channels (PICH/RRI/DATA/ACK and DRC) can exist. PICH and RRI are always in the signal.

*RST: TRAFfic

For further details refer to "Code Order" on page 103.

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: EVDO

[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 103.

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: EVDO

Manual operation: See "Code Order" on page 103

[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: EVDO

Manual operation: See "PN Offset" on page 83

[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.

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 104

Example: `CDP:PREF TOT`

Sets total power as reference power.

Mode: EVDO

Manual operation: See "Power Reference" on page 104

[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

Manual operation: See "Invert Q" on page 73

[SENSe:]CDPower:SBANd <Sideband>

This command is used to swap the left and right sideband.

Parameters:
<Sideband> NORMal | INVers
*RST: NORMal

Example: `CDP:SBAN INV`
Swap sidebands.

Mode: EVDO

[SENSe:]CDPower:SET:COUNt <NumberSets>

This command sets the number of sets to be captured and stored in the instrument's memory. Refer to "Set Count" on page 74 for more information.

Parameters:
<NumberSets> Range: 1 to 490
*RST: 1

Example: `CDP:SET:COUN 10`
Sets the number of sets to be captured to 10.

Mode: CDMA, EVDO

Manual operation: See "Set Count" on page 74

[SENSe:]CDPower:SET[:VALue] <Set>

This command selects a specific set for further analysis.

Parameters:
<Set> Range: 0 to -1
*RST: 0

Example: `CDP:SET 20`
Selects the 20th set.

Mode: CDMA, EVDO

Manual operation: See "Set to Analyze" on page 74

[SENSe:]CDPower:SLOT <Slot>

This command selects the slot that is evaluated in the Code Domain Power Diagram and is used for slot-based evaluations in the Code Domain Result Summary.

Parameters:

<Slot> 0 to (capture length-1)

*RST: 0

The capture length is defined via the `[SENSe:]CDPower:IQLength` on page 278 command.

Example: `CDP:SLOT 2`

Selects power control group 2.

Mode: EVDO

Manual operation: See "Select" on page 87

See "Select" on page 106

SENS:CDP:SMODe <Mode>

The mehtod used for the two synchronization stages: the frame synchronization (detection of the first chip of the frame) and the rough frequency/phase synchronization.

Parameters:

<Mode>

AUTO
The following modes are tried sequentially until synchronization was successful. If none of the methods was successful a failed synchronization is reported. If the result of the correlation methods (sync on Pilot and Auxiliary Pilot) becomes increasingly worse (due to bad power conditions), the non-data-aided synchronization works optimally and synchronization should be successful.

PILot
For frame synchronization, this method uses the correlation characteristic of the known pilot channel (i.e. pilot channel sequence = spreading code including scrambling sequence).
The correlation must be calculated for all hypotheses of the scrambling code (32768; for external triggers only 2048) in order to get the correct peak at the position where the frame begins.
This correlation method may fail if the power of the underlying pilot channel is too low compared to the total power. In this case, the expected correlation peak is hidden by the upcoming autocorrelation noise of the bad hypothesis.
The frequency/phase synchronization also takes advantage of the known linear phase of the pilot channel.

AUXiliary Pilot
Similar to synchronization on pilot, but with the different known sequence (= spreading code) of the auxiliary pilot channel. The benefits and problems of this approach are therefore identical to the synchronization on pilot. This mode is useful if the signal does not contains a pilot channel.

POWer
This frame synchronization method does not require a pilot channel because it analyzes the power of any specified channel (currently code 3 with spreading factor 4, which is the data channel 2). Again the channel power must be calculated for all hypotheses of the scrambling code (32768; for external triggers only 2048). Only for the correct position the result is low (inactive channel) or high (active channel) in contrast to the wrong hypothesis. Obviously, a small band exists for which we will not get a power drop or peak if the power of the tested channel is nearly equal to the noise of the other hypotheses (from total signal).
The frequency/phase synchronization works in the same way as for the methods above with the difference that here, both pilot channels are tried consecutively.

*RST: PILot

Mode: EVDO (MS mode)

Manual operation: See "Sync To" on page 94

[SENSe:]CDPower:TPMeas <State>

This command actives or deactivates the timing and phase offset evaluation of the channels to the pilot.

If the value is OFF or if more than 50 channels are active, the command `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 211 returns a value of '9' for the timing and phase offset as the result. If the value is ON, the timing and phase offsets are calculated and returned.

The results are queried using the `TRACe<n>[:DATA]?` on page 326 command and the `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 211 command.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CDP:TPM ON`
Activate timing and phase offset.

Mode: EVDO

Manual operation: See "Time/Phase Est." on page 83
See "Time/Phase Estimation" on page 103

7.6.2 Other SENSe Commands Referenced in this Manual

7.6.2.1 SENSe:ADJust Subsystem

[SENSe:]ADJust:ALL

This command determines the ideal frequency and level configuration for the current measurement.

Example: `ADJ:ALL`

Manual operation: See "Auto All" on page 115

[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer <Threshold>

This command defines a lower threshold the signal must drop below before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see `[SENSe:]ADJust:LEVel`).

Parameters:

<Threshold> Range: 0 to 200
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:LOW 2`

Example: For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level falls below 18 dBm.

Manual operation: See "Lower Level Hysteresis" on page 116

[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer <Threshold>

This command defines an upper threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see `[SENSe:]ADJust:LEVel`).

Parameters:

<Threshold> Range: 0 to 200
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:UPP 2`
For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level rises above 22 dBm.

Manual operation: See "Upper Level Hysteresis" on page 116

[SENSe:]ADJust:CONFigure:LEVel:DURation <Duration>

This command 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`

Manual operation: See "Meas Time Manual" on page 116

[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE <Mode>

This command selects the way the R&S FSVR determines the length of the measurement that is performed while determining the ideal reference level.

Parameters:

<Mode>

AUTO
Automatically determines the measurement length.

MANual
Manual definition of the measurement length.

*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.

[SENSe:]ADJust:FREQuency

This command defines the center frequency and the reference level automatically by determining the highest level in the frequency span.

Example: `ADJ:FREQ`

Manual operation: See "Auto Freq" on page 116

[SENSe:]ADJust:LEVel

This command automatically sets the optimal reference level for the current measurement.

You can define a threshold that the signal must exceed before the reference level is adjusted, see `[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer` and `[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer`.

Example: `ADJ:LEV`

Manual operation: See "Adjust Ref Lvl" on page 73
See "Auto Level" on page 116

7.6.2.2 SENSe:ESPectrum Subsystem

The SENSe:ESPectrum subsystem contains the remote commands to configure Spectrum Emission Mask (SEM) measurements.

The sweep list cannot be configured using remote commands during an on-going sweep operation.

[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 300).

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.

Manual operation: See "Edit Reference Range" on page 138

[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 300).

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.

Manual operation: See "Edit Reference Range" on page 138

[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.

Manual operation: See "Edit Reference Range" on page 138

[SENSe:]ESPectrum:HighSPeed <State>

This command activates Fast SEM mode to accelerate spurious emission mask measurements. For details see chapter 6.4.14, "Fast Spectrum Emission Mask Measurements", on page 198.

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 293
- RBW, see [SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution] on page 292
- VBW, see [SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo on page 292
- Sweep Time Mode, see [SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO on page 299
- Sweep Time, see [SENSe:]ESPectrum:RANGe<range>:SWEep:TIME on page 299
- Reference level, see [SENSe:]ESPectrum:RANGe<range>:RLEVel on page 298
- RF Att Mode, see [SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO on page 295
- Rf Attenuation, see [SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation on page 295
- Preamp, see [SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe on page 296

Parameters:

<State> ON | OFF
*RST: OFF

Example: `ESP:HSP ON`

Manual operation: See "Fast SEM" on page 134

[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.

Manual operation: See "Load Standard" on page 143

[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.

Manual operation: See "Restore Standard Files" on page 143

[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>

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.

Manual operation: See "Save As Standard" on page 143

[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution] <Value>

This command sets 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 290).

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.

Manual operation: See "RBW" on page 135

[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 290).

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.

Manual operation: See "VBW" on page 135

[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.

[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.

Manual operation: See "Delete Range" on page 138

[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 290).

Suffix:
<range> 1...20
range

Parameters:

<Type>

NORMal
Gaussian filters

CFILter
channel filters

RRC
RRC 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.

Manual operation: See "Filter Type" on page 135

[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.

Note the rules for the <Frequency> parameter specified in chapter 6.4.13, "Ranges and Range Settings", on page 197.

Suffix:

<range> 1...20
range

Parameters:

<Frequency> numeric value

*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.

Manual operation: See "Range Start / Range Stop" on page 134

[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.

Note the rules for the <Frequency> parameter specified in chapter 6.4.13, "Ranges and Range Settings", on page 197.

Suffix:

<range> 1...20
range

Parameters:

<Frequency> numeric value

*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.

Manual operation: See "Range Start / Range Stop" on page 134

[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 290).

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.

Manual operation: See "RF Attenuator" on page 136

[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 290).

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.

Manual operation: See "RF Att. Mode" on page 135

[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 290).

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.

Manual operation: See "Preamp" on page 136

[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.

Manual operation: See "Insert before Range" on page 137
See "Insert after Range" on page 137

[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.

Manual operation: See "Abs Limit Start" on page 136

[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.

Manual operation: See "Abs Limit Stop" on page 137

[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.

Manual operation: See "Rel Limit Start" on page 137

[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.

Manual operation: See "Rel Limit Stop" on page 137

[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.

Manual operation: See "Limit Check 1-4" on page 136

[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 290).

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.

Manual operation: See "Ref. Level" on page 135

[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 290).

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.

Manual operation: See "Sweep Time" on page 135

[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 290).

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.

Manual operation: See "Sweep Time Mode" on page 135

[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.

Manual operation: See "Transd. Factor" on page 136

[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.

[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.

Manual operation: See "Edit Reference Range" on page 138

7.6.2.3 SENSe:BANDwidth subsystem

[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 6.4.7, "Selecting the Appropriate Filter Type", on page 185.

In realtime mode, the resolution bandwidth is always coupled to the span. In all other modes, a change of the resolution bandwidth automatically turns the coupling to the span off.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND 1 MHz`
Sets the resolution bandwidth to 1 MHz

Manual operation: See "Res BW" on page 144
See "Res BW Manual" on page 162

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command couples and decouples the resolution bandwidth to the span.

The automatic coupling adapts the resolution bandwidth to the current frequency span according to the relationship between frequency span and resolution bandwidth.

Use `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` to define the ratio RBW/span.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:AUTO OFF`
Switches off the coupling of the resolution bandwidth to the span.

Manual operation: See "Res BW Manual" on page 162
See "Res BW Auto" on page 162
See "Default Coupling" on page 167

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>

This command defines the filter mode of 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 for sweep type "FFT".

Parameters:

<FilterMode>

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.

Manual operation: See "Auto" on page 165
See "Narrow" on page 165

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio between the resolution bandwidth (Hz) and the span (Hz).

Note that the ratio defined with the remote command (RBW/span) is reciprocal to that of the manual operation (span/RBW).

Parameters:

<Ratio> Range: 0.0001 to 1
*RST: 0.01

Example: `BAND:RAT 0.01`

Manual operation: See "Span/RBW Manual" on page 166

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command selects the type of resolution filter.

For detailed information on filters see chapter 6.4.7, "Selecting the Appropriate Filter Type", on page 185 and chapter 6.4.8, "List of Available RRC and Channel Filters", on page 186.

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

CFILter
channel filters

RRC
RRC filters

P5
5 Pole filters

*RST: NORMal

Example: `BAND:TYPE NORM`

Manual operation: See "Filter Type" on page 167

[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>

This command defines the video bandwidth. The available video bandwidths are specified in the data sheet.

Parameters:
<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND:VID 10 kHz`

Manual operation: See "Video BW Manual" on page 162

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>

This command couples and decouples the VBW to the RBW.

Use `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` to define the ratio VBW/RBW.

Parameters:
<State> ON | OFF

*RST: ON

Example: `BAND:VID:AUTO OFF`

Manual operation: See "Video BW Manual" on page 162
See "Video BW Auto" on page 163
See "Default Coupling" on page 167

[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>

This command defines the ratio between video bandwidth (Hz) and resolution bandwidth (Hz).

Note that the ratio defined with the remote command (VBW/RBW) is reciprocal to that of the manual operation (RBW/VBW).

Parameters:

<Ratio> Range: 0.01 to 1000
*RST: 3

Example: `BAND:VID:RAT 3`
Sets the coupling of video bandwidth to video bandwidth = 3*resolution bandwidth

Manual operation: See "RBW/VBW Sine [1/1]" on page 165
See "RBW/VBW Pulse [.1]" on page 165
See "RBW/VBW Noise [10]" on page 166
See "RBW/VBW Manual" on page 166
See "Span/RBW Auto [100]" on page 166

[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>

This command selects the position of the video filter in the signal path.

Changing the video filter position is possible only if the resolution bandwidth is ≤100 kHz.

Parameters:

<Mode> **LINear**
The video filter is applied in front of the logarithmic amplifier.
In linear mode, measurements with a logarithmic level scale result in flatter falling edges compared to logarithmic mode. The reason is the conversion of linear power values into logarithmic level values: if you halve the linear power, the logarithmic level decreases by 3 dB.

LOGarithmic
The video filter is applied after the logarithmic amplifier.

*RST: LINear

Example: `BAND:VID:TYPE LIN`
Video filter ahead of the logarithmic amplifier

7.6.2.4 SENSe:FREQuency subsystem

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency (frequency domain) or measuring frequency (time domain).

Parameters:
<Frequency> 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`

Manual operation: See "Center" on page 72

[SENSe:]FREQuency:CENTer:STEP <StepSize>

This command defines the center frequency step size.

Parameters:
<StepSize> Range: 1 to fmax
*RST: 0.1 x <span value>
Default unit: Hz

Example: `FREQ:CENT:STEP 120 MHz`

Manual operation: See "CF Stepsize" on page 107
See "Manual" on page 154

[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.

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples and decouples the center frequency step size to the span or the resolution bandwidth.

Parameters:

<CouplingType>

SPAN
Couples the step size to the span. Available for measurements in the frequency domain.

RBW
Couples the step size to the resolution bandwidth. Available for measurements in the time domain.

OFF
Decouples the step size (manual input).

*RST: SPAN

Example: `FREQ:CENT:STEP:LINK SPAN`

Manual operation:
See "0.1*Span (span > 0)" on page 152
See "0.1*RBW (span > 0)" on page 152
See "0.5*Span (span > 0)" on page 153
See "0.5*RBW (span > 0)" on page 153
See "x*Span (span > 0)" on page 153
See "x*RBW (span > 0)" on page 153

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Factor>

This command defines a step size factor if the center frequency step size is coupled to the span or the resolution bandwidth.

Parameters:

<Factor>

Range: 1 to 100
*RST: 10
Default unit: PCT

Example: `FREQ:CENT:STEP:LINK:FACT 20PCT`

Manual operation:
See "0.1*Span (span > 0)" on page 152
See "0.1*RBW (span > 0)" on page 152
See "0.5*Span (span > 0)" on page 153
See "0.5*RBW (span > 0)" on page 153

[SENSe:]FREQuency:OFFSet <Offset>

This command defines the frequency offset.

Parameters:

<Offset>

Range: -100 GHz to 100 GHz
*RST: 0 Hz
Default unit: Hz

Example: `FREQ:OFFS 1GHZ`

Manual operation:
See "Frequency Offset" on page 72

[SENSe:]FREQuency:SPAN <Span>

This command defines the frequency span.

Parameters:

<Span> In analyzer mode, the span range is 10 Hz to f_{max}. For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: fmax

Example: `FREQ:SPAN 10MHz`

Manual operation: See "Span Manual" on page 155

[SENSe:]FREQuency:SPAN:FULL

This command sets the frequency span to its maximum.

Example: `FREQ:SPAN:FULL`

Manual operation: See "Full Span" on page 155

[SENSe:]FREQuency:STARt <Frequency>

This command defines the start frequency for measurements in the frequency domain.

Parameters:

<Frequency> 0 to (fmax - min span)

In analyzer mode, the span range is 10 Hz to f_{max}. For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: 0

Example: `FREQ:STAR 20MHz`

Manual operation: See "Start" on page 154

[SENSe:]FREQuency:STOP <Frequency>

This command defines the stop frequency for measurements in the frequency domain.

Parameters:

<Frequency> min span to fmax

In analyzer mode, the span range is 10 Hz to f_{max}. For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: fmax

Example: `FREQ:STOP 2000 MHz`

Manual operation: See "Stop" on page 154

7.6.2.5 SENSe:POWer subsystem

[SENSe:]POWer:ACHannel:ACPairs <ChannelPairs>

This command sets the number of adjacent channels (upper and lower channel in pairs).The figure 0 stands for pure channel power measurement.

Parameters:

<ChannelPairs> 0 to 12

*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.

Manual operation: See "# of Adj Chan" on page 125

[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 6.4.8, "List of Available RRC and Channel Filters", on page 186.

Parameters:

<Bandwidth> 100 Hz to 40 GHz

*RST: 14 kHz

Example: `POW:ACH:BWID:CHAN2 30 kHz`
Sets the bandwidth of the TX channel 2 to 30 kHz.

Manual operation: See "Bandwidth" on page 126
See "Channel Bandwidth (span > 0)" on page 144

[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 6.4.8, "List of Available RRC and Channel Filters", on page 186 .

Parameters:

<Bandwidth> 100 Hz to 40 GHz

*RST: 14 kHz

Example: `POW:ACH:BWID:ACH 30 kHz`
Sets the bandwidth of all adjacent channels to 30 kHz.

Manual operation: See "Bandwidth" on page 126

[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 6.4.8, "List of Available RRC and Channel Filters", on page 186 .

Suffix:

<channel> 1...11
the alternate adjacent channel

Parameters:

<Bandwidth> 100 Hz to 40 GHz
*RST: 14 kHz

Example: `POW:ACH:BWID:ALT2 30 kHz`

Manual operation: See "Bandwidth" on page 126

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel <Alpha>

This command defines the roll-off factor for the weighting filter of the adjacent channel.

Parameters:

<Alpha> <numeric value>
*RST: 0,22

Example: `POW:ACH:FILT:ALPH:ACH 0,35`

Manual operation: See "Weighting Filter" on page 129

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel> <Alpha>

This command defines the roll-off factor for the weighting filter of the specified alternate channel.

Suffix:

<channel> 1...11
the alternate channel

Parameters:

<Alpha> <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.

Manual operation: See "Weighting Filter" on page 129

[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel> <Alpha>

This command defines the roll-off factor for the weighting filter of the specified TX channel.

Suffix:

<channel> 1...11
the TX channel

Parameters:

<Alpha> <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.

Manual operation: See "Weighting Filter" on page 129

[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`

Manual operation: See "Weighting Filter" on page 129

[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.

Manual operation: See "Weighting Filter" on page 129

[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.

Manual operation: See "Weighting Filter" on page 129

[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.

Manual operation: See "ACLR (Abs/Rel)" on page 131

[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> *RST: Adj

Example: `POW:ACH:NAME:ACH 'XYZ'`
Defines the name of the adjacent channel as 'XYZ'.

Manual operation: See "Names" on page 129

[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> *RST: ALT<1...11>

Example: `POW:ACH:NAME:ALT3 'XYZ'`
Defines the name of the third alternate channel as 'XYZ'.

Manual operation: See "Names" on page 129

[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> *RST: TX<1...12>

Example: `POW:ACH:NAME:CHAN3 'XYZ'`
Defines the name of the third transmission channel as 'XYZ'.

Manual operation: See "Names" on page 129

[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.

Manual operation: See "Adjust Settings" on page 131

[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.

Manual operation: See "Adjust Ref Lvl" on page 124
See "Adjust Ref Lvl (span > 0)" on page 144

[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`

Manual operation: See "Set CP Reference" on page 132

[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 217).

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.

Manual operation: See "ACLR Reference" on page 127

[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 217).

Parameters:

<ChannelNumber> 1 to 18
*RST: 1

Example: `POW:ACH:REF:TXCH:MAN 3`
Transmission channel 3 is used as a reference channel.

Manual operation: See "ACLR Reference" on page 127

[SENSe:]POWer:ACHannel:SPACing[:ACHannel] <Spacing>

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:

<Spacing> 100 Hz to 20 GHz
*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.

Manual operation: See "Spacing" on page 127

[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 20 GHz

*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.

Manual operation: See "Spacing" on page 127

[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel> <Spacing>

This command defines the channel spacing for the carrier signals.

Suffix:

<channel> 1...11
the TX channel

Parameters:

<Spacing> 14 kHz to 20 GHz

*RST: 20 kHz

Example: `POW:ACH:SPAC:CHAN 25kHz`

Manual operation: See "Spacing" on page 127

[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 217).

Parameters:

<Number> 1 to 18

*RST: 1

Example: `POW:ACH:TXCH:COUN 3`

Manual operation: See "# of TX Chan" on page 125

[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 313).

Parameters:
<Percentage> 10 to 99.9PCT
*RST: 99PCT

Example: `POW:BWID 95PCT`

Manual operation: See "% Power Bandwidth (span > 0)" on page 143

[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`

Manual operation: See "Fast ACLR (On/Off)" on page 132

[SENSe:]POWer:NCORrection <Mode>

This command turns noise cancellation on and off.

If noise cancellation is on, the R&S FSVR performs a reference measurement to determine its inherent noise and subtracts the result from the channel power measurement result (first active trace only).

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 corresponding message is displayed on the screen. Noise correction must be turned on again manually after the change.

Parameters:
<Mode>

ON
Performs noise correction.

OFF
Performs no noise correction.

AUTO
Performs noise correction.
After a parameter change, noise correction is restarted automatically and a new correction measurement is performed.

*RST: OFF

Example: `POW:NCOR ON`

Manual operation: See "Noise Correction" on page 133

[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.

Manual operation: See "Select Trace" on page 131

7.6.2.6 SENSe:SWEep subsystem

[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.

For Power vs Time measurements, the command the sets the number of half slots to be analyzed.

Parameters:

<NumberSweeps> 0 to 32767

*RST: 0 (GSM: 200, PHN:1)

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.

Manual operation: See "Sweep Count" on page 112
See "No of HalfSlots" on page 150

[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.

Manual operation: See "Gated Trigger (On/Off)" on page 148
See "Gate Ranges" on page 148

[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 322) and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 349), the hold-off 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`

[SENSe:]SWEep:EGATe:LENGth <TimeInterval>

This command defines a gate length.

Parameters:
<TimeInterval> 125 ns to 30 s
*RST: 400µs

Example: `SWE:EGAT:LENG 10ms`

[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`

Manual operation: See "Trigger Polarity" on page 74

[SENSe:]SWEep:EGATe:SOURce <Source>

This command selects the signal source for gated measurements.

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 | PSEN
*RST: IFPower

Example: `SWE:EGAT:SOUR IFP`
Switches the gate source to IF power.

Manual operation: See "Gated Trigger (On/Off)" on page 148

[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>

Example: `SWE:EGAT:TRAC1:COMM "SlotA"`

Manual operation: See "Gate Ranges" on page 148

[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.

Manual operation: See "Gate Ranges" on page 148

[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.

Manual operation: See "Gate Ranges" on page 148

[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.

Manual operation: See "Gate Ranges" on page 148

[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 319.

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 349), 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`

[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.

Manual operation: See "Gate Ranges" on page 148

[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> Range: 101 to 32001
*RST: 691

Example: `SWE:POIN 251`

Manual operation: See "Sweep Points" on page 170

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

Parameters:

<Time> refer to data sheet

*RST: (automatic)

Example: `SWE:TIME 10s`

Manual operation: See "Sweep Time" on page 132
See "Sweeptime Manual" on page 155

[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.

Manual operation: See "Sweeptime Manual" on page 155
See "Sweeptime Auto" on page 164
See "Default Coupling" on page 167

[SENSe:]SWEep:TYPE <Type>

This command selects the sweep type.

Parameters:
<Type>
SWE
Selects analog frequency sweeps.
AUTO
Automatically selects the sweep type (FFT or analog frequency sweep).
FFT
Selects FFT sweeps.
*RST: AUTO

Example: SWE:TYPE FFT
Selects FFT sweeps.

Manual operation: See "Sweep" on page 164
See "FFT" on page 164
See "Auto" on page 165

7.6.2.7 Other Commands in the SENSe Subsystem

[SENSe:]AVERage<n>:COUNt <NoMeasurements>

This command defines the number of measurements which contribute to the average value.

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> Selects the measurement window.

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.

[SENSe:]AVERage<n>[:STATe<Trace>] <State>

This command turns averaging for a particular trace in a particular window on and off.

Suffix:

<n> Selects the measurement window.

<Trace> 1...6
Selects the 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.

7.7 STATus subsystem

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. For details on the possible errors see chapter 8, "Status Reporting System of the 1xEV-DO Analysis", on page 358.

Return values:

<Result> 0 | 1 | 2 | 3 | 4 | 5 | 6 to 14 | 15

Example: `STAT:QUES:SYNC[:EVEN]?`

Usage: Query only

Mode: CDMA, EVDO

7.8 TRACe Subsystem

The TRACe subsystem controls access to the instrument's internal trace memory.

TRACe<n>[:DATA]? <Data>

Returns the measurement results for the selected trace.

Suffix:

<n> 1...4
window

Query parameters:

<Data> TRACE1 | TRACE2 | TRACE3 | TRACE4 | CTABle | LIST

TRACE1 | TRACE2 | TRACE3 | TRACE4
Reads out the trace data of measurement windows 1 to 4.
The return values for each measurement type are described in chapter 7.9, "TRACe:DATA Results", on page 327.

CTABle
For the "Channel Table" result display, reads out the maximum values of the timing/phase offset between each assigned channel and the pilot channel (see also chapter 7.9.14, "Channel Table (CTABle, BTS Mode)", on page 336).

LIST
Returns the peak list. For each peak the following entries are given:
<peak frequency>, <absolute level of the peak>, <distance to the limit line>

Usage: Query only

Mode: EVDO

Manual operation: See "List Evaluation (On/Off)" on page 139

7.9 TRACe:DATA Results

The measurement results for a specific trace are queried using `TRACe<n>[:DATA]?`. The format of the results varies according to the measurement type and is described here.

7.9.1 Code Domain Power (BTS mode)

The command returns three values for each code in a channel in the following order:

<code number>,<absolute level | relative level >,< power ID>

Value	Description	Range	Unit
<code number>	code number of the channel	{0… spreading factor-1}	
<absolute level>	absolute level of the code channel at the selected channel slot	{-∞ … ∞}	dBm
<relative level>	relative level of the channel referenced to total power in the channel type	{-∞ … ∞}	dB
<power ID>	power indication 0 – inactive channel 1 – active channel	{0,1}	

The number of codes that are displayed corresponds to the spreading factor. The spreading factor in turn depends on the selected channel types. Therefore, 32 value triplets are returned for PILOT and PREAMBLE channels, 16 value triplets for DATA channels and 64 value triplets for MAC channels (see chapter 6.4.2, "Working with Channel Tables", on page 176).

In addition, the output depends on the mapping settings. The output is either the I branch, the Q branch or the complex signal.

7.9.2 Code Domain Power (MS mode)

The command returns four values for each code in a channel in the following order:

<code class>, <code number>,<absolute level | relative level >,< power ID>

Value	Description	Range/Unit
<code class>	Code class of the channel; with Hadamard order it is usually code class 4.	
<code number>	code number of the channel	{0… spreading factor-1}
<absolute level>	absolute level of the code channel at the selected channel slot	{-∞ … ∞} dBm
<relative level>	relative level of the channel (referred to the total or pilot power, see the `[SENSe:]CDPower:PREFerence` command	{-∞ … ∞} dB
<power ID>	power indication 0 – inactive channel 1 – active channel 3 - Quasi–inactive channel (on the analyzed branch, the channel is not occupied, but an active channel exists on the other branch)	{0,1,3}

Power values of the individual codes are usually given in "Hadamard" order; the consolidated channel power is returned in "BitReverse" order. The Hadamard or BitReverse order is important for sorting the channels and consolidation (see `[SENSe:]CDPower:ORDer` on page 281).

With Hadamard, the individual codes are output in ascending order with their code power. The number of codes which are output corresponds to spreading factor 16.

With BitReverse, codes which belong to a particular channel are adjacent to each other and are therefore output in the class of the channel together with the channel power. The maximum number of codes or channels that are output cannot be higher than spreading factor 16, and decreases with each concentrated channel.

A programming example for a query for 2 channels is given in chapter 7.11.1, "Retrieving Trace Results", on page 355.

7.9.3 General Results/ Channel Results (BTS Mode)

The command returns 30 values for the selected channel in the following order:

<FERRor>, <FERPpm>, <CERRor>, <TFRame>, <RHOPilot>, <RHO1>, <RHO2>, <PPILot>, <PMAC>, <PDATa>, <PPReamble>, <MACCuracy>, <DMTYpe>, <MACTive>, <DACTive>, <PLENGth>, <RHO>, <PCDerror>, <IQIMbalance>, <IQOFfset>, <SRATe>, <CHANnel>, <SFACtor> <TOFFset>, <POFFset>, <CDPRelative>, <CDPabsolute>, <EVMRms>, <EVMPeak>, <MTYPe>

Value	Description	Range/Unit
<FERRor>	Frequency error	Hz
<FERPpm>	Frequency error	ppm
<CERRor>	Chip rate error	ppm
<TFRame>	Trigger to frame **Note:** *The Trigger to Frame value (TFRame) supplies a '9' if the trigger is at FREE RUN. The Timing/Phase Offset values (TOFFset/POFFset) supply a '9' if timing and phase measurement is disabled (refer to CDP:TPM) or the number of active channels is higher than 50*	
<RHOPilot>	RHO over all slots for the pilot area	{0…1}
<RHO1>	RHOoverall-1 over all slots over all chips with start of averaging at the half-slot limit	{0…1}
<RHO2>	RHOoverall-2 over all slots over all chips with start of averaging at the quarter-slot limit	{0…1}
<PPILot>	Absolute power in the PILOT channel type	dBm
<PMAC>	Absolute power in the MAC channel type	dBm
<PDATa>	Absolute power in the DATA channel type	dBm
<PPReamble>	Absolute power in the PREAMBLE channel type	dBm

Value	Description	Range/Unit
<MACCuracy>	Composit EVM	%
<DMTYpe>	Modulation type in the DATA channel type: 2 = QPSK, 3 = 8-PSK, 4 = 16-QAM 10 = 64 QAM	
<MACTive>	Number of active MAC channels	
<DACTive>	Number of active DATA channels	
<PLENGth>	Length of preamble in chips	
<RHO>	RHO value for the selected channel type/slot	
<PCDerror>	Peak Code Domain error	dB
<IQIMbalance>	IQ imbalance	%
<IQOFfset>	IQ offset	%
<SRATe>	Symbol rate	ksps
<CHANnel>	Channel number	
<SFACtor>	Spreading factor of the channel	
<TOFFset>	If the evaluation of the timing and phase offset is not active (see `[SENSe:]CDPower:TPMeas` on page 286) or more than 50 active channels are in the signal, the value 9 is returned. For inactive channels, the value 9 is returned.	S
<POFFset>	If the evaluation of the timing and phase offset is not active (see `[SENSe:]CDPower:TPMeas` on page 286) or more than 50 active channels are in the signal, the value 9 is returned. For inactive channels, the value 9 is returned.	
<CDPRelative>	relative level of the channel referenced to total power in the channel type	{-∞ … ∞} dB
<CDPAbsolute>	absolute level of the code channel at the selected channel slot	{-∞ … ∞} dBm
<EVMRms>	Error vector magnitude rms	%
<EVMPeak>	Error vector magnitude peak	%
<MTYPe>	Modulation type: 0 = BPSK-I, 1 = BPSK-Q, 2 = QPSK, 3 = 8- PSK, 4 = 16-QAM, 5 = 2BPSK (if complex analysis selected for PILOT, PREAM-BLE or MAC)	

7.9.4 Result Summary (MS Mode)

The command returns 25 values in the following order:

<SLOT>, <PTOTal>, <PPICh>, <PRRI>, <RHO>, <MACCuracy>, <PCDerror>, <ACTive>, <FERRor>, <FERPpm>, <DRPich>, <RHOVerall>, <TFRame>, <CERRor>, <IQOFfset>, <IQIMbalance>, <SRATe>, <CHANnel>, <SFACtor>, <TOFFset>, <POFFset>, <CDPRelative>, <CDPabsolute>, <EVMRms>, <EVMPeak>

Value	Description	Range/Unit
Global results of selected half slot		
<SLOT>	Half-slot number	
<PTOTal>	Total power	dBm
<PPICh>	Pilot power	dBm
<PRRI>	RRI power If the RRI is not active, its displayed PRRI value is –200 dBm. In this case, the DRPich is set to –200 dB.	dBm
<RHO>	RHO value for the selected channel type/slot	
<MACCuracy>	Composite EVM	%
<PCDerror>	Peak Code Domain error	dB
<IQOFfset>	IQ offset	%
<IQIMbalance>	IQ imbalance	%
Global results of all half slots		
<FERRor>	Frequency error	Hz
<FERPpm>	Frequency error	ppm
<DRPich>	Delta RRI/PICH	dB
<CERRor>	Chip rate error	ppm
<TFRame>	Trigger to frame **Note:** *The Trigger to Frame value (TFRame) supplies a '9' if the trigger is at FREE RUN. The Timing/Phase Offset values (TOFFset/POFFset) supply a '9' if timing and phase measurement is disabled (refer to CDP:TPM) or the number of active channels is higher than 50*	
Channel results		
<SRATe>	Symbol rate	ksps
<CHANnel>	Channel number	
<SFACtor>	Spreading factor of the channel	
<TOFFset>	If the evaluation of the timing and phase offset is not active (see `[SENSe:]CDPower:TPMeas` on page 286) or more than 50 active channels are in the signal, the value 9 is returned. For inactive channels, the value 9 is returned.	S

Value	Description	Range/Unit
<POFFset>	If the evaluation of the timing and phase offset is not active (see [SENSe:]CDPower:TPMeas on page 286) or more than 50 active channels are in the signal, the value 9 is returned. For inactive channels, the value 9 is returned.	
<CDPRelative>	relative level of the channel referenced to total power in the channel type	{-∞ … ∞} dB
<CDPAbsolute>	absolute level of the code channel at the selected channel slot	{-∞ … ∞} dBm
<EVMRms>	Error vector magnitude rms	%
<EVMPeak>	Error vector magnitude peak	%

7.9.5 Power vs Chip (BTS Mode)

The command returns one value for each chip:

<level value in dBm>

The number of results that are displayed is always 2048, one power level for each chip.

7.9.6 Power vs Halfslot (MS Mode)

The command returns one value pair for each half-slot:

<half-slot number>, <level value in dB>

The number of returned value pairs corresponds to the IQ capture length.

7.9.7 Power vs Symbol

The command returns one value for each symbol:

<value in dBm>

In BTS mode, the number of results depends on the number of symbols and is between 2 and 100.

In MS mode, the number of values depends on the spreading factor:

Spreading factor 16 : 64 values

Spreading factor 8 : 128 values

Spreading factor 4 : 256 values

7.9.8 Composite EVM

The command returns two values for each (half-)slot in the following order:

<(Half-)Slot number>, <value in %>

The number of value pairs that is displayed corresponds to the IQ capture length. Therefore the number of results is between 2 and 12.

7.9.9 Composite Data EVM (MS Mode)

The command returns the error vector magnitude for each despreaded chip of the composite data channel. The number of returned values is 1024.

7.9.10 Composite Data Constellation (MS Mode)

The command returns the real and imaginary parts from each despreaded chip of the composite data channel.

7.9.11 Composite Data Bitstream (MS Mode)

The command returns the bitstream of one half slot for the composite data channel. The number of returned bits depends on the modulation type of the composite data channel:

Modulation Type	Number of returned bits
Q4Q2	1536
E4E2	2304

7.9.12 Channel Table (Trace, BTS mode)

The command returns 8 values for all active channels in the following order:

<channel type>, <code class>, <code number>, <modulation>, <absolute level>, <relative level>, <timing offset>, <phase offset>

The channels are listed in the following channel type order: PILOT, MAC, PREAMBLE, DATA. Within the channel types, the channels are sorted in ascending code number order.

Value	Description	Range/Unit
<channel type>	channel type indication The channel type is coded with numbers as follows: 0 = PILOT, 1 = MAC, 2 = PREAMBLE with 64chip, 3 = PREAMBLE with 128chip, 4 = PREAMBLE with 256chip, 5 = PREAMBLE with 512chip, 6 = PREAMBLE with 1024chip, 7 = DATA	{0 … 7} <channel type>
<code class>	code class of the channel. Code class depends on channel type: PILOT:5 MAC:6 PREAMBLE:5 DATA:4 (spreading factor = $2^{\text{code class}}$)	{2 … 7}
<code number>	code number of the channel	{0…spreading factor-1}
<modulation>	Modulation type including mapping: 0 = BPSK-I 1= BPSK-Q 2 = QPSK 3 = 8-PSK 4 = 16-QAM 10 = 64-QAM	
<absolute level>	absolute level of the code channel at the selected channel slot	{-∞ … ∞} dBm
<relative level>	relative level of the channel referenced to total power in the channel type	{-∞ … ∞} dB
<timing offset>	Timing offset of the channel to the frame start. Referred to the first active channel in seconds. If the evaluation of the timing and phase offset is not active (see [SENSe:]CDPower:TPMeas on page 286) or more than 50 active channels are in the signal, the value 9 is returned. For inactive channels, the value 9 is returned.	s
<phase offset>	Phase offset Referred to the first active channel in rad. If the evaluation of the timing and phase offset is not active (see [SENSe:]CDPower:TPMeas on page 286) or more than 50 active channels are in the signal, the value 9 is returned. For inactive channels, the value 9 is returned.	rad

7.9.13 Channel Table (Trace, MS mode)

The command returns 8 values for each channel in the following order:

<channel type>, <code class>, <code number>, <mapping>, <absolute level>, <relative level>, <timing offset>, <phase offset>

Value	Description	Range/Unit
<channel type>	The channel type is coded with numbers as follows: 0 = PICH 1 = RRI 2 = DATA 3 = ACK 4 = DRC 5 = INACTIVE 6 = DSC 7 = Auxiliary Pilot	{0 … 7} <channel type>
<code class>	code class of the channel; specifies the spreading factor of the channel: Class 4 corresponds to spreading factor 16 (symbol rate 76.8 ksps), class 2 to the lowest permissible spreading factor 4 (symbol rate 307.2 ksps)	{2 … 4}
<code number>	code number of the channel	{0…spreading factor-1}
<mapping>	Modulation type including mapping: 0 = I branch 1= Q branch 2 = I and Q branch	
<absolute level>	absolute level of the channel	{-∞ … ∞} dBm
<relative level>	relative level of the channel referred to the total or pilot power (see `[SENSe:]CDPower:PREFerence` on page 282)	{-∞ … ∞} dB
<timing offset>	Timing offset of the channel referred to the pilot in seconds	s
<phase offset>	Phase offset referred to the pilot in rad. If the evaluation of the timing and phase offset is not active (see `[SENSe:]CDPower:TPMeas` on page 286) or more than 50 active channels are in the signal, the value 9 is returned. For inactive channels, the value 9 is returned.	rad

All detected active channels are output first, followed by the inactive or quasi–active channels. The channels are sorted in ascending code number order (with identical code numbers: the I branch first, followed by the Q branch). The unassigned codes are displayed together with code class 4.

7.9.14 Channel Table (CTABle, BTS Mode)

The command returns 12 values (including 4 reserved values) for maximum timing and phase offsets in the following order:

<max. time offset in s>, <channel type>, <code number for max. time>, <code class for max. time>, <max. phase offset in rad>, <channel type>, <code number for max. phase>, <code class for max. phase>, <reserved 1>, …, <reserved 4>

Table 7-2: Return values for parameter "CTABle"

Value	Description	Range/Unit
<max. time offset>	Max timing offset value of all channels	s
<channel type>	channel type indication The channel type is coded with numbers as follows: 0 = PILOT 1 = MAC 2 = PREAMBLE with 64chip 3 = PREAMBLE with 128chip 4 = PREAMBLE with 256chip 5 = PREAMBLE with 512chip 6 = PREAMBLE with 1024chip 7 = DATA	{0 … 7}
<code number for max. time>	The code number which has max timing offset value	
<code class for max. time>	The code class which has max timing offset value	
<max. phase offset>	Max phase offset value of all channels	rad
<code number for max. phase>	The code number which has max phase offset value	
<code class for max. phase>	The code class which has max phase offset value	
<reserved>	reserved for future functionality	{0}

7.9.15 Channel Table (CTABle, MS Mode)

In addition to the results of the channel table which are output using the TRACE parameter, the CTABle parameter provides the maximum values of the TIMING and PHASE OFFSET together with the associated channel.

The command returns 12 values (including 6 reserved values) for maximum timing and phase offsets in the following order:

<max. time offset>, <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>

Table 7-3: Return values for parameter "CTABle"

Value	Description	Range/Unit
<max. time offset>	Max timing offset value of all channels	s
<code number for max. time>	The code number which has max timing offset value	
<code class for max. time>	The code class which has max timing offset value	
<max. phase offset>	Max phase offset value of all channels	rad
<code number for max. phase>	The code number which has max phase offset value	
<code class for max. phase>	The code class which has max phase offset value	
<reserved>	reserved for future functionality	{0}

7.9.16 Channel Bitstream

The command returns the bitstream of one slot, i.e. it returns one value for each bit (either 0 or 1) in a symbol:

<bit 1>, <bit 2>,…, <bit n>

The number of returned bits depends on the modulation type. For BPSK modulated signals there is one bit per symbol, for 2BPSK and QPSK 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. Accordingly, the bitstream per slot is of different lengths. The number of results is between 2 and 400.

If a channel is detected as being inactive, the invalid bits in the bit stream are identified by "9".

7.9.17 Peak Code Domain Error

The command returns two values for each (half-)slot in the following order:

<(half-)slot number>, <level value in dB>

The number of results corresponds to the IQ capture length. The number of results is between 2 and 12.

Code Domain Error

7.9.18 Code Domain Error (BTS Mode)

The command returns three values for each code in a channel in the following order:

<code number>,<error power >,< power ID>

Value	Description	Range/Unit
<code number>	number of the code	
<error power>	value of the composite EVM	%
<power ID>	power indication 0 – inactive channel, 1 – active channel	{0,1}

The number of results corresponds to the spreading factor. The spreading factor in turn depends on the selected channel types. Therefore, 32 value triplets are returned for PILOT and PREAMBLE channels, 16 value triplets for DATA channels and 64 value triplets for MAC channels (see chapter 6.4.2, "Working with Channel Tables", on page 176).

In addition, the output depends on the mapping settings. The output is either the I branch, the Q branch or the complex signal.

7.9.19 Code Domain Error (MS Mode)

The command returns four values for each channel in the following order:

<code class>, <code number>,<error power >,< power ID>

Value	Description	Range/Unit
<code class>	Code class of the channel; usually 4 since the CDEP is displayed in base	
<code number>	code number of the channel	{0… spreading factor-1}
<error power>	absolute level of the error power; no difference of power between the Hadamard and BitReverse order	{-∞ … ∞} dB
<power ID>	power indication 0 – inactive channel 1 – active channel 3 - Quasi–inactive channel (on the analyzed branch, the channel is not occupied, but an active channel exists on the other branch)	{0,1,3}

The Hadamard or BitReverse order is important for sorting the channels (see the `[SENSe:]CDPower:ORDer` command). With Hadamard order, the individual codes are output in ascending order. With BitReverse order, codes which belong to a particular channel are adjacent to each other. Since an error power is output for the code domain error power, consolidation of the power values is not appropriate. The number of codes that are output therefore generally corresponds to the base spreading factor 16.

7.9.20 Symbol Constellation

The command returns two values, the real and imaginary parts, for each symbol in the following order:

<re 0>, <im 0>, <re 1>, <im 1>, …, <re n>, <im n>

In BTS mode, the number of results depends on the number of symbols and is between 2 and 100.

In MS mode, the number of values depends on the spreading factor:

Spreading factor 16 : 64 values

Spreading factor 8 : 128 values

Spreading factor 4 : 256 values

7.9.21 EVM vs Symbol

The command returns one value for each symbol:

<value in % symbol 0>

In BTS mode, the number of results depends on the number of symbols and is between 2 and 100.

In MS mode, the number of values depends on the spreading factor:

Spreading factor 16 : 64 values

Spreading factor 8 : 128 values

Spreading factor 4 : 256 values

7.9.22 Composite Constellation

The command returns two values, the real and imaginary parts, for each chip in the following order:

<re chip 0>, <im chip 0>, <re chip 1>, <im chip 1>, …, <re chip n>, <im chip n>

The number of results corresponds to the number of chips from the 1024 chips in a half slot.

7.9.23 Magnitude Error vs Chip

The comand returns a list of magnitude error values of all chips at the selected slot. The values are calculated as the magnitude difference between the received signal and the reference signal for each chip in %, and are normalized to the square root of the average power at the selected slot.

7.9.24 Phase Error vs Chip

The comand returns a list of phase error values of all chips at the selected slot. The values are calculated as the phase difference between the received signal and the reference signal for each chip in degrees, and are normalized to the square root of the average power at the selected slot.

7.9.25 Symbol Magnitude Error

The comand returns the magnitude error in % of each symbol at the selected slot. The number of the symbols depends on the spreading factor of the selected channel:

$NOFSymbols=10*2^{(8-CodeClass)}$

7.9.26 Symbol Phase Error

The comand returns the phase error in degrees of each symbol at the selected slot. The number of the symbols depends on the spreading factor of the selected channel:

$NOFSymbols=10*2^{(8-CodeClass)}$

7.10 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 7.6, "SENSe Subsystem", on page 276 and chapter 7.2, "CALCulate Subsystem", on page 208

7.10.1 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 R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:
<Value> *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

Manual operation: See "RF Atten Manual/Mech Att Manual" on page 109

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 R&S Digital I/Q 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.

Manual operation: See "RF Atten Auto/Mech Att Auto" on page 110

INPut:COUPling <CouplingType>

Toggles the RF input of the R&S FSVR between AC and DC coupling.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:
<CouplingType> AC | DC
*RST: AC

Example: `INP:COUP DC`

Manual operation: See "Input (AC/DC)" on page 111

INPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital baseband input from the optional R&S Digital I/Q Interface (option R&S FSV-B17).

For details see the section "Interface Status Information" for the R&S Digital I/Q 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

Manual operation: See "Connected Device" on page 118
See "Digital IQ Info" on page 118

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 R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q 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

Manual operation: See "Adjust Reference Level to Full Scale Level" on page 118

INPut:DIQ:RANGe[:UPPer] <Level>

Defines or queries the "Full Scale Level", i.e. 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 118).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q 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

Manual operation: See "Full Scale Level" on page 118

INPut:DIQ:RANGe[:UPPer]:UNIT <Unit>

Defines the unit of the full scale level (see "Level Unit" on page 118). The availability of units depends on the measurement application you are using.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q 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

Manual operation: See "Level Unit" on page 118

INPut:DIQ:SRATe <SampleRate>

This command specifies or queries the sample rate of the input signal from the R&S Digital I/Q Interface (see "Input Sample Rate" on page 118).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q 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

Manual operation: See "Input Sample Rate" on page 118

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 R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q 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>

This command defines the electronic attenuation.

If necessary, the command also turns the electronic attenuator on.

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

Manual operation: See "El Atten Mode (Auto/Man)" on page 110

INPut:EATT:AUTO <State>

This command 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

Manual operation: See "El Atten On/Off" on page 110
See "El Atten Mode (Auto/Man)" on page 110

INPut:EATT:STATe <State>

This command turns 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.

INPut:GAIN:STATe <State>

This command turns the 20 dB preamplifier on and off.

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 R&S Digital I/Q Interface (R&S FSV-B17).

Parameters:
<State> ON | OFF
*RST: OFF

Example: `INP:GAIN:STAT ON`
Turns the preamplifier on.

Manual operation: See "Preamp On/Off" on page 73

INPut:IMPedance <Impedance>

This command selects the nominal input impedance.

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 R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:
<Impedance> 50 | 75
*RST: 50 Ω

Example: `INP:IMP 75`

INPut:SELect <Source>

This command selects the signal source for measurements.

Parameters:
<Source> RF | DIQ

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Digital IQ (only available with R&S Digital I/Q 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

Manual operation: See "Input Path" on page 117

7.10.2 TRIGger Commands

TRIGger<n>[:SEQuence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger source (for digital input via the R&S Digital I/Q 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 R&S Digital I/Q Interface, R&S FSV-B17).

Suffix:
<n> irrelevant

Parameters:
<Value> *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> *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.

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> *RST: 3 dB

Example:
`TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HYST 10DB`
Sets the hysteresis limit value.

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`

Manual operation: See "Trigger Offset" on page 75

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`

TRIGger<n>[:SEQuence]:MASK:CONDition <Condition>

This command sets the condition that activates the frequency mask trigger.

Parameters:
<Condition>

ENTer
Triggers on entering the frequency mask.

LEAVing
Triggers on leaving the frequency mask.

INSide
The trigger is active as long as the signal is inside the frequency mask.

OUTSide
The trigger is active as long as the signal is outside the frequency mask.

*RST: INSide

Example: See chapter 7.2.4.4, "CALCulate:MASK Subsystem", on page 240.

Manual operation: See "Setting the trigger condition" on page 180

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`

Manual operation: See "Trigger Polarity" on page 74

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:
<n> irrelevant

Parameters:
<Source> EXTernal | IFPower | IMMediate | MASK | TIME | VIDeo

Note that the availability of the trigger source depends on the measurement you are in.

EXTernal
Selects an external trigger.

IFPower
Selects the power trigger on the second intermediate frequency.

IMMediate
Selects the free run mode (= no trigger).

MASK
Selects the frequency mask trigger.

TDTRigger
Selects the time domain trigger.

TIME
Selects the time trigger.

VIDeo
Selects the video trigger. The video trigger is available for time domain measurements.

*RST: IMMediate

Example: `TRIG:SOUR EXT`
Selects the external trigger input as source of the trigger signal

Manual operation: See "Trigger Source Free Run" on page 74
See "Trigger Source External" on page 74

7.10.3 Other Referenced Commands

ABORt

This command aborts a current measurement and resets the trigger system.

Example: `ABOR;INIT:IMM`

Mode: all

Manual operation: See "Meas Start/Stop" on page 143

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`

Manual operation: See "Noise Source" on page 117

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.

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.

Manual operation: See "ASCII File Export" on page 140
See "Decim Sep" on page 140

INITiate<n>:CONMeas

This command restarts a measurement that has been stopped in single sweep mode.

The measurement is restarted at the first sweep point.

As opposed to `INITiate<n>[:IMMediate]`, this command does not reset traces in maxhold, minhold or average mode. Therefore it can be used to continue measurements using max hold or averaging functions.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

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.

Manual operation: See "Continue Single Sweep" on page 111

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

The sweep is started immediately.

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

Manual operation: See "Continuous Sweep" on page 111
See "Single Sweep" on page 111

INITiate<n>:ESPectrum

This command starts a Spectrum Emission Mask measurement.

Suffix:
<n> irrelevant

Example: `INIT:ESP`
Starts a Spectrum Emission Mask measurement.

Manual operation: See "Meas Start/Stop" on page 143

INITiate<n>[:IMMediate]

The command initiates a new measurement sequence.

With sweep count > 0 or average count > 0, this means a restart of the indicated number of measurements. With trace functions MAXHold, MINHold and AVERage, the previous results are reset on restarting the measurement.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

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.

Mode: all

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.

Manual operation: See "Save Evaluation List" on page 139
See "ASCII File Export" on page 140

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 6.4.9, "ASCII File Export Format", on page 188

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 351).

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.

OUTPut:IF[:SOURce] <Source>

This command selects the source of the IF output.

Parameters:

<Source> **IF**
Outputs the intermediate frequency.

OFF
Turns off the output of a signal.

VIDeo
Outputs the video signal (200 mV).

*RST: IF

Example: `OUTP:IF VID`
Selects the video signal for the IF output connector.

Manual operation: See "Video Output" on page 171

OUTPut:TRIGger <PortLevel>

This command selects level of the Trigger Out port. Thus, you can trigger an additional device via the external trigger port, for example.

Parameters:

<PortLevel> LOW | HIGH

*RST: LOW

Example: `OUTP:TRIG HIGH`

Manual operation: See "Trigger Out" on page 172

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`

7.11 Programming Examples

This chapter provides some examples for typical remote control programs.

7.11.1 Retrieving Trace Results

The example shows the results of a `TRACE:DATA` query for 2 channels with the following configuration:

```
PICH     0.16     (CC 4)    I     -7.0  dB
DATA     2.4      (CC 2)    Q     -10.0 dB
```

```
"INST:SEL MDO"    'Activate 1xEV-DO MS, implicitly, CDP relative is
     'displayed on Screen A and Result Summary is active
    'on Screen B; Mapping is set to I
"INIT:CONT OFF"    'Select single sweep
"CDP:MAPP Q"    'Select Q branch
"CDP:ORD HAD"    'Set order to Hadamard
"INIT;*WAI"    'Start measurement with synchronization
"TRAC? TRACE1"    'Read out CDP relative/Hadamard/Q
4, 0,-53.3,3,    4, 1,-52.3,0, 'Code 0 is quasi-inactive as PICH is set to I
4, 2,-16.1,1,    4, 3,-54.6,0, 'The DATA channel is distributed between
4, 4,-51.2,0,    4, 5,-55.1,0, 'the active codes 2.16, 6.16, 10.16, 14.16
4, 6,-16.4,1,    4, 7,-51.3,0, 'each with one quarter of the power, i.e.
4, 8,-52.4,0,    4, 9,-55.5,0, '10 dB - 6 dB = -16 dB.
4,10,-15.8,1,    4,11,-54.3,0,
4,12,-51.8,0,    4,13,-57.6,0,
4,14,-15.9,1,    4,15,-52.5,0

"CDP:ORD BITR"    'Set order to BitReverse
"TRAC? TRACE1"    'Read out CDP relative/BitReverse/Q
    'Sorting is changed in accordance with BitReverse.
4, 0,-53.3,3,    4, 8,-52.4,0, 'PICH is quasi-inactive
4, 4,-51.2,0    4,12,-51.8,0,
2, 2,-10.0,1,        'Channel 2.4 is now consolidated and
4, 1,-52.3,0,    4, 9,-55.5,0,    'displayed with accumulated power.
4, 5,-55.1,0,    4,13,-57.6,0,
4, 3,-54.6,0,    4,11,-54.3,0,
4, 7,-51.3,0,    4,15,-52.5,0

"CDP:OVER ON"    'Activate Overview mode
    'CDP relative on Screen A I branch
```

```
    'CDP relative on Screen B Q branch
"TRAC? TRACE1"    'Read out CDP relative of I branch
4, 0, -7.0,1,    4, 8,-54.2,0,    'PICH is active
4, 4,-56.7,0    4,12,-55.3.0,
4, 2,-48.3,3,    4,10,-48.1,3,    'DATA 2.4 is quasi-inactive
4, 6,-49.0,3,    4,14,-48.5,3,
4, 1,-54.4,0,    4, 9,-55.2,0,
4, 5,-51.2,0,    4,13,-54.3,0,
4, 3,-54.5,0,    4,11,-55.7,0,
4, 7,-56.6,0,    4,15,-52.3,0

"TRAC? TRACE2"    'Read out CDP relative of Q branch
4, 0,-53.3,3,    4, 8,-52.4,0,    'PICH is quasi-inactive
4, 4,-51.2,0    4,12,-51.8.0,
2, 2,-10.0,1,        'Channel 2.4 is now consolidated and
4, 1,-52.3,0,    4, 9,-55.5,0,    'displayed with accumulated power.
4, 5,-55.1,0,    4,13,-57.6,0,
4, 3,-54.6,0,    4,11,-54.3,0,
4, 7,-51.3,0,    4,15,-52.5,0

"INST:SEL MDO"
'Activate 1xEV-DO MS; implicitly, CDP relative is
     'displayed on Screen A and Result Summary is active
    'on Screen B; Mapping is set to I
"INIT:CONT OFF"    'Select single sweep
"CDP:MAPP Q"    'Select Q branch
"CDP:ORD HAD"    'Set order to Hadamard
"INIT;*WAI"    'Start measurement with synchronization
"TRAC? TRACE1"    'Read out CDP relative/Hadamard/Q
4, 0,-53.3,3,    4, 1,-52.3,0, 'Code 0 is quasi-inactive as PICH is set to I
4, 2,-16.1,1,    4, 3,-54.6,0, 'The DATA channel is distributed between
4, 4,-51.2,0,    4, 5,-55.1,0, 'the active codes 2.16, 6.16, 10.16, 14.16
4, 6,-16.4,1,    4, 7,-51.3,0, 'each with one quarter of the power, i.e.
4, 8,-52.4,0,    4, 9,-55.5,0, '10 dB - 6 dB = -16 dB.
4,10,-15.8,1,    4,11,-54.3,0,
4,12,-51.8,0,    4,13,-57.6,0,
4,14,-15.9,1,    4,15,-52.5,0

"CDP:ORD BITR"    'Set order to BitReverse
"TRAC? TRACE1"    'Read out CDP relative/BitReverse/Q
    'Sorting is changed in accordance with BitReverse.
4, 0,-53.3,3,    4, 8,-52.4,0, 'PICH is quasi-inactive
4, 4,-51.2,0    4,12,-51.8,0,
2, 2,-10.0,1,        'Channel 2.4 is now consolidated and
4, 1,-52.3,0,    4, 9,-55.5,0,    'displayed with accumulated power.
4, 5,-55.1,0,    4,13,-57.6,0,
4, 3,-54.6,0,    4,11,-54.3,0,
4, 7,-51.3,0,    4,15,-52.5,0

"CDP:OVER ON"    'Activate Overview mode
```

```
    'CDP relative on Screen A I branch
    'CDP relative on Screen B Q branch
"TRAC? TRACE1"    'Read out CDP relative of I branch
4, 0, -7.0,1,    4, 8,-54.2,0,    'PICH is active
4, 4,-56.7,0    4,12,-55.3.0,
4, 2,-48.3,3,    4,10,-48.1,3,    'DATA 2.4 is quasi-inactive
4, 6,-49.0,3,    4,14,-48.5,3,
4, 1,-54.4,0,    4, 9,-55.2,0,
4, 5,-51.2,0,    4,13,-54.3,0,
4, 3,-54.5,0,    4,11,-55.7,0,
4, 7,-56.6,0,    4,15,-52.3,0

"TRAC? TRACE2"    'Read out CDP relative of Q branch
4, 0,-53.3,3,    4, 8,-52.4,0,    'PICH is quasi-inactive
4, 4,-51.2,0    4,12,-51.8.0,
2, 2,-10.0,1,       'Channel 2.4 is now consolidated and
4, 1,-52.3,0,    4, 9,-55.5,0,    'displayed with accumulated power.
4, 5,-55.1,0,    4,13,-57.6,0,
4, 3,-54.6,0,    4,11,-54.3,0,
4, 7,-51.3,0,    4,15,-52.5,0
```

8 Status Reporting System of the 1xEV-DO Analysis

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 for the 1xEV-DO Analysis options (K84 and K85) are described.

The R&S FSV-K84/-K85 use the `STATus:QUEStionable:SYNC` register.

Although this register is provided by the base system, the 1xEV-DO Analysis options use different bits and definitions.

The STATus:QUEStionable:SYNC Register contains information on the error situation in the code domain analysis of the 1xEV-DO Analysis options. The bits can be queried with commands `STATus:QUEStionable:SYNC:CONDition?` and `STATus:QUEStionable:SYNC[:EVENt]?` on page 326.

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 3	These bits are not used.
4	K84 Preamble Current Slot missing This bit is set when the Preamble channel type is being investigated within the application, and there is no preamble in the current slot. The measurement results that can be read out for the Preamble channel type are not valid!
5	K84 Preamble Overall missing This bit is set when the Preamble channel type is being investigated within the application, and there is no preamble in at least one of the slots being examined. The measurement results that can be read out for the Preamble channel type are not valid if the analysis takes all slots into account. (CDP with Average, Peak Code Domain Error, Composite EVM)
6 to 14	These bits are not used
15	This bit is always 0.

List of Commands

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