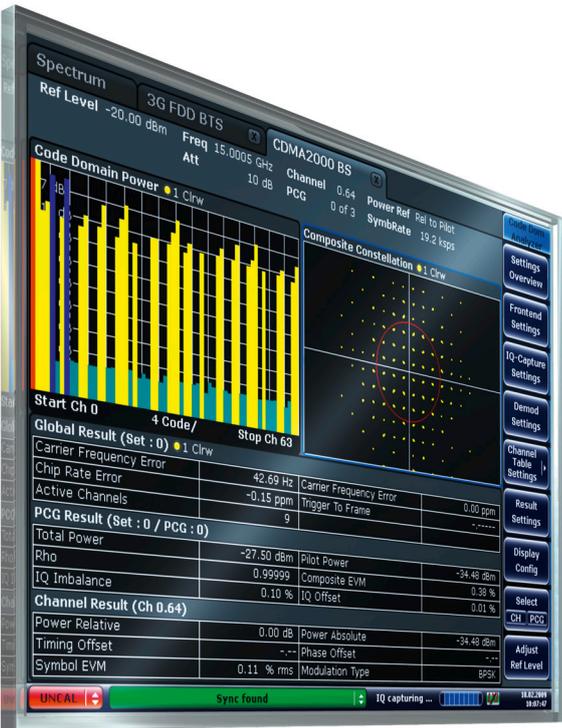


# R&S® FSV-K82/-K83

## CDMA2000 Analysis

### Operating Manual



1176.7626.02 – 05

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

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

This manual describes the following R&S FSV/FSVA models with firmware version 3.00 and higher:

- R&S®FSV4 (1321.3008K04)
- R&S®FSVA4 (1321.3008K05)
- R&S®FSV7 (1321.3008K07)
- R&S®FSVA7 (1321.3008K08)
- R&S®FSV13 (1321.3008K13)
- R&S®FSVA13 (1321.3008K14)
- R&S®FSV30 (1321.3008K30)
- R&S®FSVA30 (1321.3008K31)
- R&S®FSV40 (1321.3008K39/1321.3008K40)
- R&S®FSVA40 (1321.3008K41)

It also applies to the following R&S®FSV models. However, note the differences described in [Chapter 1.4, "Notes for Users of R&S FSV 1307.9002Kxx Models"](#), on page 9.

- R&S®FSV3 (1307.9002K03)
- R&S®FSV7 (1307.9002K07)
- R&S®FSV13 (1307.9002K13)
- R&S®FSV30 (1307.9002K30)
- R&S®FSV40 (1307.9002K39/1307.9002K40)

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Mühlhofstr. 15, 81671 München, Germany

Phone: +49 89 41 29 - 0

Fax: +49 89 41 29 12 164

Email: [info@rohde-schwarz.com](mailto:info@rohde-schwarz.com)

Internet: [www.rohde-schwarz.com](http://www.rohde-schwarz.com)

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Trade names are trademarks of the owners.

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

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# 1 Preface

## 1.1 Documentation Overview

The user documentation for the R&S FSV/FSVA 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	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 FSV/FSVA 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 FSV/FSVA is not included in the option manuals.

The following Operating Manuals are available for the R&S FSV/FSVA:

- R&S FSV/FSVA base unit; in addition:
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K7 Analog Demodulation and R&S FSV-K7S FM Stereo Measurements
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis 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 FSV/FSVA 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 FSV/FSVA and all available options. It describes both manual and remote operation. The online help is installed on the R&S FSV/FSVA 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.
<i>Input</i>	Input to be entered by the user is displayed in italics.
<a href="#">Links</a>	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.

## 1.4 Notes for Users of R&S FSV 1307.9002Kxx Models

Users of R&S FSV 1307.9002Kxx models should consider the following differences to the description of the newer R&S FSV/FSVA 1321.3008Kxx models:

- Functions that are based on the Windows7 operating system (e.g. printing or setting up networks) may have a slightly different appearance or require different settings on the Windows XP based models. For such functions, refer to the Windows documentation or the documentation originally provided with the R&S FSV instrument.
- The R&S FSV 1307.9002K03 model is restricted to a maximum frequency of 3 GHz, whereas the R&S FSV/FSVA1321.3008K04 model has a maximum frequency of 4 GHz.
- The bandwidth extension option R&S FSV-B160 (1311.2015.xx) is not available for the R&S FSV 1307.9002Kxx models. The maximum usable I/Q analysis bandwidth for these models is 28 MHz, or with option R&S FSV-B70, 40 MHz.

## 2 Introduction

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

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

This part of the documentation consists of the following chapters:

- [Chapter 3, "Test Setup for Base Station or Mobile Station Tests"](#), on page 11  
Describes the measurement setup for base station or mobile station tests.
- [Chapter 4, "Measurement Examples for the CDMA2000 BTS Analysis \(option K82\)"](#), on page 13  
Explains some basic 1xEV-DO base station tests.
- [Chapter 5, "Measurement Examples for the CDMA2000 MS Analysis \(option K83\)"](#), on page 24  
Explains some basic 1xEV-DO mobile station tests.
- [Chapter 6, "Instrument Functions of the CDMA2000 Analysis"](#), on page 35  
Describes the instrument functions of CDMA2000 Analysis.
- [Chapter 7, "Remote Commands of the CDMA2000 BTS Analysis"](#), on page 178  
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 CDMA2000 BTS Analysis \(option K82\)"](#), on page 315  
Contains device-specific error messages for R&S FSV-K82.
- [Chapter 9, "Glossary"](#), on page 316  
Contains an explanation of terms and abbreviations related to the code domain analysis.
- [Chapter 10, "Appendix"](#), on page 317

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

## 3 Test Setup for Base Station or Mobile Station Tests

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

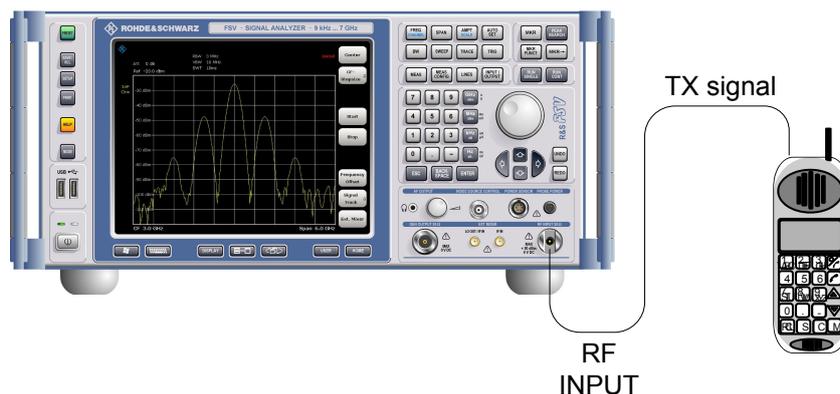
### NOTICE

#### Risk of instrument damage 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 station/mobile station to the RF input of the R&S FSV/FSVA. Use a power attenuator exhibiting suitable attenuation.



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

Maximum Power	Recommended external attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	0 to 10 dB
≥ 20 to 25 dBm	0 to 5 dB
≤ 20 dBm	0 dB

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

#### Presettings

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

## 4 Measurement Examples for the CDMA2000 BTS Analysis (option K82)

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

The following measurements are described:

- Chapter 4.2, "Measuring the Signal Channel Power", on page 15
- Chapter 4.3, "Measuring the Spectrum Emission Mask", on page 15
- Chapter 4.4, "Measuring the Relative Code Domain Power and Frequency Error", on page 17
- Chapter 4.5, "Measuring the Triggered Relative Code Domain Power", on page 19
- Chapter 4.6, "Measuring the Composite EVM", on page 21
- Chapter 4.7, "Measuring the Peak Code Domain Error and the RHO Factor", on page 22

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

### General Test Setup

The measurements are performed with the following units and accessories:

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

### 4.1 Test Setup for Base Station Tests

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

**NOTICE****Risk of damage to the instrument**

Before taking the instrument into operation, make sure that

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

Failure to comply may result in damage to the instrument

Connect the antenna output (or TX output) of the base station to the RF input of the R&S FSV/FSVA. Use a power attenuator exhibiting suitable attenuation.

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

Maximum Power	Recommended external attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	0 to 10 dB
≥ 20 to 25 dBm	0 to 5 dB
20 dBm	0 dB

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

**Presettings**

- Enter the external attenuation.
- Enter the reference level.
- Enter the center frequency.
- Set the trigger.

- If used, enable the external reference.
- Select the standard and the desired measurement.
- Set the PN offset.

## 4.2 Measuring the Signal Channel Power

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

### Test setup:

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

### Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: CDMA2000

### Procedure:

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Press the MODE key and activate the CDMA2000 BTS Analysis option.
3. Start the Power measurement
  - a) Press the MEAS key.
  - b) Press the "Power" softkey.
4. Set the center frequency to *878.49 MHz*.
5. Set the reference level.
  - a) Press the AMPT key and enter *0 dBm*.

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

## 4.3 Measuring the Spectrum Emission Mask

To detect spurious emissions such as harmonics or intermodulation products, the R&S FSV/FSVA offers a spectrum emission mask measurement. The measurement

compares the power against the spectrum emission mask in the range from -4 MHz to 4 MHz around the carrier. The exact measurement settings like the filter that is used depend on the Band Class parameter. For a list of supported bandclasses refer to the [Bandclass](#) softkey in the "Spectrum Emission Mask" menu.

**Test setup:**

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

**Signal generator settings:**

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

**Procedure:**

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Activate the CDMA2000 BTS Analysis mode.
  - a) Press the MODE key and activate the CDMA2000 BTS Analysis option.
3. Start the measurement.
  - a) Press the MEAS key.
  - b) Press the "Spectrum Emission Mask" softkey.
4. Set the center frequency.
  - a) Press the FREQ key and enter *878.49 MHz*.
5. Set the reference level.
  - a) Press the AMPT key and enter *0 dBm*.
6. Select a bandclass
  - a) Press the "Bandclass" softkey and select "BandClass 0: 800 MHz Cellular Band" from the list.

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

## 4.4 Measuring the Relative Code Domain Power and Frequency Error

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

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



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

### Test setup:

- Connect the RF output of the signal generator to the RF input of the R&S FSV/FSVA.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSV/FSVA to the reference output (REF) of the signal generator (coaxial cable with BNC connectors).

### Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: CDMA2000

### Procedure:

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Activate the "CDMA2000 BS Analysis" Mode.
  - a) Press the MODE key and select "CDMA2000 BS Analysis".
3. Enter the Code Domain Analyzer.
  - a) Press the MEAS key
  - b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement
  - a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
  - b) Select the "Code Domain Power" measurement.
5. Set the center frequency and the reference level.
  - a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.

- b) In the "Center Frequency" field enter 878.49 MHz.
- c) In the "Ref Level" field enter 10 dBm.
- d) Close the "Frontend Settings" dialog box.

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

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



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

For more information on the display concept refer to the [Display Config](#) softkey.

### Synchronization of the reference frequencies

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

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

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

### Behavior with deviating center frequency setting

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

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

Up to a frequency error of approximately 1.0 kHz, a Code Domain Power measurement on the R&S FSV/FSVA is still possible. A frequency error within this range causes no apparent difference in the accuracy of the Code Domain Power measurement.

In case of a frequency error of more than 1.0 kHz, the probability of incorrect synchronization increases. This is indicated by the "SYNC FAILED" error message. If the frequency error exceeds approximately 1.5 kHz, a Code Domain Power measurement cannot be performed. This is also indicated by the "SYNC FAILED" error message.
2. Reset the center frequency of the signal generator to *878.49 MHz*.



The center frequency of the DUT should not deviate by more than 1.0 kHz from that of the R&S FSV/FSVA.

## 4.5 Measuring the Triggered Relative Code Domain Power

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

### Test setup:

- Connect the RF output of the signal generator to the input of the R&S FSV/FSVA.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSV/FSVA 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 FSV/FSVA (EXT TRIGGER/GATE IN) to the external trigger output of the signal generator.

### Signal generator settings:

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

### Procedure:

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Activate the CDMA2000 BTS Analysis Mode.
  - a) Press the MODE key and select *CDMA2000 BS Analysis*.
3. Enter the Code Domain Analyzer.
  - a) Press the MEAS key
  - b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement.
  - a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
  - b) Select the tab for Screen A.

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

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

#### 4.5.1 Adjusting the Trigger Offset

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

Set an external trigger source and the trigger offset.

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

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

#### 4.5.2 Behaviour With the Wrong PN Offset

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

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

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

- ▶ In the "PN Offset" field enter *0*:

After adjusting it, the PN offset on the R&S FSV/FSVA is the same as that of the signal. In the result summary the "Trg To Frame" value is now shown correctly.

## 4.6 Measuring the Composite EVM

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

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

### Test Setup:

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

### Signal generator settings:

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

### Procedure:

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Activate the CDMA2000 BTS Analysis Mode.
  - a) Press the MODE key and select CDMA2000 BTS Analysis.
3. Enter the Code Domain Analyzer.
  - a) Press the MEAS key
  - b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement.
  - a) Press the "Display Config" softkey.
  - b) Select the tab for Screen A.
  - c) Select the "Composite EVM" measurement.
5. Set the center frequency and the reference level.

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

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

## 4.7 Measuring the Peak Code Domain Error and the RHO Factor

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSV/FSVA. 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 the base spreading factor. The unit of the result is dB.

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

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

### Test setup:

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

**Signal generator settings:**

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

**Procedure:**

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

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

**Displaying RHO**

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

No specific measurement is required to get the value for RHO. The R&S FSV/FSVA 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 Measurement Examples for the CDMA2000 MS Analysis (option K83)

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

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

### General Test Setup

The measurements are performed with the following units and accessories:

- An R&S FSV/FSVA equipped with the CDMA2000 MS Analysis option.
- R&S SMU signal generator equipped with option SMU-B9/B10/B11 baseband generator and SMUK46 CDMA2000 incl. 1xEVDV.
- 1 coaxial cable, 50  $\Omega$ , approximately 1 m, N connector
- 2 coaxial cables, 50  $\Omega$ , approximately 1 m, BNC connector
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### 5.1 Test Setup for Base Station or Mobile Station Tests

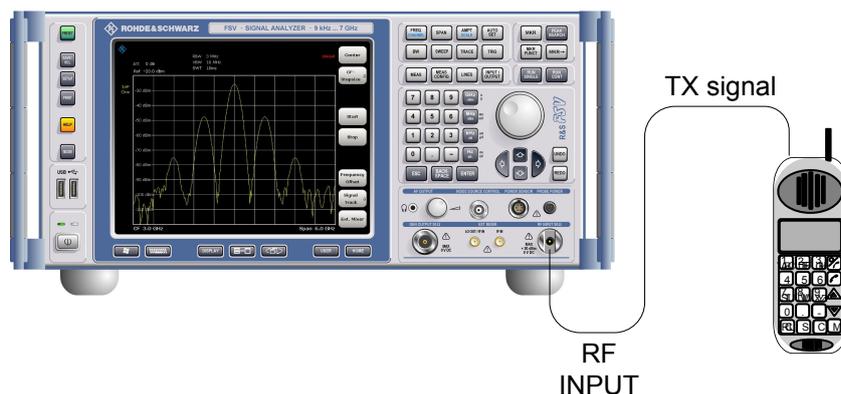
This section describes the default settings of the R&S FSV/FSVA, if it is used as a CDMA2000 base or mobile station tester. Before starting the measurements, the R&S FSV/FSVA has to be configured correctly and supplied with power as described in the Quick Start Guide, "Preparing For Use". Furthermore,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

**NOTICE****Risk of instrument damage 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 station/mobile station to the RF input of the R&S FSV/FSVA. Use a power attenuator exhibiting suitable attenuation.



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

Maximum Power	Recommended external attenuation
≥ 55 to 60 dBm	35 to 40 dB
≥ 50 to 55 dBm	30 to 35 dB
≥ 45 to 50 dBm	25 to 30 dB
≥ 40 to 45 dBm	20 to 25 dB
≥ 35 to 40 dBm	15 to 20 dB
≥ 30 to 35 dBm	10 to 15 dB
≥ 25 to 30 dBm	0 to 10 dB
≥ 20 to 25 dBm	0 to 5 dB
≤ 20 dBm	0 dB

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

#### Presettings

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

## 5.2 Measuring the Signal Channel Power

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

#### Test setup:

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

#### Signal generator settings:

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

#### Procedure:

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Press the MODE key and activate the CDMA2000 MS Analysis option.
3. Start the Power measurement

- a) Press the MEAS key.
  - b) Press the "Power" softkey.
4. Set the center frequency to *833.49 MHz*.
  5. Set the reference level.
    - a) Press the AMPT key and enter *0 dBm*.

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

### 5.3 Measuring the Spectrum Emission Mask

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

#### Test setup:

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

#### Signal generator settings:

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

#### Procedure:

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Activate the "CDMA2000 MS Analysis" mode.
  - a) Press the MODE key and activate the "CDMA2000 MS Analysis" option.
3. Start the measurement.
  - a) Press the MEAS key.
  - b) Press the "Spectrum Emission Mask" softkey.
4. Set the center frequency.
  - a) Press the FREQ key and enter *878.49 MHz*.

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

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

## 5.4 Measuring the Relative Code Domain Power and Frequency Error

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

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



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

### Test setup:

- Connect the RF output of the signal generator to the RF input of the R&S FSV/FSVA.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSV/FSVA to the reference output (REF) of the signal generator (coaxial cable with BNC connectors).

### Signal generator settings:

Frequency: 833.49 MHz

Level: 0 dBm

Standard: CDMA2000

### Procedure:

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.

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

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

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



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

For more information on the display concept refer to [Chapter 6.1.1, "Display Concept"](#), on page 36.

### Synchronization of the reference frequencies

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

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

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

### Behavior with deviating center frequency setting

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

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

Up to a frequency error of approximately 1.0 kHz, a Code Domain Power measurement on the R&S FSV/FSVA is still possible. A frequency error within this range causes no apparent difference in the accuracy of the Code Domain Power measurement.

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

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



The center frequency of the DUT should not deviate by more than 1.0 kHz from that of the R&S FSV/FSVA.

## 5.5 Measuring the Triggered Relative Code Domain Power

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

### Test setup:

- Connect the RF output of the signal generator to the input of the R&S FSV/FSVA.
- Connect the reference input (EXT REF) on the rear panel of the R&S FSV/FSVA 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 FSV/FSVA (EXT TRIGGER/GATE IN) to the external trigger output of the signal generator.

### Signal generator settings:

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

### Procedure:

1. Set the R&S FSV/FSVA to its default state.

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

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

### 5.5.1 Adjusting the Trigger Offset

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

Set an external trigger source and the trigger offset.

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

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

## 5.6 Measuring the Composite EVM

The Error Vector Magnitude (EVM) describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSV/FSVA. In the I-Q plane, the error vector represents the ratio of the measured signal to the ideal signal on sym-

bol level. The error vector is equal to the square root of the ratio of the measured signal to the reference signal. The result is given in %.

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

**Test Setup:**

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

**Signal generator settings:**

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

**Procedure:**

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Activate the "CDMA2000 MS Analysis" Mode.
  - a) Press the MODE key and select "CDMA2000 MS Analysis".
3. Enter the Code Domain Analyzer.
  - a) Press the MEAS key
  - b) Press the "Code Domain Analyzer" softkey.
4. Start the measurement.
  - a) Press the "Display Config" softkey.
  - b) Select the tab for Screen A.
  - c) Select the "Composite EVM" measurement.
5. Set the center frequency and the reference level.
  - a) Open the "Frontend Settings" dialog box.
  - b) In the "Center Frequency" field enter 833.49 MHz.
  - c) In the "Ref Level" field enter 10 dBm.
  - d) Close the "Frontend Settings" dialog box.

6. Set an external trigger source.
  - a) Open the "IQ Capture Settings" dialog box.
  - b) Set the "Trigger Source" option to "External".

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

## 5.7 Measuring the Peak Code Domain Error and the RHO Factor

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSV/FSVA. 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 the base spreading factor. The unit of the result is dB.

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

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

### Test setup:

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

### Signal generator settings:

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

**Procedure:**

1. Set the R&S FSV/FSVA to its default state.
  - a) Press the PRESET key.
2. Activate the "CDMA2000 MS Analysis" Mode.
  - a) Press the MODE key and activate the "CDMA2000 MS Analysis" option.
3. Enter the Code Domain Analyzer.
  - a) Press the MEAS key.
  - b) Press the "Code Domain Analyzer" softkey.
4. Start the Peak Code Domain Error measurement.
  - a) Press the "Display Config" softkey
  - b) Select the tab for Screen A.
  - c) Select the "Peak Code Domain Error" option and start the measurement.
5. Set the center frequency and the reference level.
  - a) Open the "Frontend Settings" dialog box.
  - b) In the "Center Frequency" field enter *833.49 MHz*.
  - c) In the "Ref Level" field enter *0 dBm*.
  - d) Close the "Frontend Settings" dialog box.
6. Set an external trigger source.
  - a) Open the "IQ Capture Settings" dialog box.
  - b) Set the "Trigger Source" option to "External".

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

**Displaying RHO**

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

No specific measurement is required to get the value for RHO. The R&S FSV/FSVA 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.

## 6 Instrument Functions of the CDMA2000 Analysis

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

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

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

The CDMA2000 BTS Analysis option supports the radio configurations 1 to 5, i.e. all radio configurations with a single carrier (1X) are supported. Accordingly, IS95A/B signals conforming to radio configurations 1&2 can be measured with the CDMA2000 BTS Analysis option. In addition to the measurements called for by the CDMA2000 standard in the code domain, the CDMA2000 BTS Analysis option features measurements in the spectral range such as channel power, adjacent channel power, occupied bandwidth and spectrum emission mask with predefined settings.

### To open the CDMA2000 settings menu

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

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

For details on the measurement types, see [Chapter 6.1, "Measurements and Result Displays"](#), on page 35.

• <a href="#">Measurements and Result Displays</a> .....	35
• <a href="#">Menu and Softkey Description for CDA Measurements</a> .....	57
• <a href="#">Softkeys and Menus for RF Measurements (K82)</a> .....	97
• <a href="#">Further Information</a> .....	151

### 6.1 Measurements and Result Displays

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

• <a href="#">Display Concept</a> .....	36
• <a href="#">Configuring the Display</a> .....	37
• <a href="#">Code Domain Analysis Results</a> .....	38
• <a href="#">RF Measurement Results</a> .....	54

## 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:

Ref Level	-10.00 dBm	Freq	3.5 GHz	Channel	0.64	Power Ref	Rel to Pilot
		Att	10 dB	PCG	0 of 3	SymbRate	19 ksps

Label	Description
Ref level	Reference level defined in " <a href="#">Ref Level</a> " on page 62
Freq	Center frequency defined in " <a href="#">Center</a> " on page 62
Att	Attenuation
Channel	Channel with spreading factor
PCG	Slot
Power Ref	Reference used for power results
SymbRate	Symbol rate of the current channel



### Overview of all measurement settings

You can easily display an overview of all measurement settings using the [Settings Overview](#) softkey.

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

### Screen focus

One of the screens has a blue frame indicating the focus. The screen focus can be changed just like in the base system. The settings for trace statistics and markers can only be changed for the focussed screen. Furthermore, the focussed screen can be set to full screen (for details see the R&S FSV/FSVA 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 236
4. Select the required result diagram to be displayed in the selected screen.  
**Tip:** SCPI command: `CALCulate<n>:FEED` on page 182
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**

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

• Code Domain Power.....	38
• Channel Table.....	40
• Power vs PCG.....	41
• Result Summary.....	42
• Code Domain Error Power.....	44
• Composite EVM (RMS).....	45
• Peak Code Domain Error.....	46
• Channel Constellation.....	47
• EVM vs Symbol.....	48
• Composite Constellation.....	49
• Power vs Symbol.....	50
• Channel Bitstream.....	50
• Mag Error vs Chip.....	52
• Phase Error vs Chip.....	52
• Symbol Magnitude Error.....	53
• Symbol Phase Error.....	54

**6.1.3.1 Code Domain Power**

This result display determines the power of all channels and plots it in a diagram. The x-axis represents the channel (code) number, which corresponds to the base spreading factor. Each bar in the diagram represents one code. The order of the codes depends on the "Code Order" on page 76. The y-axis is a logarithmic level axis that shows the power of each channel.

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

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

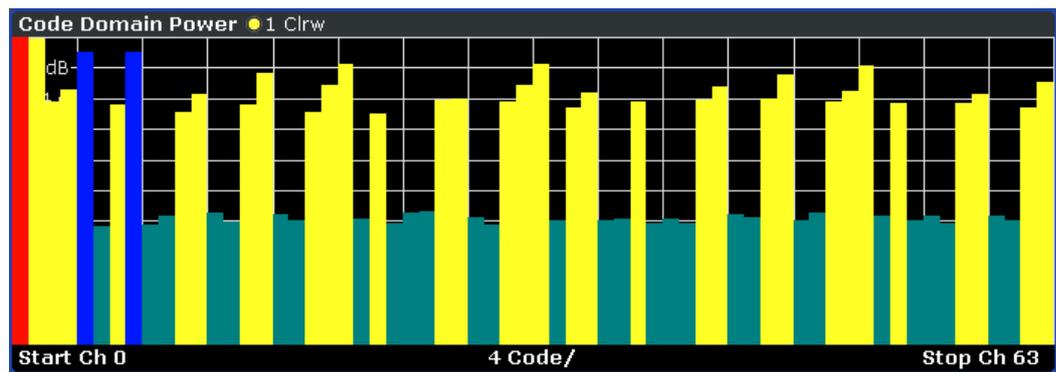


Figure 6-1: Code Domain Power Result Display in Hadamard code sorting order

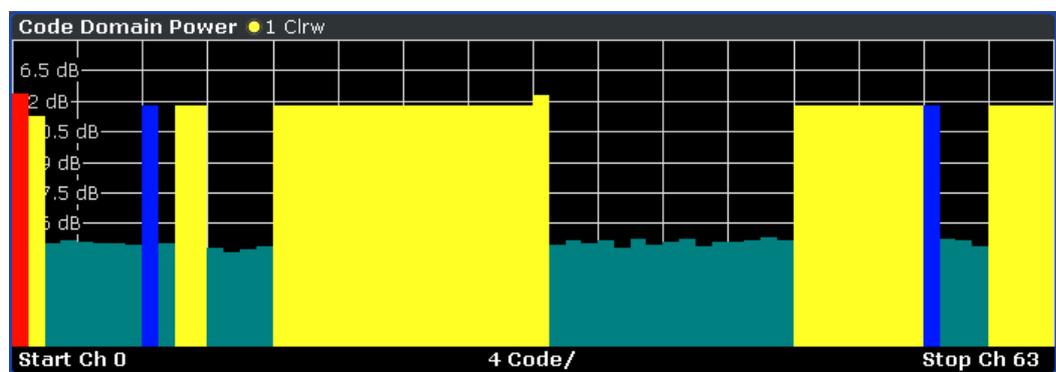


Figure 6-2: Code Domain Power Result Display in Hadamard code sorting order

Active and inactive data channels are defined via the "Inactive Channel Threshold" on page 66. The power values of the active and unassigned channels are shown in different colors. In addition, codes with alias power can occur. These codes obtain power components originating either from a spreading factor higher than the base spreading factor or from the own and/or another antenna as a result of transmit diversity.

The following colors are defined:

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



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

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

### Remote control

In remote control, this display configuration is selected using

`CALC:FEED 'XPOW:CDP'`; see [CALCulate<n>:FEED](#) on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES? CDP` or `CALC:MARK:FUNC:CDP:RES? CDP`; see [CALCulate<n>:MARKer<m>:FUNCTION:CDPower\[:BTS\]:RESult?](#) on page 184.

### 6.1.3.2 Channel Table

This result display shows all channels of the signal. The sorting of the channels is according to channel type, i.e. special channels like F-PICH, F-SYNC etc. first, then data channels (CHAN) and last inactive channels (always shown as '---'). Within a group, channels are sorted according to the spreading factor and then according to code number, also in ascending order. Within the code number, first active, then inactive channels are listed. The selected channel is marked in red. Active and inactive data channels are defined via the ["Inactive Channel Threshold"](#) on page 66.

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

The measurement evaluates the total signal over a single PCG.

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

Figure 6-3: Channel Table result display

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

Parameter	Description
Channel Type	Shows the channel type ('---' for inactive channels)
Walsh Chan.SF	Channel number including the spreading factor (in the form <Channel>.<SF>).
Symb Rate/ksps	Symbol rate with which the channel is transmitted (9.6 kbps to 307.2 kbps).
RC	Radio configuration.
State	Status display. Unassigned codes are identified as inactive channels.

Parameter	Description
Pwr dBm/Pwr dB	Specification of the absolute (dBm) and relative (dB) power of the channel. Relative powers are either referred to the pilot channel or the total power of the signal.
T Offs/ns and Ph Offs/mrad	Timing/phase offset between this channel and the pilot channel (enabled via the "Demod Settings (BTS mode)" on page 70 dialog box.  If enabled, the maximum value of the timing/phase offset is displayed together with the associated channel in the last two lines. Since the timing/phase offset values of each active channel can be either negative or positive, the absolute values are compared and the maximum is displayed with the original sign.

### Remote control

In remote control, this display configuration is selected using

`CALC:FEED 'XTIM:CDP:ERR:CTABLE'`; see `CALCulate<n>:FEED` on page 182.

#### 6.1.3.3 Power vs PCG

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

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



For signals with enabled power control, use the default reference power setting. For details refer to "Power Reference" on page 76.

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

You can set the number of PCGs by means of the "Capture Length" on page 64 field.

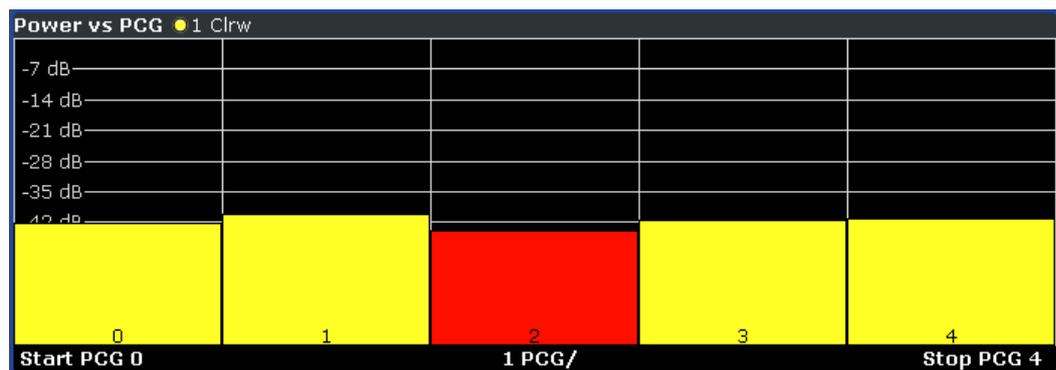


Figure 6-4: Power vs PCG result display

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



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

### Remote control

In remote control, this display configuration is selected using  
`CALC:FEED 'XTIM:CDP:PVSLOT'`; see `CALCulate<n>:FEED` on page 182.

#### 6.1.3.4 Result Summary

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

The table is divided as follows:

- Global results
- PCG results
- Channel results

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

Figure 6-5: Result Summary result display

### Remote control

In remote control, this display configuration is selected using  
`CALC:FEED 'XTIM:CDP:ERR:SUMMARY'`; see `CALCulate<n>:FEED` on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see  
`CALCulate<n>:MARKer<m>:FUNCTION:CDPower[:BTS]:RESult?` on page 184.

### Global Results

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

- Carrier Frequency Error  
 Shows the frequency error referred to the center frequency of the R&S FSV/FSVA. The absolute frequency error is the sum of the frequency error of the R&S FSV/FSVA and that of the device under test. Frequency differences between the transmitter and receiver of more than 1.0 kHz impair synchronization of the Code Domain Power measurement. If at all possible, the transmitter and the receiver

should be synchronized. For further information on correcting the frequency error refer to [Chapter 4.4, "Measuring the Relative Code Domain Power and Frequency Error"](#), on page 17 .

The frequency error is available in the units both Hz and ppm referred to the carrier frequency.

- **Chip Rate Error**  
Shows the chip rate error (1.2288 Mcps) in ppm. A large chip rate error results in symbol errors and, therefore, in possible synchronization errors for Code Domain Power measurements. This measurement result is also valid if the R&S FSV/FSVA could not synchronize to the CDMA2000 signal.
- **Trigger to Frame**  
Reflects the time offset from the beginning of the recorded signal section to the start of the first PCG. In case of triggered data recording, this corresponds to the timing offset:  
*frame trigger (+ trigger offset) – start of first PCG*  
If it was not possible to synchronize the R&S FSV/FSVA to the CDMA2000 signal, this measurement result is meaningless. For the Free Run trigger mode, dashes are displayed.
- **Active Channels**  
Specifies the number of active channels found in the signal. Detected data channels as well as special channels are regarded as active. With transmit diversity, the result applies to the selected "[Antenna Diversity](#)" on page 72. No value is displayed in both the Min and Max columns.

### PCG Results

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

- **Total Power**  
Shows the total power of the signal.
- **Pilot Power**  
Shows the power of the pilot channel. If antenna 2 is selected, the power of the F-TDPICH is displayed, in all other cases that of the F-PICH. For details on antenna selection refer to "[Antenna Diversity](#)" on page 72.
- **RHO**  
Shows the quality parameter RHO. According to the CDMA2000 standard, RHO is the normalized, correlated power between the measured and the ideally generated reference signal. When RHO is measured, the CDMA2000 standard requires that only the pilot channel be supplied.
- **Composite EVM**  
The composite EVM is the difference between the test signal and the ideal reference signal. For further details refer to the [Chapter 6.1.3.6, "Composite EVM \(RMS\)"](#), on page 45 result display.
- **IQ Imbalance/Offset**  
Shows the IQ imbalance and the DC offset of the signal in %.

### Channel results

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

- Power Relative  
Shows the channel power of the selected channel and PCG. The result depends on the selected Code Power, the Power Reference and absolute channel power.
- Power Absolute  
Shows the absolute channel power of the selected channel and PCG
- Timing Offset  
Shows the timing offset between the selected channel and the pilot channel.
- Phase Offset  
Shows the phase offset between the selected channel and the pilot channel.
- Symbol EVM  
Shows the peak or mean value of the EVM measurement result. For further details refer to the [Chapter 6.1.3.9, "EVM vs Symbol"](#), on page 48 result display.
- Modulation  
BTS mode only:  
Displays the modulation type of the channel and PCG: BPSK, QPSK, 8PSK, or 16QAM.
- Mapping  
Indicates the selected branch (I or Q)

#### 6.1.3.5 Code Domain Error Power

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

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

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

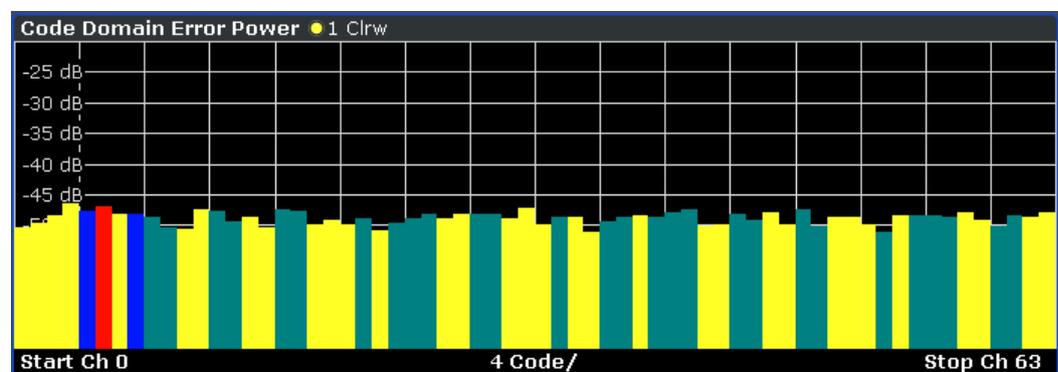


Figure 6-6: Code Domain Error Power result display in Hadamard code sorting order

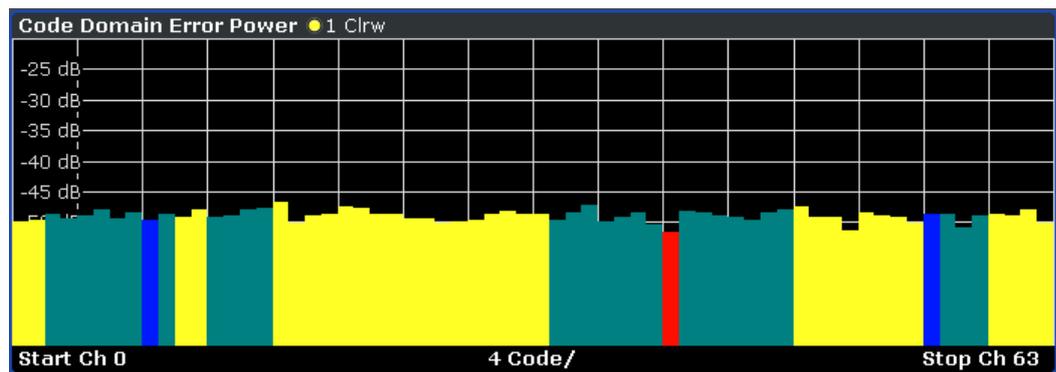


Figure 6-7: Code Domain Error Power result display in BitReverse code sorting order

Active and inactive data channels are defined via the "Inactive Channel Threshold" on page 66. The power values of the active and inactive channels are shown in different colors. In addition, codes with alias power can occur. These codes obtain power components originating either from a spreading factor higher than the base spreading factor or from the own and/or another antenna as a result of transmit diversity.

The following colors are defined:

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



If codes with alias power are displayed, set the highest base spreading factor available in the "Base Spreading Factor" on page 70 field.

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

### Remote control

In remote control, this display configuration is selected using  
`CALC:FEED 'XPOW:CDEP'`; see `CALCulate<n>:FEED` on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?`; see  
`CALCulate<n>:MARKer<m>:FUNCTION:CDPower[:BTS]:RESULT?` on page 184.

#### 6.1.3.6 Composite EVM (RMS)

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

The measurement evaluates the total signal over the entire period of observation. The selected PCG is displayed red. You can set the number of PCGs in the "Capture Length" on page 64 field.



Figure 6-8: Composite EVM result display

Only the channels detected as being active are used to generate the ideal reference signal. If a channel is not detected as being active, e.g. on account of low power, the difference between the test signal and the reference signal and therefore the composite EVM is very large. Distortions also occur if unassigned codes are wrongly given the status of "active channel". To obtain reliable measurement results, select an adequate channel threshold via the "Inactive Channel Threshold" on page 66 field.

### Remote control

In remote control, this display configuration is selected using

`CALC:FEED 'XTIM:CDP:MACCuracy'`; see `CALCulate<n>:FEED` on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?`

`MACCuracy`; see `CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?` on page 184.

### 6.1.3.7 Peak Code Domain Error

The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. That means that in this result display the [Code Domain Error Power](#) is projected onto the code domain at a specific base spreading factor. In the diagram, each bar of the x-axis represents one PCG. The y-axis represents the error power.

You can select the base spreading factor in the "Base Spreading Factor" on page 70 field and the number of evaluated PCGs in the "Capture Length" on page 64 field.

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

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

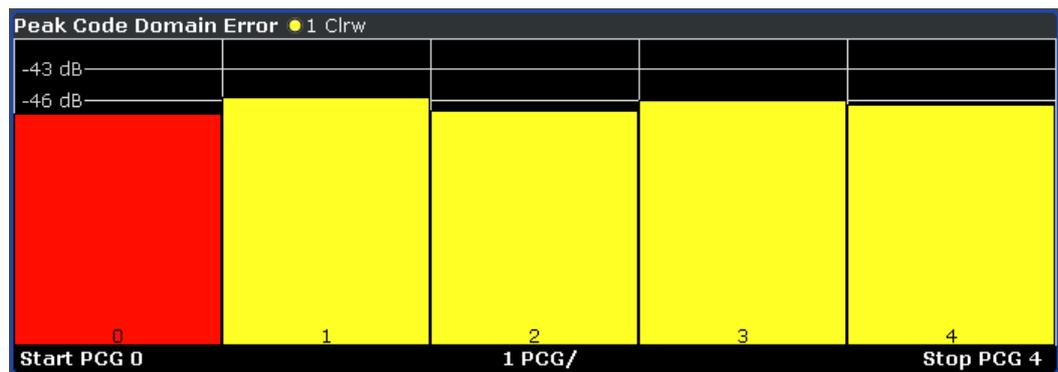


Figure 6-9: Peak Code Domain Error result display

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. 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 66 field.

#### Remote control

In remote control, this display configuration is selected using

`CALC:FEED 'XTIM:CDP:ERR:PCDomain'`; see [CALCulate<n>:FEED](#) on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES? PCDError;` see [CALCulate<n>:MARKer<m>:FUNCTION:CDPower\[:BTS\]:RESULT?](#) on page 184.

#### 6.1.3.8 Channel Constellation

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

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the [Select](#) softkey.

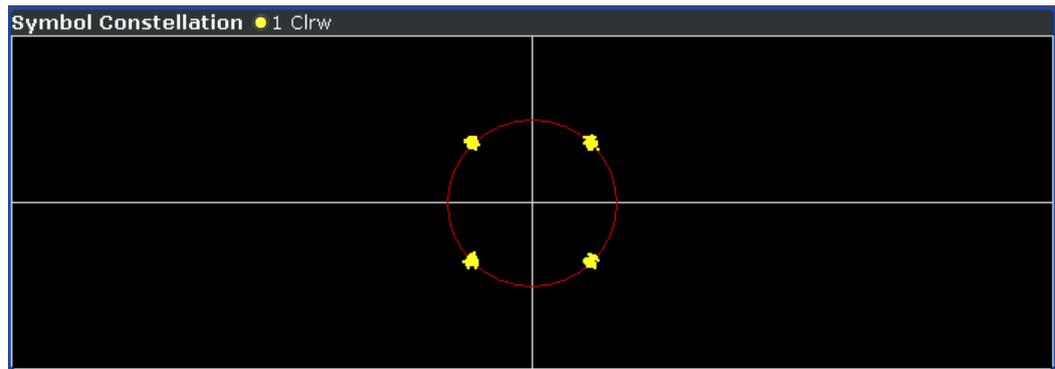


Figure 6-10: Channel Constellation result display for QPSK-modulated signal

The R&S FSV-K82 supports BPSK, QPSK, 8PSK and 16QAM modulation schemes. The modulation scheme itself depends on the channel type. Refer to [Chapter 6.4.1.1, "Relationship Between Channel and Modulation Type"](#), on page 154 for further information.

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

#### Remote control

In remote control, this display configuration is selected using

`CALC:FEED 'XTIM:CDP:SYMB:CONSTellation'`; see [CALCulate<n>:FEED](#) on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?`; see [CALCulate<n>:MARKer<m>:FUNCTION:CDPower\[:BTS\]:RESult?](#) on page 184.

#### 6.1.3.9 EVM vs Symbol

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

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the ["Select"](#) on page 79 softkey.

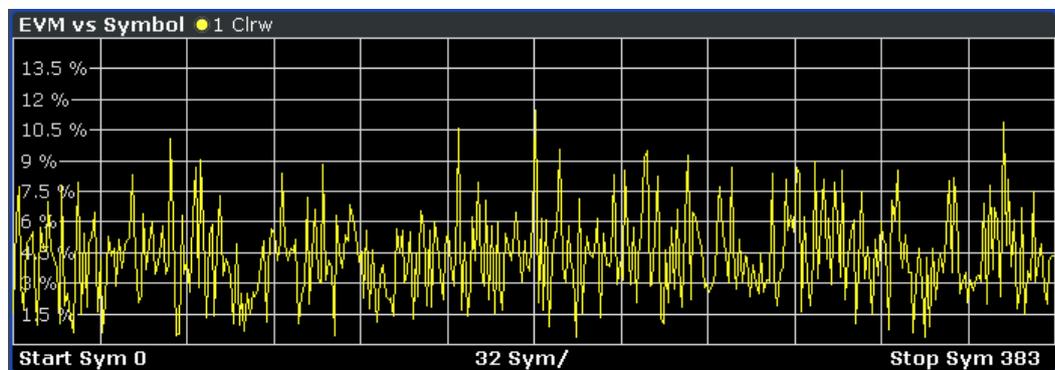


Figure 6-11: EVM vs Symbol result display

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

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

"Number of chips in one PCG = 1536"

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

"K = 1 for Antenna Diversity = OFF"

"K = 2 for Antenna Diversity = OFF"

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

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

### Remote control

In remote control, this display configuration is selected using

`CALC:FEED 'XTIM:CDP:SYMB:EVM'`; see [CALCulate<n>:FEED](#) on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see

[CALCulate<n>:MARKer<m>:FUNCTION:CDPower\[:BTS\]:RESult?](#) on page 184.

#### 6.1.3.10 Composite Constellation

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

The measurement evaluates the total signal over a single PCG.

You can select a specific PCG with the "Select" on page 79 softkey.

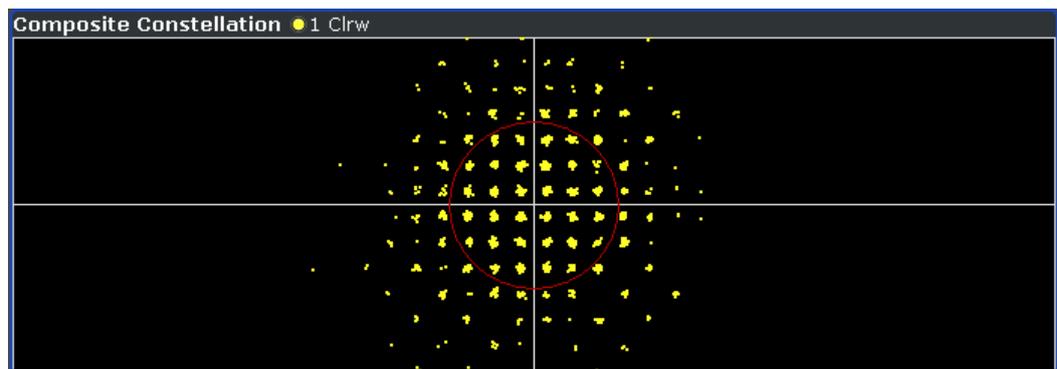


Figure 6-12: Composite Constellation result display

### Remote control

In remote control, this display configuration is selected using

`CALC:FEED 'XTIM:CDP:COMP:CONSTellation'`; see [CALCulate<n>:FEED](#)

on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see [CALCulate<n>:MARKer<m>:FUNCTION:CDPower\[:BTS\]:RESult?](#) on page 184.

### 6.1.3.11 Power vs Symbol

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

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the "Select" on page 79 softkey.

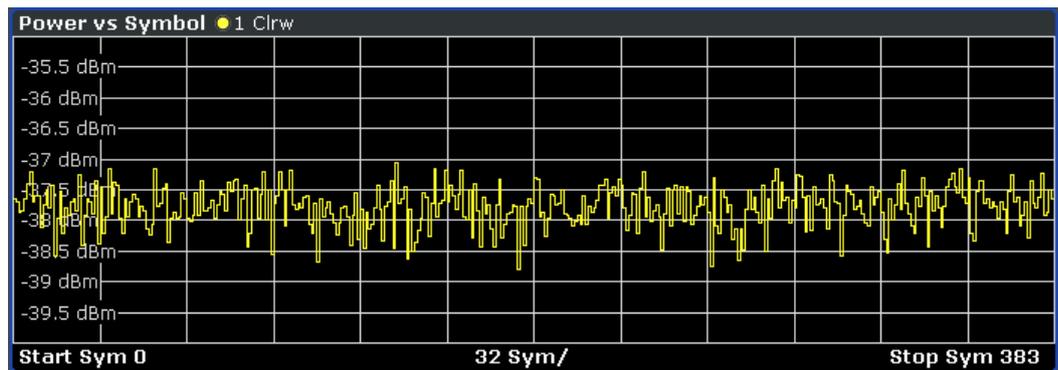


Figure 6-13: Power vs Symbol result display

### Remote control

In remote control, this display configuration is selected using `CALC:FEED 'XTIM:CDP:PVSymbol'` ; see [CALCulate<n>:FEED](#) on page 182.

To query these results, use the command `CALC:MARK:FUNC:CDP:RES?` ; see [CALCulate<n>:MARKer<m>:FUNCTION:CDPower\[:BTS\]:RESult?](#) on page 184.

### 6.1.3.12 Channel Bitstream

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

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the [Select](#) softkey.

Bitstream Table ● 1 Clrw																
	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
0	10	00	01	01	00	11	11	10	00	11	10	11	10	01	01	00
32	00	11	11	10	10	11	11	11	11	11	01	01	00	00	01	11
64	11	10	10	01	11	10	11	10	11	01	01	00	10	01	10	11
96	11	00	01	10	10	00	00	10	00	00	01	00	01	11	01	00
128	11	00	10	01	01	11	10	10	00	11	10	01	10	00	01	01
160	10	11	10	10	01	01	10	10	10	10	11	01	01	10	10	00
192	10	10	01	00	00	10	01	10	01	11	01	01	11	00	00	01
224	10	11	10	00	01	00	10	11	00	10	10	01	10	00	11	01

Figure 6-14: Bitstream result display

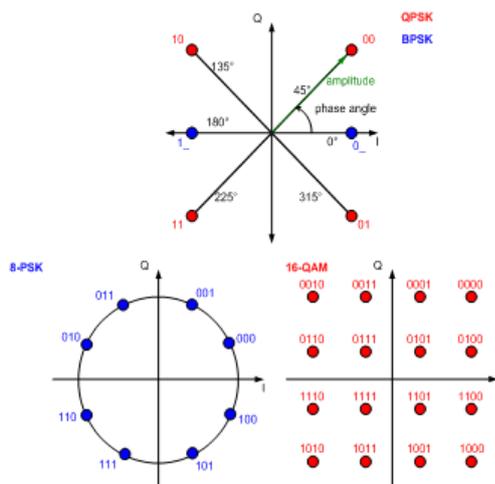
Select a specific symbol using the MKR key. If you enter a number, the marker jumps to the selected symbol. If there are more symbols than the screen is capable of displaying, use the marker to scroll inside the list.

Depending on the spreading factor (symbol rate) of the channel, a power control group may contain a minimum of 12 and a maximum of 384 symbols. In case of an active transmit diversity (Antenna Diversity) the values reduce to the half. Depending on the modulation type, a symbol consists of the following bits:

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

In accordance with the radio configuration and the channel type, there are BPSK and QPSK modulated channels in the CDMA2000 system. For details refer to [Chapter 6.4.1.1, "Relationship Between Channel and Modulation Type"](#), on page 154.

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



### Remote control

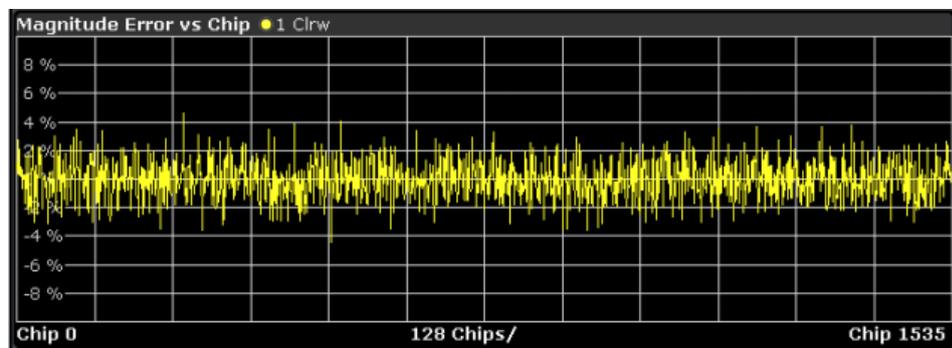
In remote control, this display configuration is selected using

`CALC:FEED 'XTIM:CDP:BSTReam'`; see [CALCulate<n>:FEED](#) on page 182.

To query these results, use the command `TRACe<1...4>[:DATA]? ABITstream<1...4>`.

#### 6.1.3.13 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 selected PCG. 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.



### Remote control

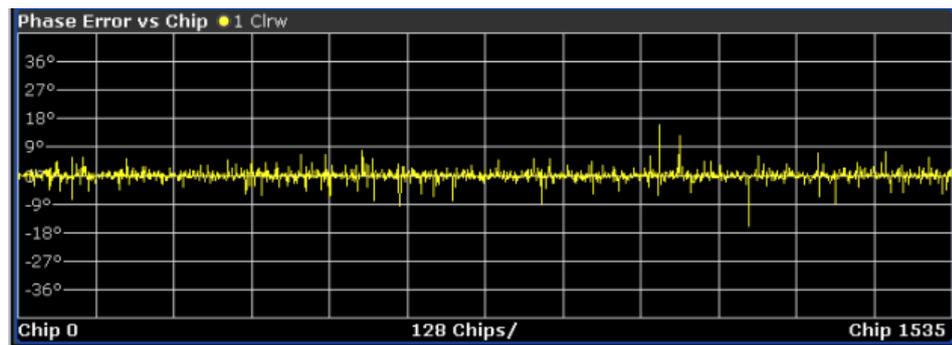
In remote control, this display configuration is selected using

`CALC:FEED "XTIM:CDP:CHIP:MAGN"`; see [CALCulate<n>:FEED](#) on page 182.

To query these results, use the command `TRACe<1...4>[:DATA]? TRACE<1...4>`.

#### 6.1.3.14 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 selected PCG. 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  $+180^\circ$  to  $-180^\circ$ .



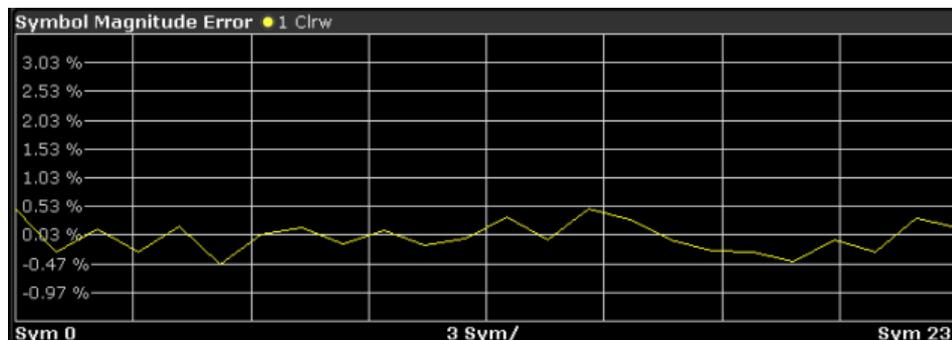
### Remote control

In remote control, this display configuration is selected using  
`CALC:FEED "XTIM:CDP:CHIP:PHAS"`; see `CALCulate<n>:FEED` on page 182.

To query these results, use the command `TRACe<1...4>[:DATA]? TRACE<1...4>`.

### 6.1.3.15 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 PCG 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.



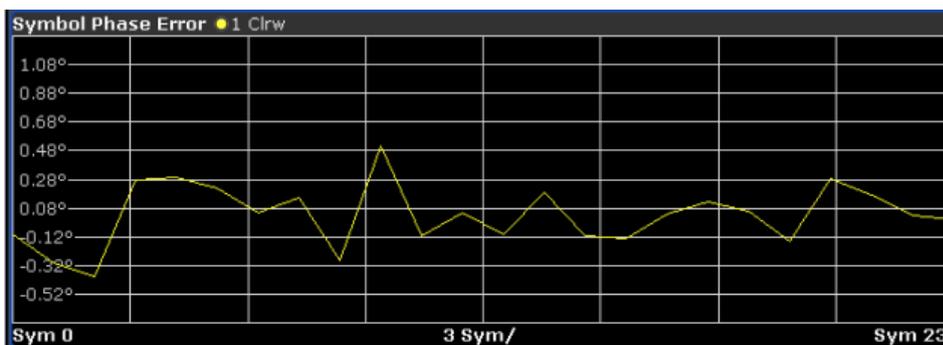
### Remote control

In remote control, this display configuration is selected using  
`CALC:FEED "XTIM:CDP:SYMB:EVM:MAGN"`; see `CALCulate<n>:FEED`  
 on page 182.

To query these results, use the command `TRACe<1...4>[:DATA]? TRACE<1...4>`.

### 6.1.3.16 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 PCG 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.



#### Remote control

In remote control, this display configuration is selected using  
`CALC:FEED "XTIM:CDP:SYMB:EVM:PHAS"`; see `CALCulate<n>:FEED`  
 on page 182.

To query these results, use the command `TRACe<1...4>[:DATA]? TRACE<1...4>`.

## 6.1.4 RF Measurement Results

- [Signal Channel Power](#).....54
- [Adjacent Channel Power](#).....55
- [Spectrum Emission Mask](#).....55
- [Occupied Bandwidth](#).....56
- [Complementary Cumulative Distribution Function \(CCDF\)](#).....56

### 6.1.4.1 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 CDMA2000 requirements. Beneath the measurement screen the bandwidth and the associated channel power are displayed. The other screen elements match that of the screen of the Spectrum Analyzer mode. The default settings are in accordance with the 3GPP2 specifications.

Setting	Default Value
Frequency Span	2 MHz
ACP Standard	1xEV-DO0 MC1

Setting	Default Value
Number of adjacent channels	0
Adjacent Channel Power	On

For details on the softkeys of the Signal Channel Power measurement refer to the [Power](#) softkey in the "Measurement" menu.

#### 6.1.4.2 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](#) softkey in the "Measurement" menu.

#### 6.1.4.3 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](#) softkey in the "Measurement" menu.

#### 6.1.4.4 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](#) in the "Measurement" menu.

#### 6.1.4.5 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](#) in the "Measurement" menu.

## 6.2 Menu and Softkey Description for CDA Measurements

This chapter describes the menus and softkeys available in CDMA2000 BTS Analysis mode for CDA measurements. For RF measurements, the softkeys are described in [Chapter 6.3, "Softkeys and Menus for RF Measurements \(K82\)"](#), on page 97.

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

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

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

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



### Importing and Exporting I/Q Data

As of firmware version 1.60, I/Q data can be imported from a file for processing in R&S FSV-K82/-K83, 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.

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### 6.2.1 Softkeys of the Code Domain Analyzer Menu

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

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### 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.

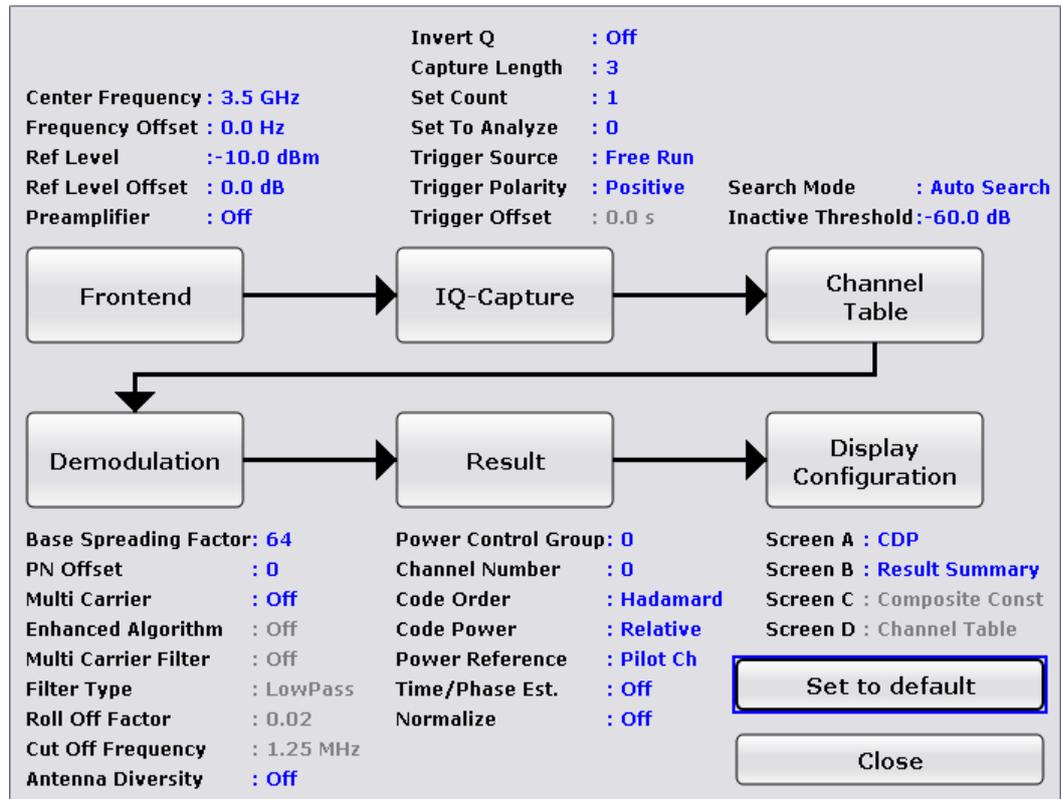


Figure 6-15: Settings overview in CDMA2000 BTS mode (K82)

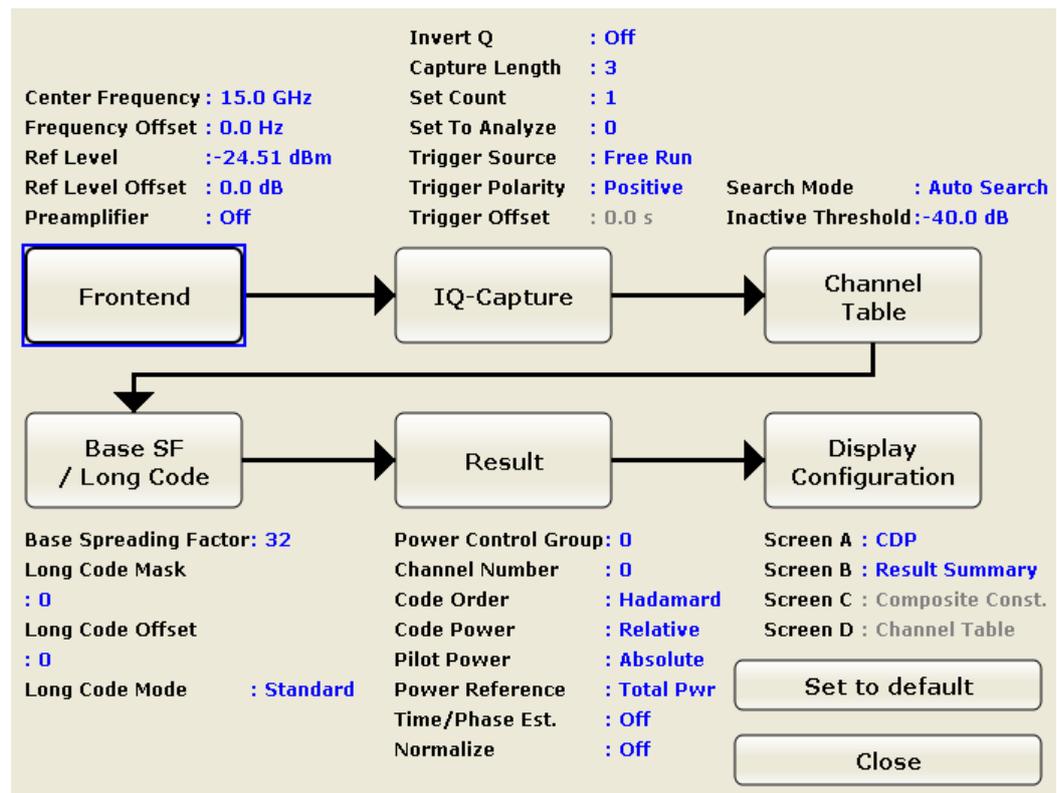


Figure 6-16: Settings overview in CDMA2000 MS mode (K83)

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

- "Frontend Settings" on page 61
- "IQ Capture Settings" on page 63
- "Demod Settings (BTS mode)" on page 70
- "Base SF/Long Code (MS mode)" on page 73
- "Channel Table Settings" on page 65
- "Result Settings" on page 74
- "Display Config" on page 77

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:

The image shows a software interface with two main sections: 'Frequency Settings' and 'Level Settings'.  
**Frequency Settings:**  
 - Center Frequency: 15.0 GHz  
 - Frequency Offset: 0.0 Hz  
**Level Settings:**  
 - Ref Level: -10.0 dBm  
 - Ref Level Offset: 0.0 dB  
 - Preamplifier: Off (radio button selected)  
 - Buttons: 'Adjust Ref Level' and 'Close'

**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:  $\text{span}_{\min}/2 \leq f_{\text{center}} \leq f_{\text{max}} - \text{span}_{\min}/2$

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

$f_{\text{max}}$  and  $\text{span}_{\min}$  are specified in the data sheet.

If the bandwidth extension option R&S FSV-B160 is active, center frequencies above 7 GHz are not available.

Remote command:

[\[SENSe:\] FREQuency:CENTer](#) on page 270

**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 272

**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 239

#### 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  $\pm 200$  dB in 0.1 dB steps.

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 240

#### 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 306

#### Adjust Ref Lvl ← Frontend Settings

Defines the optimal reference level for the current measurement automatically.

Remote command:

`[SENSe:]ADJust:LEVel` on page 254

#### IQ Capture Settings

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

The screenshot shows the "IQ Capture Settings" dialog box with the following configuration:

- Common Settings:**
  - Invert Q:  On  Off
- Data Capture Settings:**
  - Capture Length: 3
  - Set Count: 1
  - Set To Analyze: 0
- Trigger Settings:**
  - Trigger Source:  External  Free Run
  - Trigger Polarity:  Positive  Negative
  - Trigger Offset: 0.0 s

A "Close" button is located at the bottom right of the dialog.

#### 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 249

#### **Capture Length ← IQ Capture Settings**

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

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

The default value is 3.

Remote command:

[SENSe:]CDPower:IQLength on page 245

#### **Set Count ← IQ Capture Settings**

Defines the number of consecutive sets to be stored in the instrument's IQ memory. One set consists of 64 PCGs. The R&S FSV/FSVA can capture up to 31360 PCGs (about 26 seconds) in a single sweep, i.e. the possible value range is from 1 to 490 sets.

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

Remote command:

[SENSe:]CDPower:SET:COUNT on page 250

#### **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 on page 250

#### **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 309

#### **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 309

### 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 309

[SENSe:]SWEep:EGATe:POLarity on page 285

### 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:	<p>Sweep starts earlier (pre-trigger)</p> <p>Only possible for span = 0 (e.g. I/Q Analyzer mode) and gated trigger switched off</p> <p>Maximum allowed range limited by the sweep time:  <math>\text{pretrigger}_{\text{max}} = \text{sweep time}</math></p> <p>When using the R&amp;S Digital I/Q Interface (R&amp;S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples.</p> <p>See the R&amp;S Digital I/Q Interface(R&amp;S FSV-B17) description in the base unit.</p>

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 308

### Channel Table Settings

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

**Predefined Channel Table Settings**

Channel Search Mode  Predefined  
 Auto Search

Inactive Channel Threshold

Channel Tables	
	RECENT
✓	BPC_RC4
	MPC_RC1
	MPC_RC4
	TDC_RC4

Both Paths, 6 Channels, RC4

Close

Predefined channel tables allow you to customize measurements very quickly and easily. They are included in the option by default and contain settings according to specific standards. For details on the predefined channel tables refer to [Chapter 6.4.1, "Predefined Channel Tables"](#), on page 151. In addition, new channel tables can be created and saved to be used in measurements.

#### Channel Search Mode ← Channel Table Settings

Defines the kind of channel table used for the measurement.

- "Auto"            The Auto Search mode scans the whole code domain, including all permissible symbol rates and channel numbers, for active channels. The automatic search provides an overview of the channels contained in the signal. If channels are not detected as being active, change the threshold (see ["Inactive Channel Threshold"](#) on page 66) or select the Predefined channel search type.
- "Predef"           Performs the code domain measurement on the basis of the active predefined channel table. All channels of a channel table are assumed to be active. For further details also refer to the ["Channel Tables"](#) on page 67 field and the [Chapter 6.4.1, "Predefined Channel Tables"](#), on page 151 .

Remote command:

[CONFigure:CDPower\[:BTS\]:CTABLE\[:STATe\]](#) on page 227

[CONFigure:CDPower\[:BTS\]:CTABLE:SElect](#) on page 231

#### Inactive Channel Threshold ← Channel Table Settings

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

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

Remote command:

[\[SENSe:\]CDPower:ICThreshold](#) on page 245

### Channel Tables ← Channel Table Settings

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

An active channel table must describe the supplied signal completely, also in regard to the transmit diversity (see ["Antenna Diversity"](#) on page 72).

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

The following channel tables are available by default:

"RECENT"	Contains the last configuration used before switching from "Auto Search" to "Predefined"
"BPC_RC4, MPC_RC1, MPC_RC4, TDC_RC4"	Channel tables for BTS mode (K82); configured according to a specific standard
"EACHOP, RCCCHOP, RTCHOP3, RTCHOP5"	Channel tables for MS mode (K83); configured according to a specific standard

Remote command:

[CONFigure:CDPower\[:BTS\]:CTABLE:CATalog?](#) on page 227

### New / Copy / Edit ← Channel Table Settings

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

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

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

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

Note that changes are never saved automatically. Save your channel tables before ending the application ([Save](#) softkey). For more information see [Chapter 6.4.2, "Working with Channel Tables"](#), on page 155.

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 FSV/FSVA:

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

**Channel Table Settings**

Name:

Description:

Channel Type	Walsh Ch.SF	Sym Rate /ksps	RC	Power /dB	State	Domain Conflict
F-PICH	---	19.2	---	0.00	On	
F-SYNC	---	19.2	---	0.00	On	
F-PCH	1.64	19.2	---	0.00	On	
F-TDPICH	---	9.6	---	0.00	On	
CHAN	9.128	9.6	3-5	0.00	On	
CHAN	10.128	9.6	3-5	0.00	On	
CHAN	11.128	9.6	3-5	0.00	On	
CHAN	15.128	9.6	3-5	0.00	On	
CHAN	17.128	9.6	3-5	0.00	On	
CHAN	25.128	9.6	3-5	0.00	On	

**Add Channel ← New / Copy / Edit ← Channel Table Settings**

Inserts a new channel below the selected one. For a description of the parameters of the channel refer to the "New / Copy / Edit" on page 67 softkey. The default values for a new channel are:

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

The R&S FSV/FSVA automatically checks for conflicts between two active channels.

Remote command:

[CONFigure:CDPower\[:BTS\]:CTABLE:DATA](#) on page 228

**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 66). The measurement results are applied to the active channel table. The active channel table is overwritten without further notice.

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

**Sort ← New / Copy / Edit ← Channel Table Settings**

Sorts the table according to the following criteria (in the specified order):

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

**Save ← New / Copy / Edit ← Channel Table Settings**

Saves the table under its specified name in the xml-format. If you edit a channel table and want to keep the original channel table, change the name of the edited channel table before saving it.

**Cancel ← New / Copy / Edit ← Channel Table Settings**

Closes the dialog box and returns to the "Channel Table Settings" dialog box. Changes applied to the channel table are lost.

**Reload ← New / Copy / Edit ← Channel Table Settings**

Reloads the original content of the copied channel table.

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

**Delete ← Channel Table Settings**

Deletes the selected channel table. The currently active channel table cannot be deleted.

**Restore Default Tables ← Channel Table Settings**

Restores the predefined channel tables (see [Chapter 6.4.1, "Predefined Channel Tables"](#), on page 151 ) to their factory-set values. Existing channel tables with the same name as default channel tables are replaced by this action. In this way, you can undo unintentional overwriting.

**Demod Settings (BTS mode)**

This softkey opens the "Demodulation Settings" dialog box.

**Common Settings**

Base Spreading Factor  64  128

PN Offset   
(only for external trigger)

**Multi Carrier Settings**

Multi Carrier  On  Off

Enhanced Algorithm  On  Off

Multi Carrier Filter  On  Off

Filter Type  Lowpass  RRC

Roll-Off Factor

Cut Off Frequency

**Antenna Settings**

Antenna Diversity  Off  
 Antenna 1  
 Antenna 2

Close

**Base Spreading Factor ← Demod Settings (BTS mode)**

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

Remote command:

[\[SENSe:\]CDPower:SFACTOR](#) on page 250

#### **PN Offset ← Demod Settings (BTS mode)**

Specifies the Pseudo Noise (PN) offset of the base station. In a CDMA2000 system, the PN offset is used to distinguish the base stations.

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

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

Remote command:

[\[SENSe:\]CDPower:PNOFFset](#) on page 248

#### **Multi Carrier ← Demod Settings (BTS mode)**

Activates or deactivates the Multi Carrier mode. The mode improves the processing of multi carrier signals. It allows the measurement on one carrier out of a multi carrier signal.

Remote command:

[CONFigure:CDPower\[:BTS\]:MCArrier \[:STATe\]](#) on page 231

#### **Enhanced Algorithm ← Demod Settings (BTS mode)**

Activates or deactivates the enhanced algorithm that is used for signal detection on multi-carrier signals. This algorithm slightly increases the calculation time.

If both the Enhanced Algorithm and the "Multi Carrier Filter" on page 71 are deactivated, the multi carrier mode is automatically switched off.

Remote command:

[CONFigure:CDPower\[:BTS\]:MCArrier:MALGo](#) on page 233

#### **Multi Carrier Filter ← Demod Settings (BTS mode)**

Activates or deactivates the usage of a filter for signal detection on multi-carrier signals.

If both the "Enhanced Algorithm" on page 71 and the Multi Carrier Filter are deactivated, the multi carrier mode is automatically switched off.

Remote command:

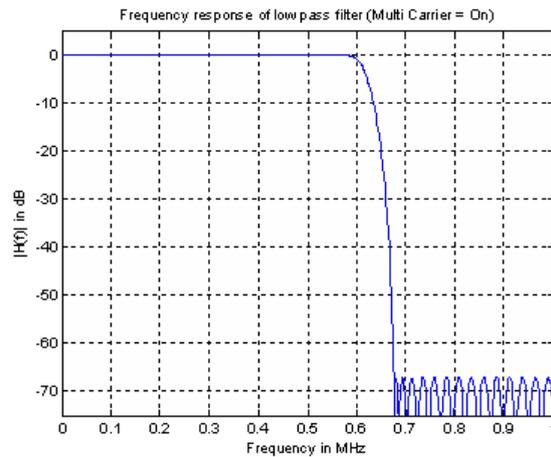
[CONFigure:CDPower\[:BTS\]:MCArrier:FILTer \[:STATe\]](#) on page 232

#### **Filter Type ← Demod Settings (BTS mode)**

Selects the filter type if "Multi Carrier Filter" on page 71 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 72 and the "Cut Off Frequency" on page 72.

Remote command:

`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 233

#### Roll-Off Factor ← Demod Settings (BTS mode)

Defines the roll-off factor of the RRC filter. The roll-off factor defines the slope of the filter curve and therefore the excess bandwidth of the filter. Possible values are between 0.01 and 0.99 in 0.01 steps. The default value is 0.02.

This parameter is available for the RRC filter.

Remote command:

`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 233

`CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF` on page 232

#### Cut Off Frequency ← Demod Settings (BTS mode)

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

This parameter is available for the RRC filter.

Remote command:

`CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE` on page 233

`CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFFrequency` on page 232

#### Antenna Diversity ← Demod Settings (BTS mode)

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

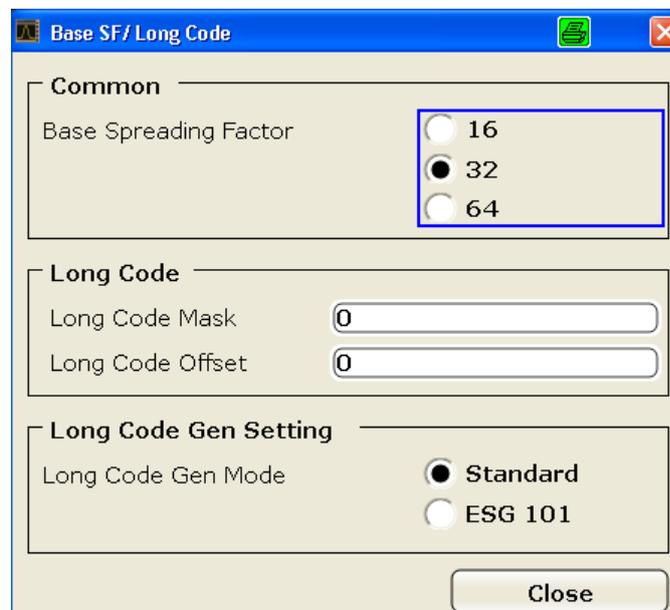
"Antenna 1"	<p>The signal of antenna 1 is fed in. The pilot channel (F-PICH) with channel number 0 and spreading factor 64 (0.64) is required. If a channel table is used in the measurement (see Channel Table), it must contain the pilot channel (F-PICH), but must not contain the transmit diversity pilot channel (F-TDPICH). As reference for the code power (Power Reference), PICH is used.</p>
"Antenna 2"	<p>The signal of antenna 2 is fed in. The transmit diversity pilot channel (F-TDPICH) with channel number 16 and spreading factor 128 (16.128) is required. If a channel table is used in the measurement (see Channel Table), it must contain the transmit diversity pilot channel (F-TDPICH), but must not contain the pilot channel (F-PICH). As reference for the code power (Power Reference), F-TDPICH is used.</p>
"Off"	<p>The aggregate signal from both antennas is fed in. The pilot channels of both antennas are required. If a channel table is used in the measurement (see Channel Table), it must contain both the transmit diversity pilot channel (F-TDPICH) and the pilot channel (F-PICH). As reference for the code power (Power Reference), F-PICH is used.</p>

Remote command:

[SENSe:]CDPower:ANTenna on page 244

### Base SF/Long Code (MS mode)

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



### Base Spreading Factor ← Base SF/Long Code (MS mode)

Sets the base spreading factor. Possible values are 16, 32, 64.

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

Remote command:

[SENSe:]CDPower:SFACTOR on page 250

#### **Long Code Mask ← Base SF/Long Code (MS mode)**

Defines the long code mask of the mobile in hexadecimal form. The value range is from 0 to 4FFFFFFFFF.

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

Remote command:

[SENSe:]CDPower:LCODE:MASK on page 246

#### **Long Code Offset ← Base SF/Long Code (MS mode)**

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

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

The chips offset is calculated as follows:

$$t_{\text{SinceStartGPS}} * 1.2288 \text{ MChips/s}$$

where  $t_{\text{SinceStartGPS}}$  is defined in seconds

Remote command:

[SENSe:]CDPower:LCODE:OFFSet on page 246

#### **Long Code Gen Mode ← Base SF/Long Code (MS mode)**

Selects the mode of the long code generation.

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

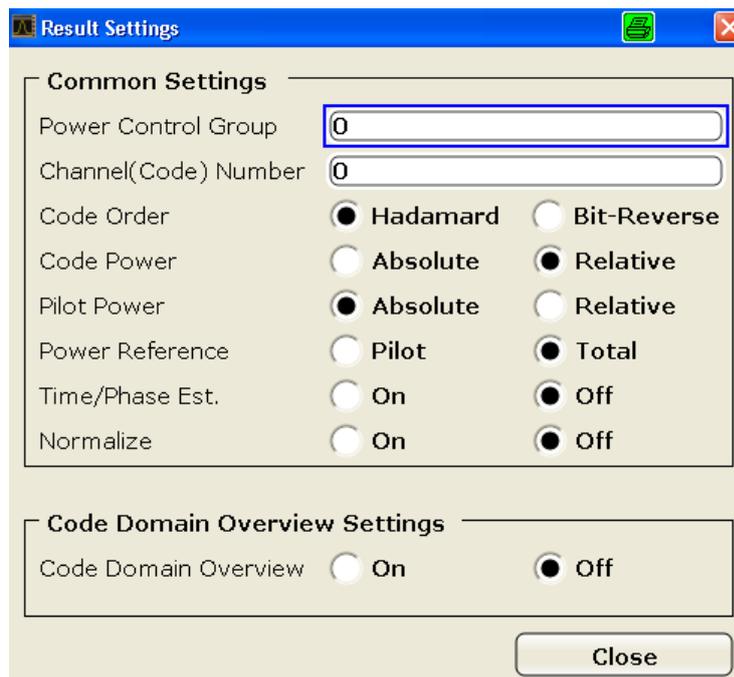
"ESG 101"      The Agilent ESG option 101 long code is used; in this case, only signals from that generator can be analysed.

Remote command:

[SENSe:]CDPower:LCODE:MODE on page 247

#### **Result Settings**

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



#### Power Control Group ← Result Settings

In some measurements it is possible to highlight the data of a specific PCG. Select the PCG on which to put the focus on in this field. The range of the value depends on the "Capture Length" on page 64 defined in the IQ Capture Settings dialog box. Therefore the range is (0 to Capture Length-1).

The defined value is valid for any measurement which takes PCGs into account (for further information see also the "Select" on page 79 softkey). The selected PCG is highlighted in red on the screen (as opposed to the others which are displayed in yellow).

Remote command:

[SENSe:]CDPower: SLOT on page 251

#### Channel (Code) Number ← Result Settings

The entry in this field corresponds to a specific code to be examined. The valid range is from 0 to BSF-1. The base spreading factor (BSF) is either 64 or 128 depending on the setting of the "Base Spreading Factor" on page 70 field. It can not be edited via this field. The selected channel is marked red in the Channel Table. In the Code Domain Power display and the Code Domain Error Power display, all codes belonging to this channel are marked red.

The defined value is valid for any measurement that takes a selected channel into account. For further information see the "Select" on page 79 softkey.

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

- in the Code Domain Power and Code Domain Error result displays, the rotary knob always selects the adjacent channel. The position of the adjacent channel in the diagram depends on the "Code Order" on page 76.
- in the Channel Table result display, the rotary knob is used to scroll through the list.

Remote command:

[SENSe:]CDPower:CODE on page 244

### Code Order ← Result Settings

Sets the sorting of the channels for the Code Domain Power and Code Domain Error result displays.

<p>Hadamard order:</p>	<p>By default, the codes are sorted in Hadamard order, i.e. in ascending order.</p> <p>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.</p> <p><i>Example (for base spreading factor of 64):</i> 0.64, 1.64, 2.64, ..., 63.64.</p>
<p>Bit-Reverse order:</p>	<p>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.</p> <p><i>Example (for base spreading factor of 64):</i> 0.64, 32.64, 16.64, 48.64, 8.64, 40.64, ..., 15.64, 47.64, 31.64, 63.64</p>

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 247

### Code Power ← Result Settings

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

- Absolute scaling shows the code power in dBm.
- Relative scaling shows the code power in dB.  
You can set the reference in the "Power Reference" on page 76 field.

Remote command:

CALCulate<n>:FEED on page 182

### Pilot Power (MS mode only) ← Result Settings

Displays the pilot power in absolute or relative values.

Remote command:

[SENSe:]CDPower:PPReference on page 249

### Power Reference ← Result Settings

Determines the reference power for relative power measurements.

<p>Pilot Channel</p>	<p>By default, the reference power is the power of the pilot channel. Which pilot channel is used as the reference depends on the "Antenna Diversity" on page 72.</p>
<p>Total Power</p>	<p>The power is measured over one PCG. The reference power is the total power of the signal for the corresponding PCG.</p>

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

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

*Example (theoretical):*

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

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

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

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

Remote command:

[\[SENSe:\]CDPower:PREference](#) on page 249

#### **Time/Phase Estimation ← 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 251

#### **Normalize ← Result Settings**

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

Remote command:

[\[SENSe:\]CDPower:TPMeas](#) on page 251

#### **Code Domain Overview (MS mode only) ← Result Settings**

If enabled, both branches are displayed at once for a code domain power measurement (see [Chapter 6.1, "Measurements and Result Displays"](#), on page 35). Otherwise, only the selected branch and the result summary are displayed.

Remote command:

[\[SENSe:\]CDPower:OVERview](#) on page 248

#### **Display Config**

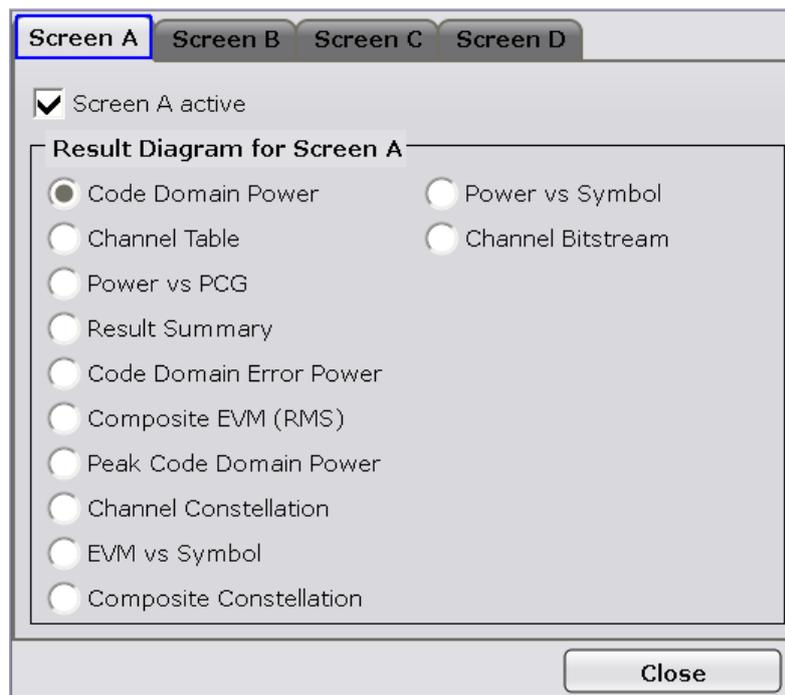
This softkey opens the "Display Config" dialog box to select the result display configuration.

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

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

For details on the displayed results and default settings refer to [Chapter 6.1.3, "Code Domain Analysis Results"](#), on page 38.

You can configure the result displays via the ["Result Settings"](#) on page 74 dialog box.



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

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

For details see [Chapter 6.1.2, "Configuring the Display"](#), on page 37.

### Select

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

For details on the effects of this softkey, refer to ["Channel \(Code\) Number"](#) on page 75 and ["Power Control Group"](#) on page 75.

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

- [Chapter 6.1.3.1, "Code Domain Power"](#), on page 38
- [Chapter 6.1.3.2, "Channel Table"](#), on page 40
- [Chapter 6.1.3.4, "Result Summary"](#), on page 42
- [Chapter 6.1.3.5, "Code Domain Error Power"](#), on page 44
- [Chapter 6.1.3.8, "Channel Constellation"](#), on page 47
- [Chapter 6.1.3.9, "EVM vs Symbol"](#), on page 48
- [Chapter 6.1.3.10, "Composite Constellation"](#), on page 49
- [Chapter 6.1.3.11, "Power vs Symbol"](#), on page 50
- [Chapter 6.1.3.12, "Channel Bitstream"](#), on page 50

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

- [Chapter 6.1.3.3, "Power vs PCG"](#), on page 41
- [Chapter 6.1.3.4, "Result Summary"](#), on page 42
- [Chapter 6.1.3.8, "Channel Constellation"](#), on page 47

- Chapter 6.1.3.9, "EVM vs Symbol", on page 48
- Chapter 6.1.3.11, "Power vs Symbol", on page 50
- Chapter 6.1.3.12, "Channel Bitstream", on page 50

Remote command:

[SENSe:]CDPower:CODE on page 244

[SENSe:]CDPower:SLOT on page 251

[SENSe:]CDPower:MAPPING on page 245

## 6.2.2 Softkeys of the Frequency Menu

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

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

Center.....	80
CF Stepsize.....	80
Frequency Offset.....	80

### 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:  $\text{span}_{\min}/2 \leq f_{\text{center}} \leq f_{\max} - \text{span}_{\min}/2$

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

$f_{\max}$  and  $\text{span}_{\min}$  are specified in the data sheet.

If the bandwidth extension option R&S FSV-B160 is active, center frequencies above 7 GHz are not available.

Remote command:

[SENSe:]FREQuency:CENTer on page 270

### 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 270

### 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 272

### 6.2.3 Softkeys of the Amplitude Menu

The following chapter describes all softkeys available in the "Amplitude" menu in "CDMA2000 BTS Analysis" mode for CDA measurements. For RF measurements, see Chapter 6.3.4, "Softkeys of the Amplitude Menu", on page 130.

Ref Level.....	81
Scale.....	81
L Auto Scale Once.....	81
L Y-Axis Maximum.....	81
L Y-Axis Minimum.....	82
Ref Level Offset.....	82
Preamp On/Off.....	82
RF Atten Manual/Mech Att Manual.....	82
RF Atten Auto/Mech Att Auto.....	83
EI Atten On/Off.....	83
EI Atten Mode (Auto/Man).....	83
Input (AC/DC).....	84

#### 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 239

#### 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 238

#### 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 241

#### 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 242

#### 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  $\pm 200$  dB in 0.1 dB steps.

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 240

#### 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 306

#### 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; "EI 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 (R&S FSV with option R&S FSV-B25 or R&S FSVA: 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:

$$\text{level}_{\text{mixer}} = \text{level}_{\text{input}} - \text{RF attenuation}$$

**Note:** As of firmware version 1.61, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVL" 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 300

#### **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 300

#### **EI 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 [EI 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 305

#### **EI 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 [EI 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 305

[INPut:EATT](#) on page 305

### Input (AC/DC)

Toggles the RF input of the R&S FSV/FSVA 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 301

## 6.2.4 Softkeys of the Sweep Menu

The following chapter describes all softkeys available in the "Sweep" menu in "CDMA2000 BTS Analysis" mode for CDA measurements. For RF measurements, see [Chapter 6.3.6, "Softkeys of the Sweep Menu"](#), on page 143.

<a href="#">Continuous Sweep</a> .....	84
<a href="#">Single Sweep</a> .....	84
<a href="#">Continue Single Sweep</a> .....	84
<a href="#">Sweep Count</a> .....	85

### 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 85).

Remote command:

INIT:CONT ON, see [INITiate<n>:CONTInuous](#) on page 312

### 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 312

### 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 311

### 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 284

## 6.2.5 Softkeys of the Trigger Menu for CDA measurements

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

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

<a href="#">Trigger Source Free Run</a> .....	85
<a href="#">Trigger Source External</a> .....	85
<a href="#">Trigger Polarity</a> .....	86
<a href="#">Trigger Offset</a> .....	86

### 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 309

### 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 309

### 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 309

[SENSe:]SWEep:EGATe:POLarity on page 285

### 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:	<p>Sweep starts earlier (pre-trigger)</p> <p>Only possible for span = 0 (e.g. I/Q Analyzer mode) and gated trigger switched off</p> <p>Maximum allowed range limited by the sweep time:  <math>\text{pretrigger}_{\text{max}} = \text{sweep time}</math></p> <p>When using the R&amp;S Digital I/Q Interface (R&amp;S FSV-B17) with I/Q Analyzer mode, the maximum range is limited by the number of pretrigger samples.</p> <p>See the R&amp;S Digital I/Q Interface(R&amp;S FSV-B17) description in the base unit.</p>

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 308

## 6.2.6 Softkeys of the Trace Menu for CDA Measurements

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

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

Clear Write.....	87
Max Hold.....	87
Min Hold.....	87
Average.....	87
View.....	88

**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 236

**Max Hold**

The maximum value is determined over several sweeps and displayed. The R&S FSV/FSPA 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 236

**Min Hold**

The minimum value is determined from several measurements and displayed. The R&S FSV/FSPA 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 236

**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 6.4.3, "Detector Overview"](#), on page 156).

This mode is not available for statistics measurements.

Remote command:

DISP:TRAC:MODE AVER, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 236

### 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 FSV/FSVA 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 236

## 6.2.7 Softkeys of the Marker Menu for CDA Measurements

The following chapter describes all softkeys available in the "Marker" menu for CDA measurements. For RF measurements, see [Chapter 6.3.7, "Softkeys of the Marker Menu for RF Measurements"](#), on page 147.

<a href="#">Marker 1/2/3/4</a> .....	88
<a href="#">Marker Norm/Delta</a> .....	89
<a href="#">All Marker Off</a> .....	89

### Marker 1/2/3/4

Selects the corresponding marker and activates it.

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

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

Remote command:

[CALCulate<n>:MARKer<m>\[:STATe\]](#) on page 214

[CALCulate<n>:MARKer<m>:X](#) on page 215

[CALCulate<n>:MARKer<m>:Y?](#) on page 217

[CALCulate<n>:DELTamarker<m>\[:STATe\]](#) on page 197

[CALCulate<n>:DELTamarker<m>:X](#) on page 198

[CALCulate<n>:DELTamarker<m>:X:RELative?](#) on page 198

[CALCulate<n>:DELTamarker<m>:Y?](#) on page 198

**Marker Norm/Delta**

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

Remote command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 214

`CALCulate<n>:DELTAmarker<m>[:STATe]` on page 197

**All Marker Off**

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

Remote command:

`CALCulate<n>:MARKer<m>:AOFF` on page 211

**6.2.8 Softkeys of the Marker To Menu**

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

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

Select 1/2/3/4/Δ.....	89
Peak.....	89
Next Peak.....	89
Next Peak Mode.....	90
F-PICH (BTS mode only).....	90
F-TDPICH (BTS mode only).....	90
PICH (MS mode only).....	90
Min.....	90
Next Min.....	91
Next Min Mode.....	91
Center =Mkr Freq (span > 0).....	91

**Select 1/2/3/4/Δ**

Selects the normal marker or the delta marker and activates the marker. "Δ" stands for delta marker 1.

`CALCulate<n>:MARKer<m>[:STATe]` on page 214

`CALCulate<n>:MARKer<m>:X` on page 215

`CALCulate<n>:MARKer<m>:Y?` on page 217

**Peak**

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

Remote command:

`CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 212

**Next Peak**

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

Remote command:

[CALCulate<n>:MARKer<m>:MAXimum:NEXT](#) on page 212

[CALCulate<n>:DELTamarker<m>:MAXimum:NEXT](#) on page 194

### Next Peak Mode

Selects the mode of the [Next Peak](#) softkey.

This softkey is available for code domain measurements.

Three settings are available:

- "<"                Sets the active marker/delta marker to the next maximum left to the marker of the selected trace.
- "abs"             Sets the active marker/delta marker to the next lower maximum of the selected trace.
- ">"               Sets the active marker/delta marker to the next maximum right to the marker of the selected trace.

Remote command:

[CALC:MARK:MAX:LEFT \(<\):CALCulate<n>:MARKer<m>:MAXimum:LEFT](#) on page 211

[CALCulate<n>:DELTamarker<m>:MAXimum:LEFT](#) on page 194

[CALC:MARK:MAX:RIGH \(>\):CALCulate<n>:MARKer<m>:MAXimum:RIGHT](#) on page 212

[CALCulate<n>:DELTamarker<m>:MAXimum:RIGHT](#) on page 195

[CALC:DELT:MAX:NEXT \(abs\):CALCulate<n>:MARKer<m>:MAXimum:NEXT](#) on page 212

[CALCulate<n>:DELTamarker<m>:MAXimum:NEXT](#) on page 194

### F-PICH (BTS mode only)

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

This softkey is available for code domain measurements.

[CALCulate<n>:MARKer<m>:FUNCTION:PICH](#) on page 186

### F-TDPICH (BTS mode only)

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

This softkey is available for code domain measurements.

[CALCulate<n>:MARKer<m>:FUNCTION:TDPIch](#) on page 190

### PICH (MS mode only)

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

This softkey is available for code domain measurements.

[CALCulate<n>:MARKer<m>:FUNCTION:PICH](#) on page 186

### Min

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

Remote command:

[CALCulate<n>:MARKer<m>:MINimum\[:PEAK\]](#) on page 214

### Next Min

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

Remote command:

[CALCulate<n>:MARKer<m>:MINimum:NEXT](#) on page 213

[CALCulate<n>:DELTamarker<m>:MINimum:NEXT](#) on page 196

### Next Min Mode

Sets the mode for the [Next Min](#) softkey.

This softkey is available for code domain measurements.

Three settings are available:

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

Remote command:

[CALC:MARK:MIN:LEFT \(>\):CALCulate<n>:MARKer<m>:MINimum:LEFT](#)  
on page 213

[CALCulate<n>:DELTamarker<m>:MINimum:LEFT](#) on page 195

[CALC:MARK:MIN:RIGH \(>\):CALCulate<n>:MARKer<m>:MINimum:RIGHT](#)  
on page 214

[CALCulate<n>:DELTamarker<m>:MINimum:RIGHT](#) on page 196

[CALC:MARK:MIN:NEXT \(abs\):CALCulate<n>:MARKer<m>:MINimum:NEXT](#)  
on page 213

[CALCulate<n>:DELTamarker<m>:MINimum:NEXT](#) on page 196

### Center =Mkr Freq (span > 0)

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

This softkey is available for RF measurements.

Remote command:

[CALCulate<n>:MARKer<m>:FUNCTION:CENTer](#) on page 186

## 6.2.9 Softkeys of the Auto Set Menu

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

<a href="#">Auto All</a> .....	92
<a href="#">Auto Freq</a> .....	92
<a href="#">Auto Level</a> .....	92

Settings.....	92
L Meas Time Manual.....	92
L Meas Time Auto.....	92
L Upper Level Hysteresis.....	93
L Lower Level Hysteresis.....	93

### Auto All

Performs all automatic settings.

- "Auto Freq" on page 92
- "Auto Level" on page 92

Remote command:

[SENSe:]ADJust:ALL on page 252

### 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 254

### 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 254

### Settings

Opens a submenu to define settings for automatic leveling.

Possible settings are:

- "Meas Time Manual" on page 92
- "Meas Time Auto" on page 92

### 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 92). The default value is 1 ms.

Remote command:

[SENSe:]ADJust:CONFigure:LEVel:DURation on page 253

### 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 253

**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 252

**6.2.10 Softkeys of the Input/Output Menu for CDA Measurements**

The following chapter describes all softkeys available in the "Input/Output" menu for CDA measurements. For RF measurements, see [Chapter 6.3.8, "Softkeys of the Input/Output Menu for RF Measurements"](#), on page 149.

Input (AC/DC).....	93
Noise Source.....	93
Signal Source.....	94
L Input Path.....	94
L Connected Device.....	94
L Input Sample Rate.....	94
L Full Scale Level.....	94
L Level Unit.....	94
L Adjust Reference Level to Full Scale Level.....	94
Digital IQ Info.....	95
EXIQ.....	95
L TX Settings.....	96
L RX Settings.....	96
L Send To.....	96
L Firmware Update.....	96
L R&S Support.....	96
L DigIConf.....	96

**Input (AC/DC)**

Toggles the RF input of the R&S FSV/FSVA 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 301

**Noise Source**

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

Remote command:

[DIAGnostic<n>:SERVice:NSOurce](#) on page 310

### 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 307

### 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 301

### 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 304

### 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 303

### Level Unit ← Signal Source

Defines the unit used for the full scale level.

Remote command:

[INPut:DIQ:RANGe\[:UPPer\]:UNIT](#) on page 303

### 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.

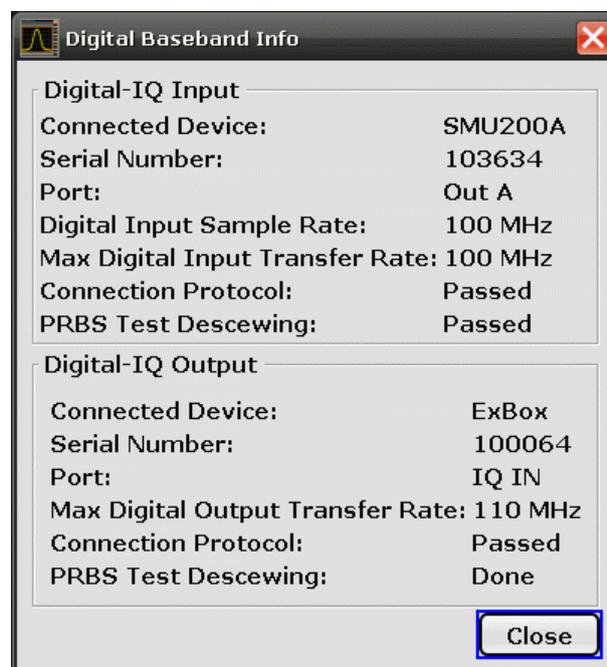
Remote command:

[INPut:DIQ:RANGe:COUPling](#) on page 303

### 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 301

### 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 FSV models 1307.9002Kxx.

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 FSV/FSVA 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 FSV/FSVA 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 FSV/FSVA 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 FSV/FSVA 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 FSV/FSVA 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 FSV/FSVA once again.

Remote command:

Remote commands for the R&S DiglConf software always begin with `SOURce:EBOX`. Such commands are passed on from the R&S FSV/FSVA to the R&S DiglConf automatically which then configures the R&S EX-IQ-BOX via the USB connection.

All remote commands available for configuration via the R&S DiglConf software are described in the "R&S®EX-IQ-BOX Digital Interface Module R&S®DiglConf Software Operating Manual".

**Example 1:**

`SOURce:EBOX:*RST`

`SOURce:EBOX:*IDN?`

Result:

"Rohde&Schwarz,DiglConf,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 (K82)

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

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

6.3.1	Softkeys of the Measurement Menu.....	97
6.3.2	Softkeys of the Frequency Menu.....	126
6.3.3	Softkeys of the Span Menu for RF Measurements.....	129
6.3.4	Softkeys of the Amplitude Menu.....	130
6.3.5	Softkeys of the Bandwidth Menu.....	137
6.3.6	Softkeys of the Sweep Menu.....	143
6.3.7	Softkeys of the Marker Menu for RF Measurements.....	147
6.3.8	Softkeys of the Input/Output Menu for RF Measurements.....	149

### 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.

<a href="#">Code Domain Analyzer</a> .....	100
<a href="#">Power</a> .....	100
↳ <a href="#">Adjust Ref Lvl</a> .....	100
<a href="#">Ch Power ACLR</a> .....	100

L Bandclass.....	100
L CP/ACLR Settings.....	101
L # of TX Chan.....	101
L # of Adj Chan.....	102
L Channel Setup.....	102
L Bandwidth.....	103
L ACLR Reference.....	104
L Spacing.....	104
L Names.....	105
L Weighting Filter.....	105
L Limits.....	106
L Limit Checking.....	106
L Relative Limit.....	107
L Absolute Limit.....	107
L Check.....	107
L Chan Pwr/Hz.....	107
L Power Mode.....	107
L Clear/Write.....	107
L Max Hold.....	108
L Select Trace.....	108
L ACLR (Abs/Rel).....	108
L Adjust Settings.....	108
L Sweep Time.....	108
L Fast ACLR (On/Off).....	109
L Set CP Reference.....	109
L Noise Correction.....	109
L Adjust Ref Lvl.....	110
Spectrum Emission Mask.....	110
L Sweep List.....	110
L Sweep List dialog box.....	110
L Range Start / Range Stop.....	111
L Fast SEM.....	111
L Filter Type.....	111
L RBW.....	111
L VBW.....	112
L Sweep Time Mode.....	112
L Sweep Time.....	112
L Ref. Level.....	112
L RF Att. Mode.....	112
L RF Attenuator.....	112
L Preamp.....	112
L Transd. Factor.....	112
L Limit Check 1-4.....	113
L Abs Limit Start.....	113
L Abs Limit Stop.....	113
L Rel Limit Start.....	113
L Rel Limit Stop.....	114
L Close Sweep List.....	114
L Insert before Range.....	114
L Insert after Range.....	114

L Delete Range.....	114
L Symmetric Setup.....	115
L Edit Reference Range.....	115
L List Evaluation.....	116
L List Evaluation (On/Off).....	116
L Margin.....	116
L Show Peaks.....	116
L Save Evaluation List.....	116
L ASCII File Export.....	117
L Decim Sep.....	117
L Edit Reference Range.....	117
L Edit Power Classes.....	118
L Used Power Classes.....	119
L PMin/PMax.....	119
L Sweep List.....	119
L Add/Remove.....	119
L Bandclass.....	119
L Load Standard.....	120
L Save As Standard.....	120
L Meas Start/Stop.....	120
L Restore Standard Files.....	120
Occupied Bandwidth.....	120
L % Power Bandwidth (span > 0).....	120
L Channel Bandwidth (span > 0).....	121
L Adjust Ref Lvl (span > 0).....	121
L Adjust Settings.....	121
CCDF.....	121
L Res BW.....	121
L # of Samples.....	122
L Scaling.....	122
L x-Axis Ref Level.....	122
L x-Axis Range.....	122
L Range Log 100 dB.....	122
L Range Log 50 dB.....	123
L Range Log 10 dB.....	123
L Range Log 5 dB.....	123
L Range Log 1 dB.....	123
L Range Log Manual.....	123
L Range Linear %.....	124
L Range Lin. Unit.....	124
L y-Axis Max Value.....	124
L y-Axis Min Value.....	124
L y-Unit % / Abs.....	124
L Default Settings.....	124
L Adjust Settings.....	125
L Gated Trigger (On/Off).....	125
L Gate Ranges.....	125
L Adjust Settings.....	126

**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"](#), on page 58. 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 35.

Remote command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 234

**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 234

[CALCulate<n>:MARKer<m>:FUNCTION:POWer:RESult?](#) on page 187

**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 FSV/FSVA 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 279

**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 234

[CALCulate<n>:MARKer<m>:FUNCTION:POWer:RESult?](#) on page 187

**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 225

#### **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 6.4.13, "Predefined CP/ACLR Standards"](#), on page 174 and [Chapter 6.4.14, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 175).

#### **# 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 281

#### # 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:

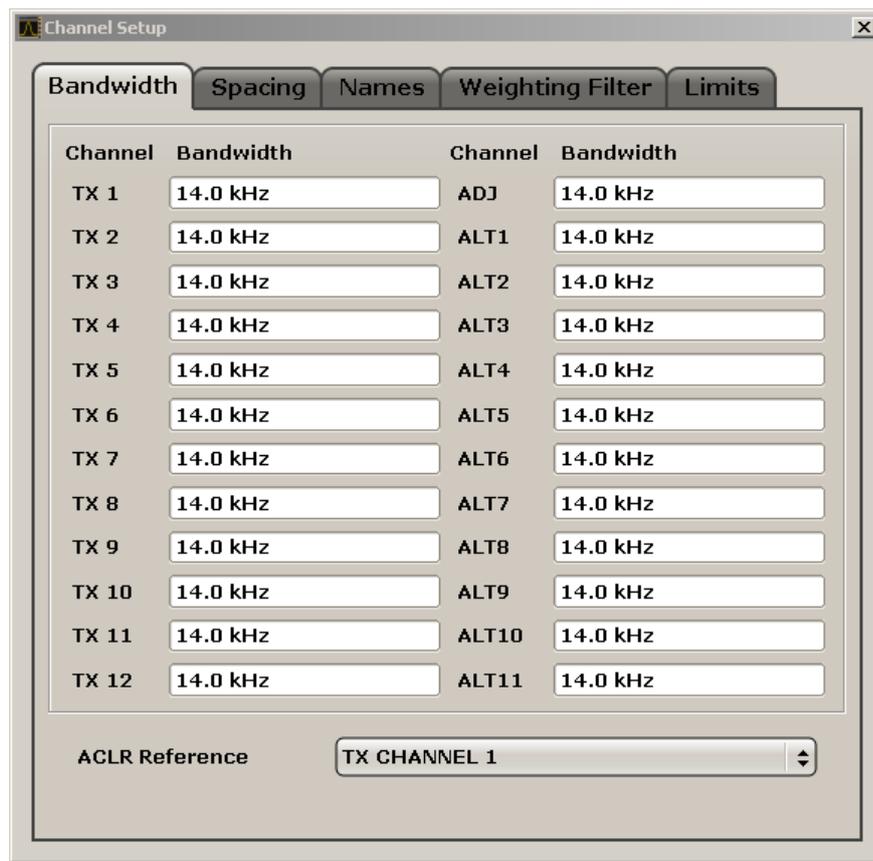
0	Only the channel powers are measured.
1	The channel powers and the power of the upper and lower adjacent channel are measured.
2	The channel powers, the power of the upper and lower adjacent channel, and of the next higher and lower channel (alternate channel 1) are measured.
3	The channel power, the 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 273

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

Opens a dialog to define the channel settings for all channels, independent of the defined number of *used* TX or adjacent channels.



The dialog contains the following tabs:

- "Bandwidth" on page 103
- "Spacing" on page 104
- "Names" on page 105
- "Weighting Filter" on page 105
- "Limits" on page 106

#### 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 6.4.14, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 175).

- 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 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159.

Remote command:

[SENSe:] POWER:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]

on page 274

[SENSe:] POWER:ACHannel:BANDwidth|BWIDth:ACHannel on page 274

[SENSe:] POWER:ACHannel:BANDwidth|BWIDth:ALternate<channel>

on page 275

#### 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 280

[SENSe:] POWER:ACHannel:REference:TXChannel:AUTO on page 279

#### 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 281

[SENSe:] POWer:ACHannel:SPACing[:ACHannel] on page 280

[SENSe:] POWer:ACHannel:SPACing:ALternate<channel> on page 281

**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 277

[SENSe:] POWer:ACHannel:NAME:ALternate<channel> on page 278

[SENSe:] POWer:ACHannel:NAME:CHANnel<channel> on page 278

**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	<ul style="list-style-type: none"> <li>• TX 1-18: TX channels</li> <li>• ADJ: Adjacent channel</li> <li>• ALT1-11: Alternate channels</li> </ul>
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 276

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 276

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 276

Activates the weighting filter for the adjacent channel.

POW:ACH:FILT:ALPH:ACH 0,35 see [SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel on page 275

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 276

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 275

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 FSV/FSVA 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 205

[CALCulate<n>:LIMit<k>:ACPowEr:ACHannel:RESult](#) on page 201

[CALCulate<n>:LIMit<k>:ACPowEr:ALternate<channel>\[:RELative\]](#)  
on page 204

#### **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 205

`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 205

`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 200

#### **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<sub>10</sub>(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 108 and "[ACLR Reference](#)" on page 104 to obtain the signal to noise ratio.

Remote command:

[CALCulate<n>:MARKer<m>:FUNCTION:POWER:RESult:PHZ](#) on page 188

#### **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 187

#### **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 187

#### **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 6.4.4, "Trace Mode Overview"](#), on page 157.

Remote command:

[\[SENSe:\]POWer:TRACe](#) on page 283

#### **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 277

#### **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 6.4.14, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 175.

Remote command:

[\[SENSe:\]POWer:ACHannel:PRESet](#) on page 278

#### **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 [Sweep Time Manual](#) softkey in the "Bandwidth" menu.

Remote command:

[SENSe:] SWEep:TIME on page 288

#### **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 FSV/FSVA 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 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159.

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 FSV/FSVA 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:] PWeR:HSPEED on page 282

#### **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:] PWeR:ACHannel:REfERENCE:AUTO ONCE on page 279

#### **Noise Correction ← Ch Power ACLR**

If activated, the results are corrected by the instrument's inherent noise, which increases the dynamic range.

"ON"	<p>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.</p> <p>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.</p>
"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 282

#### **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 FSV/FSVA 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 279

#### **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 234

[CALCulate<n>:LIMit<k>:FAIL?](#) on page 206

#### **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 114).

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 6.4.9, "Format Description of Spectrum Emission Mask XML Files"](#), on page 163).

If you load one of the provided XML files ("Load Standard" softkey, see ["Load Standard"](#) on page 120), the sweep list contains ranges and parameters according to the selected standard. For further details refer also to [Chapter 6.4.10, "Provided XML Files for the Spectrum Emission Mask Measurement"](#), on page 168.

**Note:** If you edit the sweep list, always follow the rules and consider the limitations described in [Chapter 6.4.11, "Ranges and Range Settings"](#), on page 171.

#### **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 6.4.11, "Ranges and Range Settings"](#), on page 171.

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 259

`[SENSe:]ESpectrum:RANGe<range>[:FREQuency]:STOP` on page 260

#### **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 6.4.12, "Fast Spectrum Emission Mask Measurements"](#), on page 172.

**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 256

#### **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 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159.

Remote command:

`[SENSe:]ESpectrum:RANGe<range>:FILTer:TYPE` on page 259

#### **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 257

**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 258

**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 265

**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 264

**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 264

**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 261

**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 260

**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 261

**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 265

#### **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 113, "[Abs Limit Stop](#)" on page 113, "[Rel Limit Start](#)" on page 113, "[Rel Limit Stop](#)" on page 114).

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 263

`CALCulate<n>:LIMit<k>:FAIL?` on page 206

#### **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 113).

Remote command:

`[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:ABSolute:START`

on page 262

#### **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 113).

Remote command:

`[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:ABSolute:STOP`

on page 262

#### **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 113).

Remote command:

[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:RELative:START  
on page 263

#### **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 110).

Remote command:

[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:RELative:STOP  
on page 263

#### **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 6.4.11, "Ranges and Range Settings"](#), on page 171.

Remote command:

ESP:RANG3:INS BEF, see [SENSe:]ESpectrum:RANGe<range>:INSert  
on page 261

#### **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 6.4.11, "Ranges and Range Settings"](#), on page 171.

Remote command:

ESP:RANG1:INS AFT, see [SENSe:]ESpectrum:RANGe<range>:INSert  
on page 261

#### **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 6.4.11, "Ranges and Range Settings"](#), on page 171.

Remote command:

[SENSe:]ESpectrum:RANGe<range>:DELete on page 258

### 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:

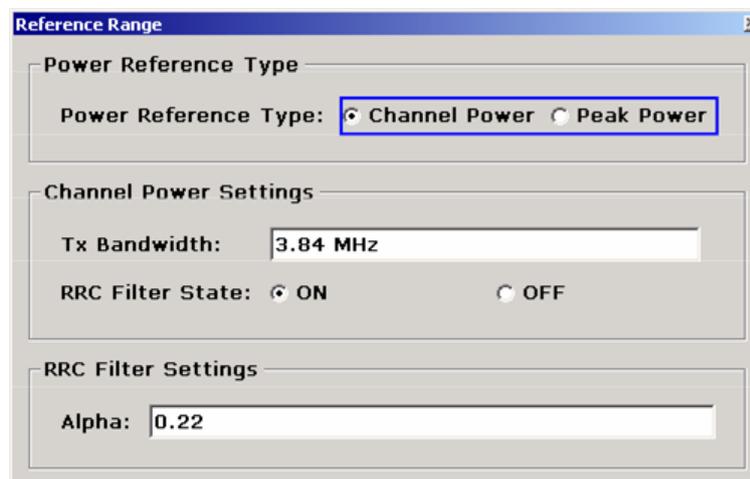
- Inserting ranges: a symmetrical range is inserted on the other side of the reference range
- Deleting ranges: the symmetrical range on the other side of the reference range is also deleted
- Editing range settings: the settings in the symmetrical range are adapted accordingly

**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 6.4.11, "Ranges and Range Settings"](#), on page 171.

Remote command:

[\[SENSe:\]ESpectrum:RTYPE](#) on page 266

[\[SENSe:\]ESpectrum:BWID](#) on page 255

[\[SENSe:\]ESpectrum:FILTer\[:RRC\]\[:STATe\]](#) on page 255

[\[SENSe:\]ESpectrum:FILTer\[:RRC\]:ALPHa](#) on page 256

#### **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 218

Querying list evaluation results:

[TRACe<n>\[:DATA\]?](#) on page 292

#### **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 218

#### **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 223

#### **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 117).

Remote command:

`MMEMemory:STORE<n>:LIST` on page 313

### 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 6.4.7, "ASCII File Export Format"](#), on page 161.

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 117).

An example of an output file for Spectrum Emission Mask measurements is given in [Chapter 6.4.8, "ASCII File Export Format \(Spectrum Emission Mask\)"](#), on page 162.

Remote command:

`FORMat:DEXPort:DSEParator` on page 311

`MMEMemory:STORE<n>:LIST` on page 313

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

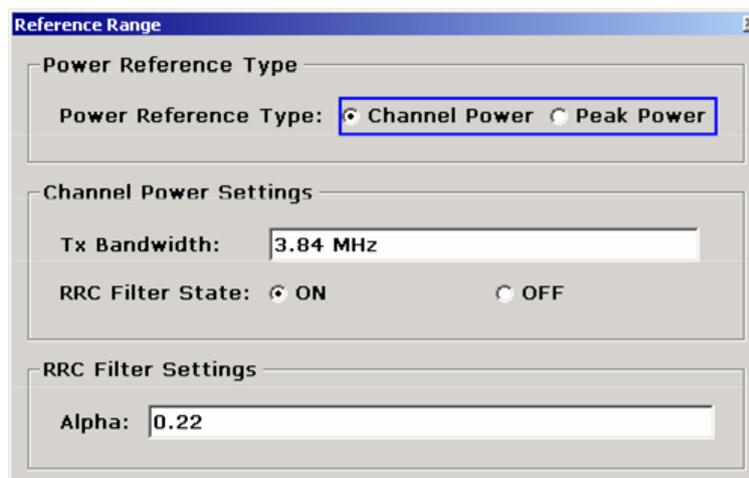
Selects the decimal separator with floating-point numerals for the ASCII Trace export to support evaluation programs (e.g. MS-Excel) in different languages. The values '.' (decimal point) and ',' (comma) can be set.

Remote command:

`FORMat:DEXPort:DSEParator` on page 311

### 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  $\leq$  value  $\leq$  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 6.4.11, "Ranges and Range Settings"](#), on page 171.

Remote command:

[SENSe:]ESpectrum:RTYPE on page 266

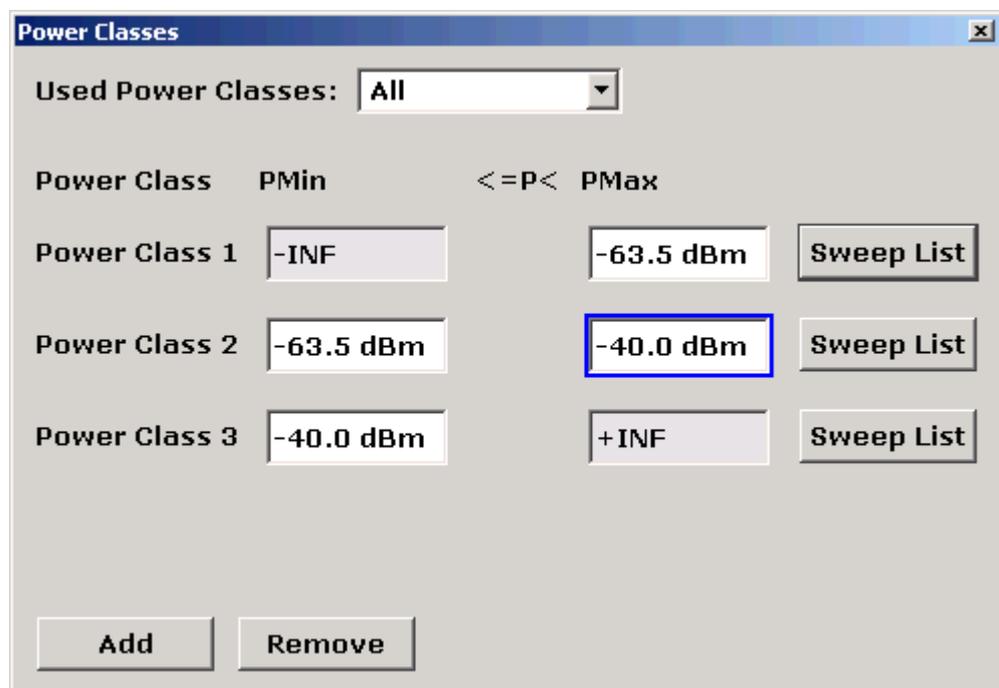
[SENSe:]ESpectrum:BWID on page 255

[SENSe:]ESpectrum:FILTer[:RRC][:STATe] on page 255

[SENSe:]ESpectrum:FILTer[:RRC]:ALPHa on page 256

#### 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 119).

Remote command:

`CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>[:EXCLusive]`

on page 207

To define all limits in one step:

`CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>:LIMit[:STATe]`

on page 208

**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:

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

Remote command:

`CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>:MINimum` on page 209

`CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>:MAXimum` on page 209

**Sweep List ← Edit Power Classes ← Spectrum Emission Mask**

See "Sweep List" on page 110

**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 207

**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 100).

The settings for each bandclass are provided in \*.xml files that are located in the directory `C:\R_S\INSTR\sem_std\evdo\d1`. 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 225

#### **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 6.4.10, "Provided XML Files for the Spectrum Emission Mask Measurement"](#), on page 168.

Remote command:

[\[SENSe:\]ESpectrum:PRESet\[:STANdard\]](#) on page 257

#### **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 6.4.9, "Format Description of Spectrum Emission Mask XML Files"](#), on page 163.

Remote command:

[\[SENSe:\]ESpectrum:PRESet:STORe](#) on page 257

#### **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 310

[INITiate<n>:ESpectrum](#) on page 312

#### **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 257

#### **Occupied Bandwidth**

Activates measurement of the bandwidth assigned to the signal.

Remote command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 234

[CALCulate<n>:MARKer<m>:FUNCTION:POWer:RESult?](#) on page 187

#### **% 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 282

#### **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 6.4.14, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 175). 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 274

#### **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 279

#### **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 6.4.14, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 175.

Remote command:

[SENSe:] POWER: AChannel: PRESet on page 278

#### **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 234

#### **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 266

#### # 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 220

#### 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 62).

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 222

#### 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 221

#### 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 241

Display range:

DISP:WIND:TRAC:Y 100DB, see DISPLAY[:WINDow<n>]:TRACe<t>:Y[:SCALE] on page 238

**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 241

Display range:

DISP:WIND:TRAC:Y 50DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

**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 241

Display range:

DISP:WIND:TRAC:Y 10DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

**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 241

Display range:

DISP:WIND:TRAC:Y 5DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

**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 241

Display range:

DISP:WIND:TRAC:Y 1DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

**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 241

Display range:

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

#### **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 241

#### **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 241

#### **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 223

#### **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 222

#### **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 222

#### **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 220

### 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 221

### 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 125 softkey.

Remote command:

[\[SENSe:\]SWEep:EGATe](#) on page 284

[\[SENSe:\]SWEep:EGATe:SOURce](#) on page 285

### Gate Ranges ← CCDF

Opens a dialog to configure up to 3 gate ranges for each trace.

Gate Ranges						
	Trace 1	Trace 2	Trace 3	Trace 4	Trace 5	Trace 6
Comment	SlotA					
Period	8 ms					
Range 1 Start	1 ms	1 μs				
Range 1 Stop	3 ms	1 μs				
Range 1 Use	On	Off	Off	Off	Off	Off
Range 2 Start	1 μs					
Range 2 Stop	1 μs					
Range 2 Use	Off	Off	Off	Off	Off	Off
Range 3 Start	1 μs					
Range 3 Stop	1 μs					
Range 3 Use	Off	Off	Off	Off	Off	Off

Remote command:

[SWE:EGAT ON](#) (see [\[SENSe:\]SWEep:EGATe](#) on page 284)

Switches on the external gate mode.

[SWE:EGAT:TRAC1:COMM "SlotA"](#) (see [\[SENSe:\]SWEep:EGATe:TRACe<k>:COMMENT](#) on page 286)

Adds a comment to trace 1.

SWE:EGAT:TRAC1:STAT1 ON (see [SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>] on page 287)

Activates tracing for range 1 of trace 1.

SWE:EGAT:TRAC1:STAR1 3ms (see [SENSe:]SWEep:EGATe:TRACe<k>:STARt<range> on page 286)

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 287)

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 286)

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 221

### 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.....	126
CF Stepsize.....	127
L 0.1*Span (span > 0).....	127
L 0.1*RBW (span > 0).....	127
L 0.5*Span (span > 0).....	127
L 0.5*RBW (span > 0).....	127
L x*Span (span > 0).....	128
L x*RBW (span > 0).....	128
L =Center.....	128
L =Marker.....	128
L Manual.....	128
Start.....	128
Stop.....	129
Frequency Offset.....	129

#### 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.

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

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

$f_{\text{max}}$  and  $\text{span}_{\text{min}}$  are specified in the data sheet.

If the bandwidth extension option R&S FSV-B160 is active, center frequencies above 7 GHz are not available.

Remote command:

[SENSe:] FREQuency:CENTer on page 270

### 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 ( $\text{span} > 0$ ) or a fraction of the resolution bandwidth ( $\text{span} = 0$ ) 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 271

FREQ:CENT:STEP:LINK:FACT 10PCT, see [SENSe:] FREQuency:CENTer:STEP:LINK:FACTor on page 271

#### 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 271

FREQ:CENT:STEP:LINK:FACT 10PCT, see [SENSe:] FREQuency:CENTer:STEP:LINK:FACTor on page 271

#### 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 271

FREQ:CENT:STEP:LINK:FACT 50PCT, see [SENSe:] FREQuency:CENTer:STEP:LINK:FACTor on page 271

#### 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 271

FREQ:CENT:STEP:LINK:FACT 50PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 271

#### **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 271

FREQ:CENT:STEP:LINK:FACT 20PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 271

#### **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 271

FREQ:CENT:STEP:LINK:FACT 20PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 271

#### **=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 270

#### **Start**

Opens an edit dialog box to define the start frequency. The following range of values is allowed:

$$f_{\min} \leq f_{\text{start}} \leq f_{\max} - \text{span}_{\min}$$

$f_{\min}$ ,  $f_{\max}$  and  $\text{span}_{\min}$  are specified in the data sheet.

Remote command:

[SENSe:] FREQuency: START on page 272

### Stop

Opens an edit dialog box to define the stop frequency. The following range of values for the stop frequency is allowed:

$$f_{\min} + \text{span}_{\min} \leq f_{\text{stop}} \leq f_{\max}$$

$f_{\min}$ ,  $f_{\max}$  and  $\text{span}_{\min}$  are specified in the data sheet.

Remote command:

[SENSe:] FREQuency: STOP on page 273

### 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 272

## 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" measurements.

Span Manual.....	129
Sweptime Manual.....	129
Full Span.....	130
Last Span.....	130

### 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:

$$\text{span} = 0: 0 \text{ Hz}$$

$$\text{span} > 0: \text{span}_{\min} \leq f_{\text{span}} \leq f_{\max}$$

$f_{\max}$  and  $\text{span}_{\min}$  are specified in the data sheet.

Remote command:

[SENSe:] FREQuency: SPAN on page 272

### Sweptime Manual

Opens an edit dialog box to enter the sweep time.

<b>Sweep time</b>	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 $\mu$ s
	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 FSV/FSVA displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF measurements.

Remote command:

SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 288  
[SENSe:]SWEep:TIME on page 288

#### Full Span

Sets the span to the full frequency range of the R&S FSV/FSVA specified in the data sheet. This setting is useful for overview measurements.

Remote command:

[SENSe:]FREQuency:SPAN:FULL on page 272

#### 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

The following table shows all softkeys available in the "Amplitude" menu. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is provided in the corresponding softkey description.

Ref Level.....	131
Range.....	131
L Range Log 100 dB.....	131
L Range Log 50 dB.....	131
L Range Log 10 dB.....	132
L Range Log 5 dB.....	132

L Range Log 1 dB.....	132
L Range Log Manual.....	132
L Range Linear %.....	132
L Range Lin. Unit.....	133
Unit.....	133
Preamp On/Off.....	133
RF Atten Manual/Mech Att Manual.....	134
RF Atten Auto/Mech Att Auto.....	134
EI Atten On/Off.....	134
EI Atten Mode (Auto/Man).....	135
Ref Level Offset.....	135
Ref Level Position.....	135
Grid Abs/Rel .....	135
Noise Correction.....	136
Input (AC/DC).....	136
Input 50 Ω/75 Ω .....	136
(Bypassing the ) YIG Filter.....	137

### 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 239

### Range

Opens a submenu to define the display range of the level axis.

This softkey and its submenu are available for RF 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 241

Display range:

`DISP:WIND:TRAC:Y 100DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]` on page 238

#### 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 241

Display range:

DISP:WIND:TRAC:Y 50DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

#### **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 241

Display range:

DISP:WIND:TRAC:Y 10DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

#### **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 241

Display range:

DISP:WIND:TRAC:Y 5DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

#### **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 241

Display range:

DISP:WIND:TRAC:Y 1DB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

#### **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 241

Display range:

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 238

#### **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 241

#### 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 241

#### Unit

Opens the "Unit" submenu to select the unit for the level axis.

The default setting is dBm.

If a transducer is switched on, the softkey is not available.

In general, the signal analyzer measures the signal voltage at the RF input. The level display is calibrated in RMS values of an unmodulated sine wave signal. In the default state, the level is displayed at a power of 1 mW (= dBm). Via the known input impedance (50 Ω or 75 Ω), conversion to other units is possible. The following units are available and directly convertible:

- dBm
- dBmV
- dBμV
- dBμA
- dBpW
- Volt
- Ampere
- Watt

Remote command:

[CALCulate<n>:UNIT:POWer](#) on page 224

#### 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 306

#### **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; "EI 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 (R&S FSV with option R&S FSV-B25 or R&S FSVA: 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:

$$\text{level}_{\text{mixer}} = \text{level}_{\text{input}} - \text{RF attenuation}$$

**Note:** As of firmware version 1.61, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVL" 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 300

#### **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 300

#### **EI 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 [EI 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 305

#### **EI 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 [EI 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 305

`INPut:EATT` on page 305

#### **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  $\pm 200$  dB in 0.1 dB steps.

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVEL:OFFSet` on page 240

#### **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.

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSITION` on page 240

#### **Grid Abs/Rel**

Switches between absolute and relative scaling of the level axis (not available with "Linear" range).

Only available for RF measurements.

- "Abs" Absolute scaling: The labeling of the level lines refers to the absolute value of the reference level. Absolute scaling is the default setting.
- "Rel" Relative scaling: The upper line of the grid is always at 0 dB. The scaling is in dB whereas the reference level is always in the set unit (for details on unit settings see the "Unit" softkey).

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 239

### Noise Correction

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 282

### Input (AC/DC)

Toggles the RF input of the R&S FSV/FSVA 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 301

### Input 50 Ω/75 Ω

Uses 50 Ω or 75 Ω as reference impedance for the measured levels. Default setting is 50 Ω.

The setting 75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75 Ω/50 Ω).

All levels specified in this Operating Manual refer to the default setting of the instrument (50 Ω).

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

Remote command:

`INPut:IMPedance` on page 306

### (Bypassing the ) YIG Filter

If the option R&S FSVA-B11 is installed, the YIG preselector can be bypassed.

This function is only available for R&S FSVA instruments.

If the YIG preselector at the input of the R&S FSVA is removed from the signal path, you can use the maximum bandwidth for signal analysis. However, image-frequency rejection is no longer ensured.

Note that the YIG preselector is active only on frequencies greater than 7 GHz. Therefore, switching the YIG preselector on and off has no effect if the frequency is below that value.

#### Note:

For the following measurements, the YIG preselector is off by default (if available).

- I/Q Analyzer
- GSM
- VSA

`INPut:FILTer:YIG[:STATe]` on page 306

## 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.....	138
Res BW Auto.....	138
Video BW Manual.....	138
Video BW Auto.....	139
Sweptime Manual.....	139
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Sweep Type.....	140
L Sweep.....	140
L FFT.....	140
L Auto.....	141
L FFT Filter Mode.....	141
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Coupling Ratio.....	141
L RBW/VBW Sine [1/1].....	141
L RBW/VBW Pulse [.1].....	141

L RBW/VBW Noise [10].....	142
L RBW/VBW Manual.....	142
L Span/RBW Auto [100].....	142
L Span/RBW Manual.....	142
L Default Coupling.....	143
Filter Type.....	143

### 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 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159.

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 267

`[SENSe:]BANDwidth|BWIDth[:RESolution]` on page 266

### 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.

Remote command:

`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 267

### 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 6.4.3, "Detector Overview"](#), on page 156.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth.

Remote command:

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 269

[SENSe:]BANDwidth|BWIDth:VIDeo on page 268

### 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.

Remote command:

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 269

### Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

<b>Sweep time</b>	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 $\mu$ s
	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 FSV/FSVA displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF measurements.

Remote command:

SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 288

[SENSe:]SWEep:TIME on page 288

### 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 FSV/FSVA 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 288

### 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 140
- "FFT" on page 140 (not available with 5-Pole filters, channel filters or RRC filters, see [Chapter 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159)
- "Auto" on page 141

### 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 289

### 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.

**Note:** The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active.

Remote command:

SWE:TYPE FFT, see [SENSe:]SWEep:TYPE on page 289

#### **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 289

#### **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 267

#### **Narrow ← FFT Filter Mode ← Sweep Type**

For an RBW  $\leq$  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 267

#### **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 269

#### **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 269

#### **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 269

#### **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 269

#### **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 FSV/FSVA.

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 269

#### **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 268

### 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.

Remote command:

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO on page 267

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 269

[SENSe:]SWEep:TIME:AUTO on page 288

### 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 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159 and [Chapter 6.4.6, "List of Available RRC and Channel Filters"](#), on page 160.

Remote command:

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE on page 268

## 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.....	144
Single Sweep.....	144
Continue Single Sweep.....	144
Sweptime Manual.....	144
Sweptime Auto.....	145
Sweep Type.....	145
L Sweep.....	145

L FFT.....	145
L Auto.....	146
L FFT Filter Mode.....	146
L Auto.....	146
L Narrow.....	146
Sweep Count.....	146
Sweep Points.....	146

### 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 85).

Remote command:

INIT:CONT ON, see INITiate<n>:CONTinuous on page 312

### 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 312

### 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 311

### 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 $\mu$ s
	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 FSV/FSVA displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF measurements.

Remote command:

SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 288

[SENSe:]SWEep:TIME on page 288

### 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 FSV/FSVA 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 288

### 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 140
- "FFT" on page 140 (not available with 5-Pole filters, channel filters or RRC filters, see [Chapter 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159)
- "Auto" on page 141

### 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 289

### 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.

**Note:** The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active.

Remote command:

`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 289

#### **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 289

#### **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 267

#### **Narrow ← FFT Filter Mode ← Sweep Type**

For an RBW  $\leq$  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 267

#### **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 284

#### **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 288

### 6.3.7 Softkeys of the Marker Menu for RF Measurements

The following chapter describes all softkeys available in the ""Marker"" menu in ""CDMA2000 BTS Analysis"" Mode for RF measurements. For CDA measurements, see [Chapter 6.2.7, "Softkeys of the Marker Menu for CDA Measurements"](#), on page 88.

<a href="#">Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta</a> .....	147
<a href="#">More Markers</a> .....	148
<a href="#">Marker Norm/Delta</a> .....	148
<a href="#">Marker to Trace</a> .....	148
<a href="#">All Marker Off</a> .....	148
<a href="#">Marker Table</a> .....	148
<a href="#">Marker Stepsize</a> .....	148
L <a href="#">Stepsize Standard</a> .....	149
L <a href="#">Stepsize Sweep Points</a> .....	149
<a href="#">Link Mkr1 and Delta1</a> .....	149

#### **Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta**

The "Marker X" softkey activates the corresponding marker and opens an edit dialog box to enter a value for the marker to be set to. Pressing the softkey again deactivates the selected marker.

If a marker value is changed using the rotary knob, the step size is defined via the [Stepsize Standard](#) or [Stepsize Sweep Points](#) softkeys.

Marker 1 is always the reference marker for relative measurements. If activated, markers 2 to 16 are delta markers that refer to marker 1. These markers can be converted into markers with absolute value display using the "Marker Norm/Delta" softkey. If marker 1 is the active marker, pressing the "Marker Norm/Delta" softkey switches on an additional delta marker.

Remote command:

CALCulate<n>:MARKer<m>[:STATe] on page 214

CALCulate<n>:MARKer<m>:X on page 215

CALCulate<n>:MARKer<m>:Y? on page 217

CALCulate<n>:DELTamarker<m>[:STATe] on page 197

CALCulate<n>:DELTamarker<m>:X on page 198

[CALCulate<n>:DELTaMarker<m>:X:RELative?](#) on page 198

[CALCulate<n>:DELTaMarker<m>:Y?](#) on page 198

### More Markers

Opens a sub-menu to select one of up to 16 available markers. See "[Marker 1 / Marker 2 / Marker 3 / ... Marker 16, / Marker Norm/Delta](#)" on page 147.

### Marker Norm/Delta

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

Remote command:

[CALCulate<n>:MARKer<m>\[:STATe\]](#) on page 214

[CALCulate<n>:DELTaMarker<m>\[:STATe\]](#) on page 197

### Marker to Trace

Opens an edit dialog box to enter the number of the trace on which the marker is to be placed.

Remote command:

[CALCulate<n>:MARKer<m>:TRACe](#) on page 215

### All Marker Off

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

Remote command:

[CALCulate<n>:MARKer<m>:AOFF](#) on page 211

### Marker Table

Defines how the marker information is displayed.

This softkey is available for RF measurements.

For more information, see "Displayed Marker Information" in the description of the base unit.

"On" Displays the marker information in a table in a separate area beneath the diagram.

"Off" Displays the marker information within the diagram area.

"Aut" (Default) The marker table is displayed automatically if more than 2 markers are active, and removed if only 1 or 2 markers are active. This helps keep the information in the display clear.

Remote command:

[DISPlay:MTABle](#) on page 235

### Marker Stepsize

Opens a submenu to set the step size of all markers and delta markers.

Default value for the marker step size is [Stepsize Sweep Points](#).

This softkey is available for RF measurements.

**Stepsize Standard ← Marker Stepsize**

Moves the marker or delta marker from one measurement point to the next, if the marker or delta marker value is changed via the rotary knob ( "Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta" softkeys, see "[Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta](#)" on page 147). If more measured values than measurement points exist, it is not possible to read out all measured values. In this case, use the [Stepsize Sweep Points](#) softkey.

Remote command:

CALC:MARK:X:SSIZ STAN (see [CALCulate<n>:MARKer<m>:X:SSIZe](#) on page 216)

**Stepsize Sweep Points ← Marker Stepsize**

Moves the marker or delta marker from one measured value to the next, if the marker or delta marker value is changed via the rotary knob ( "Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta" softkeys, see "[Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta](#)" on page 147). If more measured values than measurement points exist, every single measured value is accessible and its value is displayed in the marker field.

The number of measured values is defined in the ""Sweep"" menu via the [Sweep Points](#) softkey.

This functionality is available for all base unit measurements with the exception of statistics ( "APD" and "CCDF" softkeys in the "Measurement" menu).

Remote command:

CALC:MARK:X:SSIZ POIN (see [CALCulate<n>:MARKer<m>:X:SSIZe](#) on page 216)

**Link Mkr1 and Delta1**

The delta marker 1 is linked to marker 1, so if the x-axis value of the marker 1 is changed, the delta marker 1 will follow on the same x-position. The link is off by default.

You can set the two markers on different traces to measure the difference (e.g. between a max hold trace and a min hold trace or between a measurement and a reference trace).

This softkey is available for RF measurements.

Remote command:

[CALCulate<n>:DELTAmarker<m>:LINK](#) on page 194

**6.3.8 Softkeys of the Input/Output Menu for RF Measurements**

The following chapter describes all softkeys available in the "Input/Output" menu for RF measurements. For CDA measurements, see [Chapter 6.2.10, "Softkeys of the Input/Output Menu for CDA Measurements"](#), on page 93.

Input (AC/DC).....	150
Noise Source.....	150
Video Output.....	150
Power Sensor.....	150
Trigger Out.....	150

**Input (AC/DC)**

Toggles the RF input of the R&S FSV/FSVA 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 301

**Noise Source**

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

Remote command:

[DIAGnostic<n>:SERVice:NSource](#) on page 310

**Video Output**

Sends a video output signal according to the measured level to the connector on the rear panel of the R&S FSV/FSVA.

**Note:** Video output does not return valid values in IQ or FFT mode.

Remote command:

[OUTP:IF VID](#) , see [OUTPut:IF\[:SOURce\]](#) on page 314

**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 FSV/FSVA 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 314

## 6.4 Further Information

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### 6.4.1 Predefined Channel Tables

Predefined channel tables offer access to a quick configuration for the channel search. The CDMA2000 BTS Analysis (R&S FSV-K82) option provides the following set of channel tables compliant with the CDMA2000 specification:

Channel table	Contents
RECENT	Contains the channels that were automatically created during the last measurement with the "Auto Search" option activated (for details refer to " <a href="#">Channel Tables</a> " on page 67).
MPC_RC1 (Base Station Main Path 6 Channels Radio Configuration 1)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
MPC_RC4 (Base Station Main Path 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.

Channel table	Contents
TDC_RC4 (Base Station Transmit Diversity Path 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
BPC_RC4 (Base Station Both Paths 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-TDPICH/F-SYNC/F-PCH and 6 data channels  This standard does not specify a channel number for the data channels.

The CDMA2000 MS Analysis (R&S FSV-K83) option provides the following set of channel tables compliant with the CDMA2000 specification:

Channel table	Contents
RECENT	Contains the channels that were automatically created during the last measurement with the "Auto Search" option activated (for details refer to " <a href="#">Channel Tables</a> " on page 67).
EACHOP	Channel table for Enhanced Access CHannel OPeration with PICH and EACH
RCCCHOP	Channel table for Reverse Common Control CHannel OPeration with PICH and CCCH
RTCHOP3	Channel table for Reverse Traffic CHannel OPeration with the following 3 channels: PICH/DCCH/FCH
RTCHOP5	Channel table for Reverse Traffic CHannel OPeration with the following 5 channels: PICH/DCCH/FCH/S1CH/S2CH



To use channels other than those in the predefined channel tables, you can copy the original tables and modify the channels in the copy.

**Table 6-1: Base station channel table for main branch in radio configuration 1 (MPC\_RC1)**

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.64	1
		10.64	1
		11.64	1
		15.64	1
		17.64	1
		25.64	1

**Table 6-2: Base station channel table for main branch in radio configuration 4 (MPC\_RC4)**

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128	4
		10.128	4
		11.128	4
		15.128	4
		17.128	4
		25.128	4

**Table 6-3: Base station test model for aggregate signal in radio configuration 4 (TDC\_RC4)**

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	16.128	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128	4
		10.128	4
		11.128	4
		15.128	4
		17.128	4
		25.128	4

**Table 6-4: Base station test model for aggregate signal in radio configuration 4 (BPC\_RC4)**

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	16.128	-
	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128	4
		10.128	4
		11.128	4
		15.128	4
		17.128	4
		25.128	4

**Table 6-5: Channel table for enhanced access channel operation**

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
EACH	2.8	Q

**Table 6-6: Channel table for reverse common control channel operation**

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
CCCH	2.8	Q

**Table 6-7: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 3**

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
FCH	4.16	Q
S1CH	2.4	Q

**Table 6-8: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 5**

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
DCCH	8.16	I
FCH	4.16	Q
S1CH	2.4	Q
S2CH	6.8	I

#### 6.4.1.1 Relationship Between Channel and Modulation Type

Channel type	Channel	Modulation
F-PICH	Pilot channel	BPSK
F-SYNC	Synchronisation channel	BPSK
F-PCH	Paging channel	BPSK
F-TDPICH	Transmit diversity pilot channel	BPSK
F-APICH	Auxiliary pilot channel	BPSK
F-ATDPICH	Auxiliary transmit diversity channel	BPSK
F-BCH	Broadcast channel	QPSK
F-CPCCH	Common power control channel	QPSK
F-CACH	Common assignment channel	QPSK
F-CCCH	Common control channel	QPSK

F-PDCCH	Packet data control channel	QPSK
F-PDCH	Packet data channel	QPSK, 8PSK or 16QAM
CHAN	Data channel radio configuration 1-2	BPSK
CHAN	Data channel radio configuration 3-5	QPSK

## 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 **"New / Copy / Edit"** on page 67 softkey to create a new channel table.  
The "New Channel Table" dialog box is displayed. The new channel table contains no data at all.
5. Enter a name for the new channel table, e.g. 'Test Table' in the corresponding field.  
The name you enter in this field is also the name of the table channel file.
6. Enter a description for your new channel table, e.g. 'Channel table created for test purposes' in the "Description" field.
7. Build your channel table by adding the channels with the configuration you need  
*or*  
Measure the current signal by pressing the **"Meas"** on page 69 softkey. The R&S FSV/FSVA automatically adds the channels of the current signal to the channel table.  
Refer to the **"New / Copy / Edit"** on page 67 softkey for a description of all parameters relating to a channel.
8. Save your table by pressing the **"Save"** on page 69 softkey. All data is lost if you just close the dialog box.  
The list of available channel tables in the "Channel Table Settings" dialog box now contains the 'Test Table'.

### Editing a channel table

1. Select the "Code Domain Analyzer" softkey.
2. Select the "Channel Table Settings" softkey.
3. Select your recently created channel table. Press the **"New / Copy / Edit"** on page 67 softkey to open and modify the channel table.  
Each row in the channel table represents one channel.

4. Sort the channels in the channel table by pressing the "Sort" on page 69 softkey. The R&S FSV/FSVA sorts the channels according to the rules listed in the "Sort" on page 69 softkey description.
5. Add a new channel by pressing the "Add Channel" on page 69 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.
1. You can delete a channel with the "Delete Channel" on page 69 softkey. Note that a channel is deleted without further notice.
2. If you want to discard your changes, you can restore the original table with the "Reload" on page 70 softkey. All your changes will be lost.  
You can also restore the default channel tables delivered with the R&S FSV/FSVA with the "Restore Default Tables" on page 70. This recovery can be done even if you have saved changes to these tables.

For more information on softkeys, dialog boxes and parameters concerning channel tables refer to the description of the "Channel Table Settings" on page 65 dialog box.

### 6.4.3 Detector Overview

The measurement detector for the individual display modes can be selected directly by the user or set automatically by the R&S FSV/FSVA. The detector activated for the specific trace is indicated in the corresponding trace display field by an abbreviation.

The detectors of the R&S FSV/FSVA 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 6-9: 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

Detector	Indicator	Function
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 FSV/FSVA 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 than 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.

### 6.4.4 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 FSV/FSVA 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 236

### Max Hold

The maximum value is determined over several sweeps and displayed. The R&S FSV/FSVA 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 236

### Min Hold

The minimum value is determined from several measurements and displayed. The R&S FSV/FSVA 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 236

### 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 6.4.3, "Detector Overview"](#), on page 156).

This mode is not available for statistics measurements.

Remote command:

DISP:TRAC:MODE AVER, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 236

### 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 FSV/FSVA 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 236

#### **Blank**

Hides the selected trace.

Remote command:

DISP:TRAC OFF, see [DISPlay\[:WINDow<n>\]:TRACe<t>\[:STATe\]](#) on page 237

### **6.4.5 Selecting the Appropriate Filter Type**

All resolution bandwidths are realized with digital filters.

The video filters are responsible for smoothing the displayed trace. Using video bandwidths that are small compared to the resolution bandwidth, only the signal average is displayed and noise peaks and pulsed signals are repressed. If pulsed signals are to be measured, it is advisable to use a video bandwidth that is large compared to the resolution bandwidth ( $VBW * 10 \times RBW$ ) 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 6.4.6, "List of Available RRC and Channel Filters"](#), on page 160 .  
Channel filters do not support FFT mode.
- RRC filters  
For details see [Chapter 6.4.6, "List of Available RRC and Channel Filters"](#), on page 160 .  
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.

### 6.4.6 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table). The indicated filter bandwidth is the 3 dB bandwidth. For RRC filters, the fixed roll-off factor (a) is also indicated.

**Table 6-10: Filter types**

Filter Bandwidth	Filter Type	Application
100 Hz	CFILter	
200 Hz	CFILter	
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)
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

Filter Bandwidth	Filter Type	Application
25 kHz	CFILter	APCO 25-P2
30 kHz	CFILter	CDPD, CDMAone
50 kHz	CFILter	
100 kHz	CFILter	
150 kHz	CFILter	FM Radio
192 kHz	CFILter	PHS
200 kHz	CFILter	GSM
300 kHz	CFILter	
500 kHz	CFILter	J.83 (8-VSB DVB, USA); RF ID 14333
1 MHz	CFILter	CDMAone
1.228 MHz	CFILter	CDMAone
1.28 MHz, a=0.22	RRC	TD-SCDMA
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	

### 6.4.7 ASCII File Export Format

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

**Table 6-11: ASCII file format for trace export**

File contents: header and data section	Description
Type;FSV;	Instrument model
Version;1.50;	Firmware version
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display
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

#### 6.4.8 ASCII File Export Format (Spectrum Emission Mask)

The first part of the file lists information about the signal analyzer and the general setup. For a detailed description refer to [Chapter 6.4.7, "ASCII File Export Format"](#), on page 161.

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 115
PeaksPerRange;1; Values;4;	evaluation list information
0;-22500000;-9270000;1000000;2986455000;-74.762840270996094; -10.576210021972656;-45.762840270996094;PASS; 1;-9270000;-4770000;1000000;2991405000;-100.17695617675781; -35.990325927734375;-1.490325927734375;PASS 3;4770000;9270000;1000000;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)>;

### 6.4.9 Format Description of Spectrum Emission Mask XML Files

The files for importing range settings are in XML format and therefore obey the rules of the XML standard. Below, the child nodes, attributes, and structure defined for the data import is described. Build your own XML files according to these conventions because the R&S FSV/FSVA 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*

Figure 6-17: 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 FSV/FSVA 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 6-17](#)), 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 110) 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 FSV/FSVA 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 110) 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 FSV/FSVA 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 FSV/FSVA 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	Indices 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
	Short-Name	<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 111	Yes
	Type	NORM   PULS   CFIL   RRC		No
VBW	Bandwidth	<bandwidth in Hz>	"VBW" on page 112	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 112	Yes
	Time	<time in sec>	"Sweep Time" on page 112	No
Amplitude				No
ReferenceLevel	Value	<power in dBm>	"Ref. Level" on page 112	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 112	Yes, if the ReferenceLevel child node is used
Preamplifier		ON   OFF	"Preamp" on page 112	Yes

#### 6.4.10 Provided XML Files for the Spectrum Emission Mask Measurement

You can change the settings manually or via XML files. The XML files offer a quick way to change the configuration. A set of ready-made XML files for different standards is

already provided. For details see [Table 6-15](#). You can also create and use your own XML files (for details see [Chapter 6.4.9, "Format Description of Spectrum Emission Mask XML Files"](#), on page 163). 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 120).

**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

### 6.4.11 Ranges and Range Settings

In the Spectrum Emission Mask measurements, a range defines a segment for which you can define the following parameters separately:

- Start and stop frequency
- RBW
- VBW
- Sweep time
- Sweep points
- Reference level
- Attenuator settings
- 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 110.

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 symmetrically. 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 115.

Symmetrical ranges fulfill the conditions required for "Fast SEM" mode (see [Chapter 6.4.12, "Fast Spectrum Emission Mask Measurements"](#), on page 172).

## 6.4.12 Fast Spectrum Emission Mask Measurements

In order to improve the performance of the R&S FSV/FSVA 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 111
  - "RBW", see ["RBW"](#) on page 111
  - "VBW", see ["VBW"](#) on page 112
  - "Sweep Time Mode", see ["Sweep Time Mode"](#) on page 112
  - "Ref Level", see ["Ref. Level"](#) on page 112

- "Rf Att. Mode", see ["RF Att. Mode"](#) on page 112
- "RF Attenuator", see ["RF Att. Mode"](#) on page 112
- "Preamp", see ["Preamp"](#) on page 112

### Activating Fast SEM mode

"Fast SEM" mode is activated in the sweep list (see ["Fast SEM"](#) on page 111) 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 256

### 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.

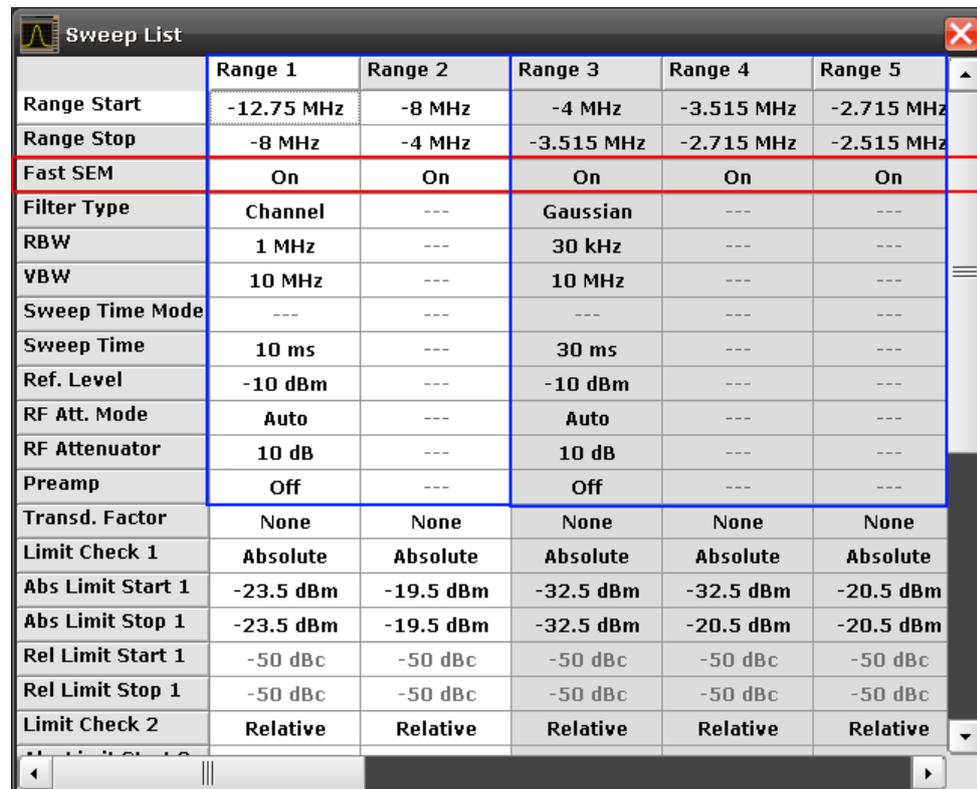


If "Symmetrical Setup" mode is active when "Fast SEM" mode is activated, not all sweep list settings can be configured symmetrically automatically (see also ["Symmetric Setup"](#) on page 115).

---

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



	Range 1	Range 2	Range 3	Range 4	Range 5
Range Start	-12.75 MHz	-8 MHz	-4 MHz	-3.515 MHz	-2.715 MHz
Range Stop	-8 MHz	-4 MHz	-3.515 MHz	-2.715 MHz	-2.515 MHz
Fast SEM	On	On	On	On	On
Filter Type	Channel	---	Gaussian	---	---
RBW	1 MHz	---	30 kHz	---	---
VBW	10 MHz	---	10 MHz	---	---
Sweep Time Mode	---	---	---	---	---
Sweep Time	10 ms	---	30 ms	---	---
Ref. Level	-10 dBm	---	-10 dBm	---	---
RF Att. Mode	Auto	---	Auto	---	---
RF Attenuator	10 dB	---	10 dB	---	---
Preamp	Off	---	Off	---	---
Transd. Factor	None	None	None	None	None
Limit Check 1	Absolute	Absolute	Absolute	Absolute	Absolute
Abs Limit Start 1	-23.5 dBm	-19.5 dBm	-32.5 dBm	-32.5 dBm	-20.5 dBm
Abs Limit Stop 1	-23.5 dBm	-19.5 dBm	-32.5 dBm	-20.5 dBm	-20.5 dBm
Rel Limit Start 1	-50 dBc	-50 dBc	-50 dBc	-50 dBc	-50 dBc
Rel Limit Stop 1	-50 dBc	-50 dBc	-50 dBc	-50 dBc	-50 dBc
Limit Check 2	Relative	Relative	Relative	Relative	Relative

Figure 6-18: Sweep list using Fast SEM mode

In Figure 6-18, a sweep list is shown for which Fast SEM is activated. The formerly 5 separately defined ranges are combined to 2 sweep ranges internally.

### 6.4.13 Predefined CP/ACLR Standards

When using predefined standards for ACLR measurement, the test parameters for the channel and adjacent-channel measurements are configured automatically. The available standards are listed below.



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 FSV/FSVA, 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 FSV/FSVA if the standards marked with an asterisk \*) are selected.

#### 6.4.14 Optimized Settings for CP/ACLR Test Parameters

The "Adjust Settings" softkey (see "Adjust Settings" on page 108) 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:

" $RBW \leq 1/40$  of channel bandwidth"

The maximum possible resolution bandwidth (with respect to the requirement  $RBW \leq 1/40$ ) 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:

" $VBW \geq 3 \times RBW$ "

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:

$$P_{\text{RMS}} = \sqrt{\frac{1}{N} \cdot \sum_{i=1}^N s_i^2}$$

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"

" $P_{\text{RMS}}$  = 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 100).

# 7 Remote Commands of the CDMA2000 BTS Analysis

This chapter describes the remote commands specific to the CDMA2000 Analysis options (R&S FSV-K82/-K83). The abbreviation CDMA stands for the operating mode of this option. For details on conventions used in this chapter refer to [Chapter 7.1, "Notation"](#), on page 179.

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:DELTa marker
- CALCulate:MARKer (except for the specific commands described in [Chapter 7.2, "CALCulate Subsystem"](#), on page 181)
- 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 243)
- TRIGger subsystem

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## 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)
SFM	Stereo FM measurements (option R&S FSV-K7S)
SPECM	Spectrogram 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.

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## 7.2.1 CALCulate:FEED Subsystem

The `CALCulate:FEED` subsystem selects the result display for the measurement data. This corresponds to the result display selection in manual operation.

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---	-----

---

### `CALCulate<n>:FEED <result display>`

This command selects the result display for the measured data.

In MS mode, the results are displayed for the branch selected by `[SENSe:]CDPower:MAPPING`.

#### Suffix:

<code>&lt;n&gt;</code>	1...4
	screen

**Parameters:**

&lt;result display&gt;

'XPOW:CDP' | 'XPOW:CDP:RAT' | 'XPOW:CDEP' |  
 'XTIM:CDP:ERR:CTABLE' | 'XTIM:CDP:PVSLOT' |  
 'XTIM:CDP:ERR:SUMMARY' | 'XTIM:CDP:MACCURITY' |  
 'XTIM:CDP:ERR:PCDOMAIN' |  
 'XTIM:CDP:SYMB:CONSTELLATION' | 'XTIM:CDP:SYMB:EVM' |  
 'XTIM:CDP:BSTREAM' | 'XTIM:CDP:COMP:CONSTELLATION' |  
 'XTIM:CDP:PVSYMBOL' | 'XTIME:CDPOWER:CHIP:MAGNITUDE' |  
 'XTIME:CDPOWER:CHIP:PHASE' |  
 'XTIME:CDPOWER:SYMBOL:EVM:PHASE' |  
 'XTIME:CDPOWER:SYMBOL:EVM:MAGNITUDE'

**'XPOW:CDP'**

Code Domain Power (CDP) result display (absolute)

**'XPOW:CDP:RAT'**

Code Domain Power (CDP) result display (relative)

**'XTIM:CDP:BSTREAM'**

Channel Bitstream result display

**'XTIM:CDP:COMP:CONSTELLATION'**

Composite Constellation result display

**'XPOW:CDEP'**

Code Domain Error Power (CDEP) result display

**'XTIM:CDP:ERR:CTABLE'**

Channel Table result display

**'XTIM:CDP:ERR:PCDOMAIN'**

Peak Code Domain Error result display

**'XTIM:CDP:ERR:SUMMARY'**

Result Summary result display

**'XTIM:CDP:MACCURITY'**

Composite EVM result display

**'XTIM:CDP:PVSLOT'**

Power versus Power Control Group (PCG) result display

**'XTIM:CDP:PVSYMBOL'**

Power versus Symbol result display

**'XTIM:CDP:SYMB:CONSTELLATION'**

Channel Constellation result display

**'XTIM:CDP:SYMB:EVM'**

Symbol Error Vector Magnitude result display

**'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:CDPOWER:CHIP:MAGNITUDE'**

Result display magnitude error versus chip

**'XTIME:CDPOWER:CHIP:PHASE'**

Result display phase error versus chip

\*RST: 'XPOW:CDP:RAT' (screen A),  
"XTIM:CDP:ERR:SUMM' (screen B)

**Example:** `CALC2:FEED 'XTIM:CDP:MACC'`  
Selects the Composite EVM result display for measurement screen 2

**Usage:** SCPI confirmed

**Mode:** CDMA

**Manual operation:** See "[Code Power](#)" on page 76

## 7.2.2 CALCulate:MARKer:FUNCTion Subsystem

The CALCulate:MARKer:FUNCTion subsystem checks the marker functions in the instrument.

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---

### **CALCulate<n>:MARKer<m>:FUNCTion:CDPower[:BTS]:RESult?**

This command queries the results of the code domain measurement for the selected channel. The channel is selected via the `[SENSe:]CDPower:CODE` command.

For a description of the result types refer to [Chapter 6.1.3, "Code Domain Analysis Results"](#), on page 38.

**Suffix:**

<n>                    1...4  
                          window

<m>                    irrelevant

**Parameters:**

&lt;Result&gt;

SLOT | PTOTAL | PPICH | RHO | MACCuracy | PCDerror |  
 ACTIVE | FERRor | FERPpm | CERRor | TFRame I | IQOFFset |  
 IQIMbalance | SRATe | CHANnel | SFACTor | TOFFset |  
 POFFset | CDPabsolute | CDPRelative | EVMRms | EVMPeak |  
 DMType

**SLOT**

PCG number

**PTOTAL**

Total power in dBm

**PPICH**

Pilot power in dBm

**RHO**

RHO

**MACCuracy**

Composite EVM in %

**PCDerror**

Peak code domain error in dB

**ACTIVE**

Number of active channels

**FERRor**

Frequency error in Hz

**FERPpm**

Frequency error in ppm

**CERRor**

Chip rate error in ppm

**TFRame I**

Trigger to frame

**IQOFFset**

IQ offset in %

**IQIMbalance**

IQ imbalance in %

**SRATe**

Symbol rate in ksps

**CHANnel**

Channel number

**SFACTor**

Spreading factor of channel

**TOFFset**

Timing offset in s

**POFFset**

Phase offset in rad

**CDPabsolute**

Channel power absolute in dBm

**CDPRelative**

Channel power relative in dB (relative to total or PICH power, refer to `CDP:PREF` command)

**EVMRms**

Error vector magnitude RMS in %

**EVMPeak**

Error vector mag. peak in %

**DMType**

Domain type

**Example:**

```
CALC:MARK:FUNC:CDP:RES? PTOT
```

Reads out total power.

```
CDP:SLOT 2
```

Selects power control group 2.

```
CDP:CODE 11
```

Selects code number 11.

```
CALC:MARK:FUNC:CDP:RES? EVMR
```

Reads out Composite EVM of the code with number 11 in PCG 2.

**Usage:**

Query only

**Mode:**

CDMA

**CALCulate<n>:MARKer<m>:FUNCTion:CENTer**

This command 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.

**Manual operation:** See "[Center =Mkr Freq \(span > 0\)](#)" on page 91

**CALCulate<n>:MARKer<m>:FUNCTion:PICH**

This command sets the marker to channel 0.64.

**Suffix:**

<n> 1...4  
window

<m> 1...4  
marker to be set to the pilot channel

<b>Example:</b>	<pre>CALC:MARK:FUNC:PICH</pre> <p>Activates marker and positions it at pilot 0.64.</p> <pre>CALC:MARK:Y?</pre> <p>Queries value of the relative Code Domain Power of the pilot channel.</p>
<b>Usage:</b>	Event
<b>Mode:</b>	CDMA
<b>Manual operation:</b>	<p>See "F-PICH (BTS mode only)" on page 90</p> <p>See "PICH (MS mode only)" on page 90</p>

---

#### **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 107

See "Max Hold" on page 108

---

#### **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`.

`[SENSe:]POWER:ACHannel:MODE`

is set to "REL", the adjacent/alternate-channel power is output in dB. 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 100  
See "Ch Power ACLR" on page 100  
See "Occupied Bandwidth" on page 120

---

**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 bandwidth.

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 187.

**Manual operation:** See "[Chan Pwr/Hz](#)" on page 107

**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
	<b>ACPower</b> Adjacent-channel power measurement with a single carrier signal
	<b>CPOWer</b> Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with "NO. OF ADJ CHAN" = 0)
	<b>MCACpower</b> Channel/adjacent-channel power measurement with several carrier signals
	<b>OBANdwidth   OBWidth</b> Measurement of occupied bandwidth
	<b>CN</b> Measurement of carrier-to-noise ratio
	<b>CNO</b> 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:TDPIch**

This command sets the marker to channel 16.128.

**Suffix:**

<n>	1...4 window
<m>	1...4 marker

**Example:**

```
CALC:MARK:FUNC:TDPI
Activates marker and positions it at TDPICH 16.128.
CALC:MARK:Y?
Queries value of the relative Code Domain Power of the transmit diversity pilot channel.
```

**Usage:** Event

**Mode:** CDMA

**Manual operation:** See "F-TDPICH (BTS mode only)" on page 90

## 7.2.3 Other CALCulate Commands Referenced in this Manual

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### 7.2.3.1 CALCulate:DELTamarker subsystem

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---

#### 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

**Manual operation:** See "[Link Mkr1 and Delta1](#)" on page 149

### 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.

**Manual operation:** See "[Next Peak Mode](#)" on page 90

### 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.

**Manual operation:**

See "Next Peak" on page 89

See "Next Peak Mode" on page 90

**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.

**Manual operation:**

See "Next Peak Mode" on page 90

**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.

**Manual operation:** See "Next Min Mode" on page 91

**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.

**Manual operation:** See "Next Min" on page 91  
See "Next Min Mode" on page 91

**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.

**Manual operation:** See ["Next Min Mode"](#) on page 91

**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 DELTmarker 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.

**Manual operation:** See ["Marker 1/2/3/4"](#) on page 88  
See ["Marker Norm/Delta"](#) on page 89  
See ["Marker 1 / Marker 2 / Marker 3 / ... Marker 16, / Marker Norm/Delta"](#) on page 147

**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".

**Suffix:**

<n> Selects the measurement window.

<m> Selects the marker.

**Parameters:**

<TraceNumber> 1 ... 6

Trace number the marker is positioned on.

**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.

**Manual operation:** See ["Marker 1/2/3/4"](#) on page 88  
See ["Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta"](#) on page 147

**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

**Manual operation:** See ["Marker 1/2/3/4"](#) on page 88  
See ["Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta"](#) on page 147

**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 obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with `CALC:UNIT:POW` or on the activated measuring functions, the query result is output in the units below:

<b>Suffix:</b>	
<n>	Selects the measurement window.
<m>	Selects the marker.
<b>Example:</b>	<pre>INIT:CONT OFF</pre> <p>Switches to single sweep mode.</p> <pre>INIT;*WAI</pre> <p>Starts a sweep and waits for its end.</p> <pre>CALC:DELT2 ON</pre> <p>Switches on delta marker 2.</p> <pre>CALC:DELT2:Y?</pre> <p>Outputs measurement value of delta marker 2.</p>
<b>Usage:</b>	Query only
<b>Manual operation:</b>	<p>See "Marker 1/2/3/4" on page 88</p> <p>See "Marker 1 / Marker 2 / Marker 3 / ... Marker 16,/ Marker Norm/Delta" on page 147</p>

### 7.2.3.2 CALCulate:LIMit subsystem

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---

**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.

<b>Suffix:</b>	
<n>	Selects the measurement window.
<k>	irrelevant
<b>Parameters:</b>	
<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>:ACPpower: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>:ACPpower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPpower: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 107

---

**CALCulate<n>:LIMit<k>:ACPpower: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>:ACPpower: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>:ACPpower: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 106

---

#### **CALCulate<n>:LIMit<k>:ACPpower: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>:ACPpower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPpower: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>:ACPpower: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>:ACPpower: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>:ACPpower: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>:ACPpower: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>,            first value: 0 to 100dB; limit for the lower and the upper alternate adjacent channel  
 <UpperLimit>  
 \*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 106

---

**CALCulate<n>:LIMit<k>:ACPpower: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>:ACPpower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPpower: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>:ACPpower[:STATe] <State>**

This command switches on and off the limit check for adjacent-channel power measurements. The commands `CALCulate<n>:LIMit<k>:ACPpower:ACHannel[:RELative]:STATe` or `CALCulate<n>:LIMit<k>:ACPpower: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 106

See "[Relative Limit](#)" on page 107

See "[Absolute Limit](#)" on page 107

**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 110  
See "Limit Check 1-4" on page 113

**7.2.3.3 CALCulate:LIMit:ESpectrum subsystem**

The CALCulate:LIMit:ESpectrum subsystem defines the limit check for the Spectrum Emission Mask.

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CALCulate<n>:LIMit<k>:ESpectrum:RESTore.....	210
CALCulate<n>:LIMit<k>:ESpectrum:VALue.....	210

**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 7.2.3.3, "CALCulate:LIMit:ESPectrum subsystem"](#), on page 206 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 119  
See "[Add/Remove](#)" on page 119

**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:**

&lt;State&gt;

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 119**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:**

&lt;n&gt;

irrelevant

&lt;k&gt;

irrelevant

&lt;Class&gt;

1...4

the power class to be evaluated

**Parameters:**

&lt;Level&gt;

&lt;numeric value&gt;

\*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 119**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:**

&lt;n&gt;

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 119

**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**  
 $P \geq 33$   
**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.

#### 7.2.3.4 CALCulate:MARKer subsystem

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---

#### **CALCulate<n>:MARKer<m>:AOFF**

This command all markers off, including delta markers and marker measurement functions.

**Suffix:**

<n>                      Selects the measurement window.  
 <m>                      depends on mode  
                              irrelevant

**Example:** `CALC:MARK:AOFF`  
 Switches off all markers.

**Usage:**                Event

**Manual operation:** See "[All Marker Off](#)" on page 89

---

#### **CALCulate<n>:MARKer<m>:MAXimum:LEFT**

This command positions a marker to the next smaller trace maximum on the left of the current position (i.e. in descending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n>                      Selects the measurement window.  
 <m>                      Selects the marker.

- Example:** `CALC:MARK2:MAX:LEFT`  
Positions marker 2 to the next lower maximum value to the left of the current value.
- Usage:** Event
- Manual operation:** See ["Next Peak Mode"](#) on page 90

**CALCulate<n>:MARKer<m>:MAXimum:NEXT**

This command positions the marker to the next smaller trace maximum.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

- <n> Selects the measurement window.
- <m> Selects the marker.

- Example:** `CALC:MARK2:MAX:NEXT`  
Positions marker 2 to the next lower maximum value.

- Usage:** Event

- Manual operation:** See ["Next Peak"](#) on page 89  
See ["Next Peak Mode"](#) on page 90

**CALCulate<n>:MARKer<m>:MAXimum[:PEAK]**

This command positions the marker on the current trace maximum.

The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

- <n> Selects the measurement window.
- <m> depends on mode  
Selects the marker.

- Example:** `CALC:MARK2:MAX`  
Positions marker 2 to the maximum value of the trace.

- Usage:** Event

- Manual operation:** See ["Peak"](#) on page 89

**CALCulate<n>:MARKer<m>:MAXimum:RIGHT**

This command positions a marker to the next smaller trace maximum on the right of the current value (i.e. in ascending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> Selects the measurement window.

<m> Selects the marker.

**Example:**

`CALC:MARK2:MAX:RIGH`

Positions marker 2 to the next lower maximum value to the right of the current value.

**Usage:**

Event

**Manual operation:** See "[Next Peak Mode](#)" on page 90

**CALCulate<n>:MARKer<m>:MINimum:LEFT**

This command positions a marker to the next higher trace minimum on the left of the current value (i.e. in descending X direction).

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:MARK2:MIN`

Positions marker 2 to the minimum value of the trace.

`CALC:MARK2:MIN:LEFT`

Positions marker 2 to the next higher minimum value to the left of the current value.

**Usage:**

Event

**Manual operation:** See "[Next Min Mode](#)" on page 91

**CALCulate<n>:MARKer<m>:MINimum:NEXT**

This command positions a marker to the next higher trace minimum.

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:MARK2:MIN`

Positions marker 2 to the minimum value of the trace.

`CALC:MARK2:MIN:NEXT`

Positions marker 2 to the next higher maximum value.

**Usage:**

Event

**Manual operation:** See "Next Min" on page 91  
See "Next Min Mode" on page 91

---

### **CALCulate<n>:MARKer<m>:MINimum[:PEAK]**

This command positions the marker on the current trace minimum.

The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> Selects the measurement window.

<m> depends on mode  
Selects the marker.

**Example:** `CALC:MARK2:MIN`  
Positions marker 2 to the minimum value of the trace.

**Usage:** Event

**Manual operation:** See "Min" on page 90

---

### **CALCulate<n>:MARKer<m>:MINimum:RIGHT**

This command positions a marker to the next higher trace minimum on the right of the current value (i.e. in ascending X direction).

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:MARK2:MIN`  
Positions marker 2 to the minimum value of the trace.  
`CALC:MARK2:MIN:RIGHT`  
Positions marker 2 to the next higher minimum value to the right of the current value.

**Usage:** Event

**Manual operation:** See "Next Min Mode" on page 91

---

### **CALCulate<n>:MARKer<m>[:STATE] <State>**

This command turns markers on and off.

If the corresponding marker number is currently active as a deltamarker, it is turned into a normal marker.

**Suffix:**

<n> Selects the measurement window.  
 <m> depends on mode  
 Selects the marker.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:MARK3 ON  
 Switches on marker 3 or switches to marker mode.

**Manual operation:**

See "[Marker 1/2/3/4](#)" on page 88  
 See "[Marker Norm/Delta](#)" on page 89  
 See "[Select 1/2/3/4/Δ](#)" on page 89  
 See "[Marker 1 / Marker 2 / Marker 3 / ... Marker 16, / Marker Norm/Delta](#)" on page 147

**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.

**Suffix:**

<n> Selects the measurement window.  
 <m> depends on mode  
 Selects the marker.

**Parameters:**

<Trace> 1 ... 6  
 Trace number the marker is positioned on.

**Example:**

CALC:MARK3:TRAC 2  
 Assigns marker 3 to trace 2.

**Manual operation:** See "[Marker to Trace](#)" on page 148

**CALCulate<n>:MARKer<m>:X <Position>**

This command positions a marker on a particular coordinate on the x-axis.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

**Suffix:**

<n> Selects the measurement window.  
 <m> Selects the marker.

**Parameters:**

<Position> Numeric value that defines the marker position on the x-axis. The unit is either Hz (frequency domain) or s (time domain) or dB (statistics).  
 Range: The range depends on the current x-axis range.

**Example:**

CALC:MARK2:X 1.7MHz  
 Positions marker 2 to frequency 1.7 MHz.

**Manual operation:**

See "[Marker 1/2/3/4](#)" on page 88  
 See "[Select 1/2/3/4/Δ](#)" on page 89  
 See "[Marker 1 / Marker 2 / Marker 3 / ... Marker 16, / Marker Norm/Delta](#)" on page 147

**CALCulate<n>:MARKer<m>:X:SLIMits[:STATE] <State>**

This command turns marker search limits on and off.

If the power measurement in zero span is active, this command limits the evaluation range on the trace.

**Suffix:**

<n> Selects the measurement window.  
 <m> marker

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:MARK:X:SLIM ON  
 Switches on search limitation.

**CALCulate<n>:MARKer<m>:X:SSIZE <StepSize>**

This command defines the step size of the rotary knob for marker or delta marker value changes. It only takes effect in manual operation.

The marker step size is unavailable for statistical measurements.

**Suffix:**

<n> irrelevant  
 <m> irrelevant

**Parameters:**

&lt;StepSize&gt;

**STANdard**

step size corresponds to space between two pixels

**POINts**step size corresponds to space between two measured values  
(number of measured values is defined via the[SENSe<n>:]SWEep:POINts command, see [SENSe:  
]SWEep:POINts on page 288)

\*RST: POINts

**Example:**

CALC:MARK:X:SSIZ STAN

Sets the measured value step size.

**Manual operation:**

See "Stepsize Standard" on page 149

See "Stepsize Sweep Points" on page 149

**CALCulate<n>:MARKer<m>:Y?**

This command queries the measured value of a marker.

The corresponding marker is activated before or switched to marker mode, if necessary.

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:**

&lt;n&gt;

Selects the measurement window.

&lt;m&gt;

Selects the marker.

**Return values:**

&lt;Result&gt;

The measured value of the selected marker is returned.

The unit is variable and depends on the one you have currently set.

**Example:**

INIT:CONT OFF

Switches to single sweep mode.

CALC:MARK2 ON

Switches marker 2.

INIT;\*WAI

Starts a sweep and waits for the end.

CALC:MARK2:Y?

Outputs the measured value of marker 2.

**Usage:**

Query only

**Manual operation:**

See "Marker 1/2/3/4" on page 88

See "Select 1/2/3/4/Δ" on page 89

See "Marker 1 / Marker 2 / Marker 3 / ... Marker 16, / Marker  
Norm/Delta" on page 147

### 7.2.3.5 CALCulate:PSE subsystem

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---

#### 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 FSV/FSVA.

**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 116

---

#### 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 116

---

### **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.

#### **7.2.3.6 CALCulate:STATistics subsystem**

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---

### **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:**

&lt;n&gt; 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:**

&lt;n&gt; 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 122**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:**

&lt;n&gt; irrelevant

**Example:**CALC:STAT:PRESet  
Resets the scaling for statistical functions**Manual operation:** See "[Default Settings](#)" on page 124**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 125

**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 122

#### 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 122

#### 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 124

#### 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 124

#### 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 124

### 7.2.3.7 Other Referenced CALCulate Commands

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#### 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 116

**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.

**Manual operation:** See "Unit" on page 133

## 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.

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---

**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 100.

**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 100.

**22**  
(3C) JTACS band, see "[Bandclass](#)" on page 100.

\*RST: 0

**Example:** `CONF:CDP:BCL 1`  
Selects band class 1, 1900 MHz

**Mode:** CDMA, EVDO

**Manual operation:** See "[Bandclass](#)" on page 100  
See "[Bandclass](#)" on page 119

#### **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 66

#### **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 67

#### **CONFigure:CDPower[:BTS]:CTable:COMMent <Comment>**

This command defines a comment on the selected channel table.

**Parameters:**  
<Comment> <'string'> = comment on the channel table

**Example:** `CONF:CDP:CTAB:NAME 'NEW_TAB'`  
 Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created.

`CONF:CDP:CTAB:DATA`  
`0,6,0,0,0,0,1,0.0,10,5,3,4,0,0,1,0.0`  
 Defines a table with the following channels: PICH 0.64 and data channel with RC4/Walsh code 3.32.

`CONF:CDP:CTAB:COMM 'Comment for NEW_TAB'`  
 Specifies 'Comment for NEW\_TAB' as comment.

**Mode:** CDMA, EVDO

---

#### **CONFigure:CDPower[:BTS]:CTABLE:COPY** <TargetFileName>

This command copies one channel table to another. Select the channel table you want to copy using the `CONFigure:CDPower[:BTS]:CTABLE:SElect` command.

#### **Parameters:**

<TargetFileName> <'string'> = name of the new channel table.

#### **Example:**

`CONF:CDP:CTAB:NAME 'CTAB_1'`  
 Selects channel table CTAB\_1 for copying.

`CONF:CDP:CTAB:COPY 'CTAB_2'`  
 Copies CTAB\_1 to CTAB\_2.

**Usage:** Event

**Mode:** CDMA, EVDO

---

#### **CONFigure:CDPower[:BTS]:CTABLE:DATA** <ChannelType>, <CodeClass>, <CodeNumber>, <Modulation>, <Reserved1>, <Reserved2>, <Status>, <CDPRelative>

This command defines a channel table. The following description applies to EVDO BTS mode (K84) only.

For MS mode, see `CONFigure:CDPower[:BTS]:CTABLE:DATA` on page 229.

Before using this command, you must set the name of the channel table using the `CONFigure:CDPower[:BTS]:CTABLE:SElect` command.

#### **Parameters:**

<ChannelType> The channel type is numerically coded as follows:

- 0 = PILOT
- 1 = MAC
- 2 = PREAMBLE with 64 chip length
- 3 = PREAMBLE with 128 chip length
- 4 = PREAMBLE with 256 chip length
- 5 = PREAMBLE with 512 chip length
- 6 = PREAMBLE with 1024 chip length
- 7 = DATA

<CodeClass>	Depending on channel type, the following values are allowed: PILOT: 5 MAC: 6 PREAMBLE: 5 DATA: 4 (spreading factor = $2^{\text{code class}}$ )
<CodeNumber>	0...spreading factor-1
<Modulation>	Modulation type including mapping: 0 = BPSK-I 1 = BPSK-Q 2 = QPSK 3 = 8-PSK 4 = 16-QAM Modulation types QPSK/8-PSK/16-QAM have complex values.
<Reserved1>	Always 0 (reserved)
<Reserved2>	Always 0 (reserved)
<Status>	0: inactive, 1: active Can be used in a setting command to disable a channel temporarily
<CDPRelative>	Power value in dB.
<b>Example:</b>	<pre>CONF:CDP:CTAB:NAME 'NEW_TAB'</pre> <p>Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created.</p> <pre>CONF:CDP:CTAB:DATA 0,6,0,0,0,0,1,0.0,10,5,3,4,0,0,1,0.0</pre> <p>Defines a table with the following channels: PICH 0.64 and data channel with RC4/Walsh code 3.32.</p>
<b>Mode:</b>	EVDO BTS
<b>Manual operation:</b>	See <a href="#">"Add Channel"</a> on page 69

---

**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 228.

Before using this command, you must set the name of the channel table using the [CONFigure:CDPower\[:BTS\]:CTABLE:SElect](#) command.

**Parameters:**

<ChannelType>	The channel type is numerically coded as follows: 0 = PICH 1 = RRI 2 = DATA 3 = ACK 4 = DRC 5 = INACTIVE
<CodeClass>	2 to 4
<CodeNumber>	0...15
<Mapping>	0 = I branch 1 = Q branch
<Activity>	0..65535 (decimal)  The decimal number - interpreted as a binary number in 16 bits - determines the half slot in which the channel is active (value 1) or inactive (value 0). See <a href="#">Table 7-1</a> .
<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

#### **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 66

#### **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 71

**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 71

**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 72

**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 72

**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 232 and [CONFigure:CDPower\[:BTS\]:MCARrier:FILTer:COFFrequency](#) on page 232 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 "Filter Type" on page 71  
                           See "Roll-Off Factor" on page 72  
                           See "Cut Off Frequency" on page 72

**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 71

### CONFigure:CDPower[:BTS]:MEASurement <Measurement>

This command selects the measurement type.

**Parameters:**

<Measurement>    ACLR | CCDF | CDPower | ESpectrum | OBWidth | POWER

**ACLR**  
 Adjacent-Channel Power measurement  
 (with predefined settings according to the CDMA2000 standard)

**CCDF**  
 measurement of the complementary cumulative distribution  
 function (signal statistics)

**CDPower**  
 Code Domain Analyzer measurement.

**ESpectrum**  
 check of signal power (Spectrum Emission Mask)

**OBWidth**  
 measurement of the occupied bandwidth

**POWER**  
 Signal Channel Power measurement  
 (with predefined settings according to the CDMA2000 standard)

\*RST:            CDPower

**Example:**           CONF:CDP:MEAS POW  
 Selects Signal Channel Power measurement.

**Mode:**             CDMA, EVDO

**Manual operation:** See "[Code Domain Analyzer](#)" on page 100  
 See "[Power](#)" on page 100  
 See "[Ch Power ACLR](#)" on page 100  
 See "[Spectrum Emission Mask](#)" on page 110  
 See "[Occupied Bandwidth](#)" on page 120  
 See "[CCDF](#)" on page 121

## 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.

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---

### DISPlay:MTABLE <DisplayMode>

This command turns the marker table on and off.

#### Parameters:

<DisplayMode>	<b>ON</b> Marker table is displayed.
	<b>OFF</b> Marker table is not displayed.
	<b>AUTO</b> 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?
```

**Manual operation:** See "[Marker Table](#)" on page 148

---

### 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.

<b>Suffix:</b>	
<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<b>Parameters:</b>	
<Size>	SMAL   LARGe
	*RST: SMAL
<b>Example:</b>	DISP:WIND2:SIZE LARG Maximizes the second measurement screen
<b>Mode:</b>	CDMA, EVDO

**DISPlay[:WINDow<n>]:SSElect**

This command selects which window (screen) is active.

<b>Suffix:</b>	
<n>	1...4 window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<b>Parameters:</b>	
	*RST: 1
<b>Example:</b>	DISP:WIND1:SSEL Sets the window 1 active.
<b>Mode:</b>	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:

<b>Suffix:</b>	
<n>	window
<b>Parameters:</b>	
<State>	ON   OFF
	*RST: OFF
<b>Example:</b>	DISP:WIND3:STAT ON Turns on a third measurement screen.
<b>Mode:</b>	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 6.4.4, "Trace Mode Overview"](#), on page 157.

**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 87

See ["Max Hold"](#) on page 87

See ["Min Hold"](#) on page 87

See ["Average"](#) on page 87

See ["View"](#) on page 88

**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 159

**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 241.

**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 122  
See ["Range Log 50 dB"](#) on page 123  
See ["Range Log 10 dB"](#) on page 123  
See ["Range Log 5 dB"](#) on page 123  
See ["Range Log 1 dB"](#) on page 123  
See ["Range Log Manual"](#) on page 123

**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 FSV/FSVA 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 81

---

### 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 135

---

### 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  $\neq 0$ , 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 62

**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 63

**DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>**

This command defines the position of the reference level on the display grid..

When using a tracking generator (only with option R&S FSV-B9 or -B10, requires active normalization), and in Bluetooth mode (option R&S FSV-K8) this command defines the position of the reference value for all windows.

**Suffix:**

<n> 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, with tracking generator  
or time display: 50 PCT

Default unit: PCT

**Example:** DISP:TRAC:Y:RPOS 50PCT

**Manual operation:** See "Ref Level Position" on page 135

**DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>**

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator, this command requires active normalization.

**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 122

See ["Range Log 50 dB"](#) on page 123

See ["Range Log 10 dB"](#) on page 123

See ["Range Log 5 dB"](#) on page 123

See ["Range Log 1 dB"](#) on page 123

See ["Range Log Manual"](#) on page 123

See ["Range Linear %"](#) on page 124

See ["Range Lin. Unit"](#) on page 124

**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 81

**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 82

## 7.5 INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

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<a href="#">INSTrument:NSElect</a> .....	243

**INSTRument[:SElect] <Mode>****Parameters:**

&lt;Mode&gt; BC2K

This command switches to the CDMA2000 BTS Analysis mode (R&S FSV-K82 option)

**INSTRument:NSElect <Mode>****Parameters:**

&lt;Mode&gt; 10

This command switches to the CDMA2000 BTS Analysis mode (R&S FSV-K82 option)

## 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.

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### 7.6.1 SENSE:CDPower Subsystem

This subsystem sets the parameters for the code domain measurements mode.

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---

### [SENSe:]CDPower:ANTenna <AntennaState>

This command deactivates the orthogonal transmit diversity (two-antenna system) or defines the antenna for which the result display evaluated.

#### Parameters:

<AntennaState>      OFF | 1 | 2

**OFF**  
The aggregate signal from both antennas is fed in.

**1**  
The signal of antenna 1 is fed in.

**2**  
The signal of antenna 2 is fed in.

\*RST:            OFF  
For further details refer to "[Antenna Diversity](#)" on page 72.

**Example:**            CDP:ANT 2  
Selects antenna 2.

**Mode:**                CDMA

**Manual operation:** See "[Antenna Diversity](#)" on page 72

---

### [SENSe:]CDPower:CODE <CodeNo>

This command selects the code number.

For further details refer to "[Channel \(Code\) Number](#)" on page 75.

#### Parameters:

<CodeNo>              <numeric value>

Range:            0 to base spreading factor - 1

Increment:        1

\*RST:              0

- Example:** CDP:CODE 8  
Selects the eighth channel.
- Mode:** CDMA
- Manual operation:** See "[Channel \(Code\) Number](#)" on page 75  
See "[Select](#)" on page 79

#### [SENSe:]CDPower:ICThreshold <ThresholdLevel>

This command defines the minimum power that a single channel must have compared to the total signal in order to be regarded as an active channel. Channels below the specified threshold are regarded as "inactive".

##### Parameters:

<ThresholdLevel> Range: -100 dB to 0 dB  
\*RST: -60 dB

- Example:** CDP:ICT -50  
Sets the Inactive Channel Threshold to -50 dB.
- Mode:** CDMA, EVDO, TDS, WCDMA
- Manual operation:** See "[Inactive Channel Threshold](#)" on page 66

#### [SENSe:]CDPower:IQLength <CaptureLength>

This command sets the capture length in multiples of the power control group.

##### Parameters:

<CaptureLength> Range: 2 to 64  
\*RST: 3

- Example:** SENS:CDP:IQLength 3
- Mode:** CDMA
- Manual operation:** See "[Capture Length](#)" on page 64

#### [SENSe:]CDPower:LEVel:ADJust

This command adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSV/FSVA or limiting the dynamic range by an S/N ratio that is too small.

- Example:** CDP:LEV:ADJ  
Adjusts the reference level.
- Mode:** CDMA, EVDO, TDS, WCDMA

#### [SENSe:]CDPower:MAPPING <SignalComponent>

This command switches between I and Q component of the signal.

**Parameters:**

<SignalComponent> I | Q  
 \*RST: Q

**Example:** CDP:MAPP Q

**Mode:** CDMA, WCDMA

**Manual operation:** See "[Select](#)" on page 79

**[SENSe:]CDPower:LCODE:MASK <Mask>**

Defines the long code mask of the mobile in hexadecimal form.

**Note:** For the default mask value of 0 the long code offset (see ) is not taken into consideration.

**Parameters:**

<Mask> Range: #H0 to #H4FFFFFFFFF  
 \*RST: #H0

**Example:** INST:SEL MC2K  
 'Activate cdma2000 MS; by default, "CDP relative" is displayed in screen A and "Result Summary" in screen B.  
 INIT:CONT OFF  
 'Select single sweep  
 TRIG:SOUR:EXT  
 'Select external trigger source  
 CDP:LCOD:MASK '#HF'  
 'Define long code mask  
 INIT;\*WAI  
 'Start measurement with synchronization

**Mode:** CDMA

**Manual operation:** See "[Long Code Mask](#)" on page 74

**[SENSe:]CDPower:LCODE:OFFSet <CodeOffset>**

Defines the long code offset, including the PN offset. This offset is applied at the next trigger pulse (which cannot occur until a setup time of 300 ms has elapsed).

This command is ignored if [[SENSe:\]CDPower:LCODE:MASK](#) is set to 0.

**Parameters:**

<CodeOffset> **Offset in chips in hexadecimal format with a 52-bit resolution. The chips offset is calculated as follows:  $t_{\text{SinceStartGPS}} * 1.2288 \text{ MChips/s}$ , where  $t_{\text{SinceStartGPS}}$  is defined in seconds.**  
 This value corresponds to the GPS timing since 6.1.1980 00:00:00 UTC.  
 \*RST: #H0

**Example:** The hexadecimal offset of 258000 h chips is set for the first even second clock trigger:

```
INST:SEL MC2K
```

'Activate cdma2000 MS; by default, "CDP relative" is displayed in screen A and "Result Summary" in screen B.

```
INIT:CONT OFF
```

'Select single sweep

```
TRIG:SOUR:EXT
```

'Select external trigger source

```
CDP:LCOD:MASK '#H2'
```

'Define long code mask

```
CDP:LCOD:OFFS '#H258000'
```

'Define long code offset

```
INIT;*WAI
```

'Start measurement with synchronization

**Mode:** CDMA

**Manual operation:** See "[Long Code Offset](#)" on page 74

**[SENSe:]CDPower:LCODE:MODE <Mode>**

This command selects the mode of the long code generation.

**Parameters:**

<Mode>

**STANdard**

The cdma2000 standard long code generator is used.

**ESG101**

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

```
*RST: STANdard
```

**Mode:** CDMA

**Manual operation:** See "[Long Code Gen Mode](#)" on page 74

**[SENSe:]CDPower:NORMalize <boolean>**

This command activates or deactivates the elimination of the IQ offset from the signal.

**Parameters:**

<ON | OFF>

```
*RST: OFF
```

**Example:**

```
CDP:NORM ON
```

Activates normalization.

**Mode:** CDMA, EVDO, TDS, WCDMA

**[SENSe:]CDPower:ORDer <SortOrder>**

This command sets the channel sorting for the Code Domain Power and Code Domain Error Power result displays.

**Parameters:**

<SortOrder> HADamard | BITReverse  
 \*RST: HADamard  
 For further details refer to "[Code Order](#)" on page 76.

**Example:**

```
CDP:ORD HAD
Sets Hadamard order.
TRAC? TRACE2
Reads out the results in Hadamard order.
CDP:ORD BITR
Sets BitReverse order.
TRAC? TRACE2
Reads out the results in BitReverse order.
```

**Mode:** CDMA

**Manual operation:** See "[Code Order](#)" on page 76

**[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

**Manual operation:** See "[Code Domain Overview \(MS mode only\)](#)" on page 77

**[SENSe:]CDPower:PNOffset <Offset>**

This command sets the PN offset of the base station in multiples of 64 chips.

**Parameters:**

<Offset> Range: 0 to 511  
 \*RST: 0

**Example:** CDP:PNOF 45  
 Sets PN offset.

**Mode:** CDMA

**Manual operation:** See "[PN Offset](#)" on page 71

**[SENSe:]CDPower:PPReference <Mode>**

This command defines how the pilot channel power is displayed in the absolute summary. In relative mode, the reference power is the total power.

**Parameters:**

<Mode> ABS | REL  
\*RST: ABS

**Example:**

CDP:PPR REL  
Pilot channel power is displayed in relation to the total power.

**Mode:** CDMA

**Manual operation:** See "[Pilot Power \(MS mode only\)](#)" on page 76

**[SENSe:]CDPower:PREference <Power>**

This command specifies the reference power for the relative power result displays (e.g. Code Domain Power, Power vs PCG).

**Parameters:**

<Power> PICH | TOTal

**PICH**

The reference power is the power of the pilot channel. Which pilot channel is used as reference depends on the antenna diversity (for details see [\[SENSe:\]CDPower:ANTenna](#) on page 244 command).

**TOTal**

The reference power is the total power of the signal referred per PCG to the corresponding PCG.

\*RST: PICH

For further information refer to "[Power Reference](#)" on page 76

**Example:**

CDP:PREF TOT  
Sets total power as reference power.

**Mode:** CDMA

**Manual operation:** See "[Power Reference](#)" on page 76

**[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 63

**[SENSe:]CDPower:SBANd** <NORMal | INVers>

This command is used to swap the left and right sideband.

**Parameters:**

<NORMal | INVers> \*RST: NORM

**Example:**

CDP:SBAN INV  
Switches the right and left sideband.

**Mode:** CDMA, EVDO, TDS

**[SENSe:]CDPower:SET:COUNT** <NoOfSets>

This command sets the number of sets to be captured and stored in the instrument's memory.

Refer to "[Set Count](#)" on page 64 for more information.

**Parameters:**

<NoOfSets> Range: 1 to TDS: 99; CDMA: 490  
Increment: 1  
\*RST: 1

**Example:**

CDP:SET:COUN 12  
Sets the number of sets to 12.

**Mode:** TDS

**Manual operation:** See "[Set Count](#)" on page 64

**[SENSe:]CDPower:SET** <SetNo>

This command selects a specific set for further analysis. The number of sets has to be defined with the `[SENSe:]CDPower:SET` command before using this command.

**Parameters:**

<SetNo> Range: 0 to SET COUNT -1  
Increment: 1  
\*RST: 0

**Example:**

CDP:SET:COUN 10  
Selects the 10th set for further analysis.

**Mode:** CDMA, EVDO, TDS

**Manual operation:** See "[Set to Analyze](#)" on page 64

**[SENSe:]CDPower:SFACTOR** <SpreadingFactor>

This command defines the base spreading factor. If the base spreading factor of 64 is used for channels with a spreading factor of 128 (code class 7), an alias power is displayed in the Code Domain Power and Code Domain Error Power diagrams.

**Parameters:**

<SpreadingFactor> 64 | 128  
 \*RST: 64

**Example:**

CDP:SFAC 128  
 Selects base spreading factor 128.

**Mode:** CDMA

**Manual operation:** See "[Base Spreading Factor](#)" on page 70  
 See "[Base Spreading Factor](#)" on page 73

**[SENSe:]CDPower:SLOT <numeric value>**

This command selects the slot/Power Control Group (PCG) to be analyzed.

**Parameters:**

<numeric value> Range: 0 to TDS: 62; CDMA: (capture length-1); WCDMA.  
 14  
 Increment: 1  
 \*RST: 0  
 The capture length is defined via the [\[SENSe:\]CDPower:IQLength](#) on page 245 command.

**Example:**

CDP:SLOT 7  
 Selects slot number 7 for analysis.

**Mode:** CDMA, EVDO, TDS, WCDMA

**Manual operation:** See "[Power Control Group](#)" on page 75  
 See "[Select](#)" on page 79

**[SENSe:]CDPower:TPMeas <State>**

This command activates or deactivates the timing and phase offset evaluation of the channels to the pilot.

The results are queried using the [TRACe<n>\[:DATA\]?](#) on page 292 command and the [CALCulate<1...4>:MARKer<1...4>:FUNCTION:CDPower\[:BTS\]:RESULT?](#) command.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

<b>Example:</b>	<pre> CDP:TPM ON Activates timing and phase offset. CDP:SLOT 2 Selects power control group 2. CDP:CODE 11 Selects code number 11. CALC:MARK:FUNC:CDP:RES? TOFF Reads out timing offset of the code with number 11 in PCG 2. CALC:MARK:FUNC:CDP:RES? POFF Reads out the phase offset of the code with number 11 in PCG 2. </pre>
<b>Mode:</b>	CDMA
<b>Manual operation:</b>	See "Time/Phase Estimation" on page 77 See "Normalize" on page 77

## 7.6.2 Other SENSe Commands Referenced in this Manual

### 7.6.2.1 SENSe:ADJust Subsystem

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---

#### [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 92

---

#### [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 93

**[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 93

**[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 92

**[SENSe:]ADJust:CONFIgure:LEVel:DURation:MODE <Mode>**

This command selects the way the R&S FSV/FSVA 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 92

---

### [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 63  
 See "Auto Level" on page 92

## 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.

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[SENSe:]ESpectrum:RANGe<range>:BANDwidth[:RESolution].....	257
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[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:ABSolute:STOP.....	262
[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:RELative:START.....	263
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[SENSe:]ESpectrum:RANGe<range>:RLEVel.....	264
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[SENSe:]ESpectrum:RANGe<range>:TRANsducer.....	265
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---

### [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 266).

#### 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 115

---

### [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 266).

#### 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 115

**[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 115

**[SENSe:]ESpectrum:HighSPeed <State>**

This command activates Fast SEM mode to accelerate spurious emission mask measurements. For details see [Chapter 6.4.12, "Fast Spectrum Emission Mask Measurements"](#), on page 172.

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 259
- RBW, see [SENSe:]ESpectrum:RANGe<range>:BANDwidth[:RESolution] on page 257
- VBW, see [SENSe:]ESpectrum:RANGe<range>:BANDwidth:VIDeo on page 258
- Sweep Time Mode, see [SENSe:]ESpectrum:RANGe<range>:SWEep:TIME:AUTO on page 265
- Sweep Time, see [SENSe:]ESpectrum:RANGe<range>:SWEep:TIME on page 264
- Reference level, see [SENSe:]ESpectrum:RANGe<range>:RLEVel on page 264
- RF Att Mode, see [SENSe:]ESpectrum:RANGe<range>:INPut:ATTenuation:AUTO on page 261
- Rf Attenuation, see [SENSe:]ESpectrum:RANGe<range>:INPut:ATTenuation on page 260
- Preamp, see [SENSe:]ESpectrum:RANGe<range>:INPut:GAIN:STATe on page 261

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:** ESP:HSP ON

**Manual operation:** See "Fast SEM" on page 111

**[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 120

**[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 120

**[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 120

**[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 256).

**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 111

**[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 256).

**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 112

**[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 114

**[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 256).

**Suffix:**

<range> 1...20  
range

**Parameters:**

<Type>

**NORMAL**

Gaussian filters

**CFILter**

channel filters

**RRC**

RRC filters

**PULSe**

EMI (6dB) filters

**P5**

5 Pole filters

\*RST: NORM

The available bandwidths of the filters are specified in the data sheet.

**Example:**

ESP:RANG1:FILT:TYPE RRC

Sets the RRC filter type for range 1.

**Manual operation:** See ["Filter Type"](#) on page 111

**[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 6.4.11, "Ranges and Range Settings"](#), on page 171.

<b>Suffix:</b>	
<range>	1...20 range
<b>Parameters:</b>	
<Frequency>	numeric value
*RST:	-250.0 MHz (range 1), -2.52 MHz (range 2), 2.52 MHz (range 3)
<b>Example:</b>	ESP:RANG1:STAR 100000000 Sets the start frequency for range 1 to 100 MHz.
<b>Manual operation:</b>	See " <a href="#">Range Start / Range Stop</a> " on page 111

**[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 6.4.11, "Ranges and Range Settings"](#), on page 171.

<b>Suffix:</b>	
<range>	1...20 range
<b>Parameters:</b>	
<Frequency>	numeric value
*RST:	-2.52 MHz (range 1), 2.52 MHz (range 2), 250.0 MHz (range 3)
<b>Example:</b>	ESP:RANG3:STOP 100000000 Sets the stop frequency for range 2 to 10 MHz.
<b>Manual operation:</b>	See " <a href="#">Range Start / Range Stop</a> " on page 111

**[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 256).

<b>Suffix:</b>	
<range>	1...20 range
<b>Parameters:</b>	
<Value>	Refer to the data sheet.
*RST:	0 dB
<b>Example:</b>	ESP:RANG3:INP:ATT 10 Sets the attenuation of range 3 to 10 dB.
<b>Manual operation:</b>	See " <a href="#">RF Attenuator</a> " on page 112

**[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 256).

**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 112

**[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 256).

**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 112

**[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 114  
 See ["Insert after Range"](#) on page 114

**[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 113

**[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 113

**[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 113

**[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 114

**[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 113

**[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 256).

**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 112

**[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 256).

**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 112

**[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 256).

**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 112

**[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 112

**[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 115

**7.6.2.3 SENSe:BANDwidth subsystem**

[SENSe:]BANDwidth BWIDth[:RESolution].....	266
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[SENSe:]BANDwidth BWIDth[:RESolution]:RATio.....	268
[SENSe:]BANDwidth BWIDth[:RESolution]:TYPE.....	268
[SENSe:]BANDwidth BWIDth:VIDeo.....	268
[SENSe:]BANDwidth BWIDth:VIDeo:AUTO.....	269
[SENSe:]BANDwidth BWIDth:VIDeo:RATio.....	269
[SENSe:]BANDwidth BWIDth:VIDeo:TYPE.....	269

**[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 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159.

**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 121  
See "Res BW Manual" on page 138

---

### [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.

The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

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 138  
See "Res BW Auto" on page 138  
See "Default Coupling" on page 143

---

### [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 141  
See "Narrow" on page 141

**[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 142

**[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>**

This command selects the type of resolution filter.

For detailed information on filters see [Chapter 6.4.5, "Selecting the Appropriate Filter Type"](#), on page 159 and [Chapter 6.4.6, "List of Available RRC and Channel Filters"](#), on page 160.

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 143

**[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 138

---

**[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 138  
 See ["Video BW Auto"](#) on page 139  
 See ["Default Coupling"](#) on page 143

---

**[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 141  
 See ["RBW/VBW Pulse \[.1\]"](#) on page 141  
 See ["RBW/VBW Noise \[10\]"](#) on page 142  
 See ["RBW/VBW Manual"](#) on page 142  
 See ["Span/RBW Auto \[100\]"](#) on page 142

---

**[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>**

This command selects the position of the video filter in the signal path.

**Parameters:**

&lt;Mode&gt;

**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**

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**[SENSe:]FREQUENCY:CENTer <Frequency>**

This command defines the center frequency (frequency domain) or measuring frequency (time domain).

**Parameters:**

&lt;Frequency&gt;

Range: 0 to f<sub>max</sub>\*RST: f<sub>max</sub>/2

Default unit: Hz

f<sub>max</sub> is specified in the data sheet. min span is 10 Hz**Example:**

FREQ:CENT 100 MHz

**Manual operation:** See "Center" on page 62**[SENSe:]FREQUENCY:CENTer:STEP <StepSize>**

This command defines the center frequency step size.

**Parameters:**

&lt;StepSize&gt;

Range: 1 to f<sub>max</sub>

\*RST: 0.1 x &lt;span value&gt;

Default unit: Hz

**Example:** `FREQ:CENT:STEP 120 MHz`

**Manual operation:** See "[CF Stepsize](#)" on page 80  
See "[Manual](#)" on page 128

#### **[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 127  
See "[0.1\\*RBW \(span > 0\)](#)" on page 127  
See "[0.5\\*Span \(span > 0\)](#)" on page 127  
See "[0.5\\*RBW \(span > 0\)](#)" on page 127  
See "[x\\*Span \(span > 0\)](#)" on page 128  
See "[x\\*RBW \(span > 0\)](#)" on page 128

#### **[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 127  
 See "[0.1\\*RBW \(span > 0\)](#)" on page 127  
 See "[0.5\\*Span \(span > 0\)](#)" on page 127  
 See "[0.5\\*RBW \(span > 0\)](#)" on page 127

**[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 62

**[SENSe:]FREQUENCY:SPAN <Span>**

This command defines the frequency span.

**Parameters:**

<Span>             min span to fmax  
                       \*RST:        fmax  
                        $f_{max}$  is specified in the data sheet. min span is 10 Hz

**Example:** `FREQ:SPAN 10MHz`

**Manual operation:** See "[Span Manual](#)" on page 129

**[SENSe:]FREQUENCY:SPAN:FULL**

This command sets the frequency span to its maximum.

**Example:** `FREQ:SPAN:FULL`

**Manual operation:** See "[Full Span](#)" on page 130

**[SENSe:]FREQUENCY:STARt <Frequency>**

This command defines the start frequency for measurements in the frequency domain.

**Parameters:**

<Frequency>        0 to (fmax - min span)  
                       \*RST:        0  
                        $f_{max}$  is specified in the data sheet. min span is 10 Hz

**Example:** `FREQ:STAR 20MHz`

**Manual operation:** See "[Start](#)" on page 128

**[SENSe:]FREQuency:STOP** <Frequency>

This command defines the stop frequency for measurements in the frequency domain.

**Parameters:**

<Frequency>            min span to fmax  
                               \*RST:        fmax  
                               f<sub>max</sub> is specified in the data sheet. min span is 10 Hz

**Example:**                FREQ:STOP 2000 MHz

**Manual operation:**    See "Stop" on page 129

**7.6.2.5 SENSe:POWer subsystem**

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**[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 102

**[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 6.4.6, "List of Available RRC and Channel Filters"](#), on page 160.

**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 103  
See "[Channel Bandwidth \(span > 0\)](#)" on page 121

**[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 6.4.6, "List of Available RRC and Channel Filters"](#), on page 160 .

**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 103

---

**[SENSe:]POWer:ACHannel:BWIDth|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 6.4.6, "List of Available RRC and Channel Filters"](#), on page 160 .

**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 103

---

**[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 105

---

**[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 105

**[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 105

**[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 105

**[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 105

**[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 105

#### [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 108

#### [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 105

**[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 105

**[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 105

**[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 108

---

#### [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 100  
 See ["Adjust Ref Lvl \(span > 0\)"](#) on page 121

---

#### [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 109

---

#### [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 189).

**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 104

**[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 189).

**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 104

**[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 104

**[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 104

**[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 104

**[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 189).

**Parameters:**

<Number> 1 to 18  
\*RST: 1

**Example:**

POW:ACH:TXCH:COUN 3

**Manual operation:** See "[# of TX Chan](#)" on page 101

---

**[SENSe:]POWer:BAWidth|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 278).

**Parameters:**

<Percentage>            10 to 99.9PCT  
 \*RST:                    99PCT

**Example:**             POW:BWID 95PCT

**Manual operation:** See "[% Power Bandwidth \(span > 0\)](#)" on page 120

---

**[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 109

---

**[SENSe:]POWer:NCORrection <Mode>**

This command turns noise cancellation on and off.

If noise cancellation is on, the R&S FSV/FSVA 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:**

&lt;Mode&gt;

**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 109**[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:**

&lt;TraceNumber&gt; 1 to 6

**Example:**

POW:TRAC 2

Assigns the measurement to trace 2.

**Manual operation:** See "Select Trace" on page 108**7.6.2.6 SENSe:SWEep subsystem**

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[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range>.....	286
[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>].....	287
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**[SENSe:]SWEep:COUNT <NumberSweeps>**

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

**Parameters:**

<NumberSweeps> 0 to 32767  
 \*RST: 0 (GSM: 200, 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 85

**[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 125  
 See "[Gate Ranges](#)" on page 125

**[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 287) and an IFP trigger (see TRIGger<n>[:SEQUENCE]:SOURCE on page 309), 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 65

**[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 125

---

**[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 125

---

**[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 125

---

**[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 125

**[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 125

**[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 285.

**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 309), 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  $\mu$ s

**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 125

**[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 146

**[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 108  
See "[Sweeptime Manual](#)" on page 129

**[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 129  
 See "Sweeptime Auto" on page 140  
 See "Default Coupling" on page 143

**[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 140  
 See "FFT" on page 140  
 See "Auto" on page 141

**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?	290
STATus:QUEStionable:SYNC[:EVENt]?	291

---

### 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. The possible events are described in the table below.

**Example:** STAT:QUES:SYNC[:EVENT]?

**Usage:** Query only

**Mode:** WCDMA, CDMA, EVDO

Bit	Definition
0	Not used.
1	Frame Sync failed This bit is set when synchronization is not possible within the application. Possible reasons: <ul style="list-style-type: none"> <li>• Incorrectly set frequency</li> <li>• Incorrectly set level</li> <li>• Incorrectly set scrambling code</li> <li>• Incorrectly set values for Q-INVERT or SIDE BAND INVERT</li> <li>• Invalid signal at input</li> </ul>
2	Not used.
3 to 4	Not used.
5	Incorrect Pilot Symbol This bit is set when one or more of the received pilot symbols are not equal to the specified pilot symbols of the 3GPP standard. Possible reasons: <ul style="list-style-type: none"> <li>• Incorrectly sent pilot symbols in the received frame.</li> <li>• Low signal to noise ratio (SNR) of the WCDMA signal.</li> <li>• One or more code channels has a significantly lower power level compared to the total power. The incorrect pilots are detected in these channels because of low channel SNR.</li> <li>• One or more channels are sent with high power ramping. In slots with low relative power to total power, the pilot symbols might be detected incorrectly (check the signal quality by using the symbol constellation display).</li> </ul>
6 to 14	Not used.
15	This bit is always 0.

## 7.8 TRACe Subsystem

The TRACe subsystem controls access to the instrument's internal trace memory.

TRACe<n>[:DATA]?.....292

**TRACe<n>[:DATA]? <ResultType>**

This command reads trace data from the R&S FSV/FSVA.

For details on reading trace data for other than code domain measurements refer to the `TRACe:DATA` command in the base unit description.

**Suffix:**

<n> 1...4  
irrelevant

**Query parameters:**

<ResultType> TRACE1 | TRACE2 | TRACE3 | TRACE4 | CTABLE

**TRACE1 | TRACE2 | TRACE3 | TRACE4**

Reads out the trace data of measurement window 1 to 4.

**CTABLE**

For the Channel Table result display, reads out the maximum values of the timing/phase offset between every assigned channel and the pilot channel (see also [\[SENSe:\]CDPower:TPMeas](#) on page 251 command).

**Return values:**

<Return values> The measurement results are explained separately for each measurement and illustrated by a short example at the end of this command description.

- Code Domain Power
- Code Domain Error Power
- Channel Table
- Result Summary
- Power vs PCG
- Peak Code Domain Error
- Composite EVM
- EVM vs Symbol
- Channel Constellation
- Composite Constellation
- Channel Bitstream

**Usage:** Query only  
SCPI confirmed

**Mode:** CDMA

**Manual operation:** See "[List Evaluation \(On/Off\)](#)" on page 116

**Code Domain Power**

The command returns four values for each channel:

<code class>, <code number>, <signal level>, <power ID>, ...

Value	Description	Range/Unit
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (4, symbol rate 307.2 ksp/s), 7 corresponds to the highest spreading factor (128, symbol rate 9.6 ksp/s)	{2...7}
<code number>	code number of the channel	{0...127}
<signal level>	absolute or relative power, depending on the setting (see Power Reference) Hadamard order: power values for each code BitReverse order: power values for combined channels	{-∞...∞} dB or dBm
<power ID>	power detection 0 - inactive channel, 1 - power of own antenna, 2 - alias power of own antenna, 3 - alias power of other antenna, 4 - alias power of own and other antenna to avoid alias power, set the base spreading factor correctly	

**Note:** To avoid alias power, set the base spreading factor correctly

The number of displayed data depends on the spreading factor. In addition, the structure of the output differs whether Hadamard or BitReverse code sorting order was selected.

In Hadamard order, the different codes are output in ascending order together with their code power. The number of output codes corresponds to the base spreading factor.

In BitReverse order, codes belonging to a channel are next to one another and are therefore output in the class of the channel together with the consolidated channel power. The maximum number of output codes or channels cannot be higher than the base spreading factor, but decreases with every concentrated channel.

For further information refer to "[Base Spreading Factor](#)" on page 70 and "[Code Order](#)" on page 76.

#### Code Domain Error Power

The command returns four values for each channel:

<code class>, <code number>, <error power>, <power ID>, ...

Value	Description	Range/Unit
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (4, symbol rate 307.2 ksp/s), 7 corresponds to the highest spreading factor (128, symbol rate 9.6 ksp/s)	{2...7}
<code number>	code number of the channel	{0...127}

Value	Description	Range/Unit
<signal level>	error power	{-∞...∞} dB
<power ID>	power detection 0 - inactive channel, 1 - power of own antenna, 2 - alias power of own antenna, 3 - alias power of other antenna, 4 - alias power of own and other antenna	

**Note:** To avoid alias power, set the base spreading factor correctly

The number of displayed data depends on the spreading factor. In addition, the structure of the output differs whether Hadamard or BitReverse code sorting order was selected.

In Hadamard order, the different codes are output in ascending order.

In BitReverse order, codes belonging to a channel are next to one another. Because an error power is output with the code domain error power, a consolidation of the power values is not sensible.

For further information refer to "[Base Spreading Factor](#)" on page 70 and "[Code Order](#)" on page 76.

### Channel Table

TRACE1 | TRACE2 | TRACE3 | TRACE4 parameter

The command returns 8 values for each channel in the following order:

<channel type>, <code class>, <code number>, <radio configuration>, <absolute level>, <relative level>, <timing offset>, <phase offset>

Value	Description	Range	Unit
<channel type>	channel type: 0 - PICH, 1 - SYNC, 2 - PCH, 3 - TDPICH, 4 - APICH, 5 - ATD-PICH, 6 - BCH, 7 - CPCCH, 8 - CACH, 9 - CCCH, 10 - CHAN, 11 - INACTIVE, 12 - PDCCH, 13 - PDCH	{2...13}	
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (=4, symbol rate 307.2 ksps), 7 corresponds to the highest spreading factor (=128, symbol rate 9.6 ksps)	{2...7}	
<radio config>	radio configuration For deactivated Auto Search: 0 - special channels, 1 to 5 - data channels, 10 - QPSK, 20 - 8PSK, 30 - 16QAM For activated Auto Search: 1 - RC 1 and 2, 3 - RCs 3 to 5 and 10 - PDCH		
<absolute level>	absolute power level of the channel	{-∞...∞}	dBm
<relative level>	relative power level of the channel, referred to either Total or Pilot power	{-∞...∞}	dB

Value	Description	Range	Unit
<timing offset>	referred to the pilot channel		s
<phase offset>	referred to the pilot channel		rad

The sorting of the channels is according to these rules:

1. All detected special channels
2. Data channels, in ascending order by code class and within the code class in ascending order by code number.
3. Unassigned codes, with the code class of the base spreading factor

CTABLE parameter

The command returns 7 values for each channel in the following order:

<max. time offset in s>, <code number for max. time>, <code class for max. time>, <max. phase offset in rad>, <code number for max. phase>, <code class for max. phase>, <reserved 1>, ..., <reserved 6>

Value	Description	Range	Unit
<time offset>	maximum time offset		s
<code number>	code number of the channel with maximum time offset	{0...127}	
<code class>	code class of the channel with maximum time offset	{2...7}	
<phase offset>	maximum phase offset		rad
<code number>	code number of the channel with maximum phase offset	{0...127}	
<code class>	code class of the channel with maximum phase offset	{2...7}	
<reserved 1...6>	reserved		

### Result Summary

The command returns 22 values for each channel in the following order:

<SLOT>, <PTOTAL>, <PPICH>, <RHO>, <MACCuracy>, <PCDerror>, <ACTive>, <FERRor>, <FERPpm>, <TFRame>, <CERRor>, <IQOFFset>, <IQIMbalance>, <SRATe>, <CHANnel>, <SFACtor>, <TOFFset>, <POFFset>, <CDPRelative>, <CDPabsolute>, <EVMRms>, <EVMPeak>

Value	Description	Range	Unit
<SLOT>	Number of the PCG		
<PTOTAL>	Total power	{-∞...∞}	dBm
<PPICH>	Pilot power	{-∞...∞}	dBm
<RHO>	RHO	{0...1}	
<MACCuracy>	Composite EVM		%
<PCDerror>	Peak Code Domain Error		dB

Value	Description	Range	Unit
<ACTive>	Number of active channels		
<FERRor>	Frequency error		Hz
<FERPpm>	Frequency error		ppm
<TFRame>	Trigger to Frame Returns a '9' if the trigger is set to Free Run		
<CERRor>	Chip rate error		ppm
<IQOFFset>	IQ offset		%
<IQIMbalance>	IQ imbalance		%
<SRATe>	Symbol rate		ksp/s
<CHANnel>	Channel number		
<SFACtor>	Spreading factor of the channel		
<TOFFset>	Timing offset returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50		s
<POFFset>	Phase offset returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50		rad
<CDPRelative>	Relative (to total or pilot power) channel power	{-∞...∞}	dBm
<CDPabsolute>	Absolute channel power	{-∞...∞}	dB
<EVMRms>	Error vector magnitude (RMS)		%
<EVMPeak>	Error vector magnitude peak		%

**Tip:** Read out the modulation type with the command: `CALCulate<n>:MARKer<m>:FUNCTION:CDPower[:BTS]:RESULT?` on page 184

### Power vs PCG

The command returns 2 values for each channel in the following order:

<slot number>, <level value in dB>, <slot number>, <level value in dB>, ...

The number of displayed value pairs corresponds to the Capture Length.

### Peak Code Domain Error

The command returns 2 values for each channel in the following order:

<slot number>, <level value in dB>, <slot number>, <level value in dB>, ...

The number of displayed value pairs corresponds to the Capture Length.

### Composite EVM

The command returns 2 values for each channel in the following order:

<slot number>, <level value in %>, <slot number>, <level value in %>, ...

The number of displayed value pairs corresponds to the Capture Length.

### EVM vs Symbol

The command returns one value for every symbol in the following order:

<value in % symbol 0>, <value in % symbol 1>,...

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

### Power vs Symbol

The command returns one value for every symbol in the following order:

<value in dBm symbol 0>, <value in dBm symbol 1>,...

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

### Channel Constellation

The command returns two values, the real and imaginary parts, for every symbol in the following order:

<re 0>,<im 0>,<re 1>,<im 1>,...,<re n>, <im n>, ...

The number of value pairs depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of pairs is reduced to the half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

### Composite Constellation

The command returns two values, the real and imaginary parts, for every chip in the following order:

<re chip 0>,<im chip 0>,<re chip 1>,<im chip 1>,...

The number of value pairs corresponds to the chip number of 1536 chips in a power control group.

### Channel Bitstream

The command returns the bitstream of one slot, i.e. it returns one value for every bit (either 0 or 1) in a symbol in the following order:

<bit 1>, <bit 2>,..., <bit n>,...

The number of returned bits depends on the symbol rate and therefore the spreading factor of the channel. A PCG can contain a minimum of 12 and a maximum of 384 symbols.

### BPSK modulation:

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

### QPSK modulation:

Spreading factor	Number of values
128	24
64	48
32	96
16	192

8	384
4	768

**8PSK modulation:**

Spreading factor	Number of values
32	144

**16QAM modulation:**

Spreading factor	Number of values
32	192

Depending on the modulation type, a symbol consists of a different number of bits. For BPSK modulated signals there is one bit per symbol, for QPSK modulated signals there are 2 bits per symbol, for 8-PSK modulated signals there are 3 bits per symbol and for 16QAM modulated signal there are 4 bits per symbol.

With transmit diversity activated the values reduce to the half.

**Magnitude Error vs Chip**

The comand returns a list of magnitude error values of all chips at the selected PCG. 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 PCG.

**Phase Error vs Chip**

The comand returns a list of phase error values of all chips at the selected PCG. 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 PCG.

**Symbol Magnitude Error**

The comand returns the magnitude error in % of each symbol at the selected PCG. The number of the symbols depends on the spreading factor of the selected channel:

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

**Symbol Phase Error**

The comand returns the phase error in degrees of each symbol at the selected PCG. The number of the symbols depends on the spreading factor of the selected channel:

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

## 7.9 Other Commands Referenced in this Manual

The following commands are identical to those in the base unit and are included in this manual only because they are specifically referenced to here.

See also [Chapter 7.6.2, "Other SENSE Commands Referenced in this Manual"](#), on page 252 and [Chapter 7.2.3, "Other CALCulate Commands Referenced in this Manual"](#), on page 191

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### 7.9.1 INPut commands

---

#### INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

The RF attenuation can be set in 5 dB steps (R&S FSV with option R&S FSV-B25 or R&S FSVA: 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.

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 82

---

#### 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 83

**INPut:COUPling** <CouplingType>

Toggles the RF input of the R&S FSV/FSVA 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 84

**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. <b>Not Started</b> <b>Has to be Started</b> <b>Started</b> <b>Passed</b> <b>Failed</b> <b>Done</b>
<PRBSTestState>	State of the PRBS test. <b>Not Started</b> <b>Has to be Started</b> <b>Started</b> <b>Passed</b> <b>Failed</b> <b>Done</b>
<SampleRateType>	<b>0</b> Maximum sampling rate is displayed <b>1</b> Current sampling rate is displayed
<Placeholder>	for future use; currently "0"
<b>Example:</b>	INP:DIQ:CDEV? Result: 1, SMU200A, 103634, Out A, 700000000, 1000000000, Passed, Not Started, 0, 0
<b>Mode:</b>	IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS
<b>Manual operation:</b>	See " <a href="#">Connected Device</a> " on page 94 See " <a href="#">Digital IQ Info</a> " on page 95

---

#### 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 94

#### **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 94).

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 94

#### **INPut:DIQ:RANGe[:UPPer]:UNIT** <Unit>

Defines the unit of the full scale level (see "[Level Unit](#)" on page 94). 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, ADEMODO, TDS

**Manual operation:** See "[Level Unit](#)" on page 94

**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 94).

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, ADEMODO, GSM, OFDM, OFDMA/WiBro, WLAN

**Manual operation:** See "[Input Sample Rate](#)" on page 94

**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, ADEMODO, 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 "[EI Atten Mode \(Auto/Man\)](#)" on page 83

---

**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 "[EI Atten On/Off](#)" on page 83  
See "[EI Atten Mode \(Auto/Man\)](#)" on page 83

---

**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:FILTer:YIG[:STATe] <State>**

If the option R&S FSVA-B11 is installed, the YIG preselector can be bypassed.

This function is only available for R&S FSVA instruments.

If the YIG preselector at the input of the R&S FSVA is removed from the signal path, you can use the maximum bandwidth for signal analysis. However, image-frequency rejection is no longer ensured.

Note that the YIG preselector is active only on frequencies greater than 7 GHz. Therefore, switching the YIG preselector on and off has no effect if the frequency is below that value.

#### **Parameters:**

<State> ON | OFF | 0 | 1  
\*RST: 1 (0 for I/Q Analyzer, GSM, VSA measurements)

**Example:** `INP:FILT:YIG OFF`  
Deactivates the YIG preselector.

**Manual operation:** See "[\(Bypassing the \) YIG Filter](#)" on page 137

---

### **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 63

---

### **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

**Manual operation:** See "[Input 50 Ω/75 Ω](#)" on page 136

**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 94

## 7.9.2 TRIGger Commands

**TRIGger**<n>[:SEquence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger source (for digital input via the 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:**

<Source>	<b>IMMediate</b> Free Run
	<b>EXTErn</b> External trigger
	<b>IFPower</b> Power trigger at the second intermediate frequency
	<b>RFPower</b> Power trigger at the first intermediate frequency
	<b>TIME</b> Time interval
	<b>PSEN</b> External power sensor (requires R&S FSV-K9 option)
	*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 64  
See ["Trigger Source External"](#) on page 64

### 7.9.3 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 120

**DIAGnostic<n>:SERVice:NSOource <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 93

**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 117  
 See ["Decim Sep"](#) on page 117

**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 84

**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 84  
See "[Single Sweep](#)" on page 84

**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 120

**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 116  
See ["ASCII File Export"](#) on page 117

### **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 6.4.7, "ASCII File Export Format"](#), on page 161

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 311).

**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 a 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.

**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 150

---

**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 150

---

**SYSTem:DISPly: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

## 8 Status Reporting System of the CDMA2000 BTS Analysis (option K82)

Detailed information on the status registers of the base system is given in the base unit description. In this section, only the new and altered status registers/its for the CDMA2000 BTS Analysis option (K82) are described.

The R&S FSV-K82 uses the STATus:QUEStionable:SYNC register.

Although this register is provided by the base system, the CDMA2000 BTS Analysis option (K82) uses different bits and definitions.

The STATus:QUEStionable:SYNC register contains information on the error situation in the code domain analysis of the CDMA2000 BTS Analysis option. The bits can be queried with commands STATus:QUEStionable:SYNC:CONDition? and STATus:QUEStionable:SYNC[:EVENT]?

Bit No	Meaning
0	This bit is not used.
1	Frame Sync failed. This bit is set when synchronization is not possible within the application. Possible reasons: Incorrectly set frequency Incorrectly set level Incorrectly set PN Offset Incorrectly set values for Swap IQ Invalid signal at input
2 to 14	These bits are not used.
15	This bit is always 0.

## 9 Glossary

For a more comprehensive glossary refer to the CDMA2000 standard.

APICH	auxiliary pilot channel
ATDPCH	auxiliary transmit diversity pilot channel
BCH	broadcast channel.
CACH	common assignment channel
CCCH	common control channel
CDEP	code domain error power
CDP	code domain power
Composite EVM	in accordance with the 3GPP2 specifications, determines the square root of the squared error between the real and the imaginary parts of the test signal and an ideally generated reference signal (EVM referred to the total signal) in a composite EVM measurement.
CPCCH	common power control channel
Crest factor	ratio of peak to average value of the signal
Inactive Channel Threshold	minimum power that a single channel must have compared with the total signal to be recognized as an active channel.
MC1	multi-carrier1 (one carrier system 1X).
MC2	multi-carrier3 (three carrier system 3X).
OTD	orthogonal transmit diversity, two antennas used
PCG	power control group: name in CDMA2000 system for 1536 chips or 1.25 ms interval; transmitter power is constant during a power control group
PCH	paging channel
PDCH	packet data channel
PDCCH	packet data control channel
PICH	pilot channel 0.64
RC	radio configuration; definition of sampling rate, permissible data rates, modulation types and use of special channels, and transmit diversity
Set	a group of 64 consecutive PCGs
SF	spreading factor
SYNC	synchronisation channel 32.64
TD	transmit diversity, two antennas used
TDPICH	transmit diversity pilot channel 16.128
x.y	Walsh code x.y, with code number x and spreading factor y of the channel

# 10 Appendix

## Hadamard and BitReverse Code Tables

The following tables show the code sequences with Hadamard and BitReverse orders for the Code Domain Power and Code Domain Error Power result displays.

As an example, the corresponding cells for channel 8.32 (channel number 8 for spreading factor 32) are marked to show where the different codes of this channel are located.

HADAMARD				BITREVERSE					
0	000000	0	0	0	0	0	0	000000	0
1	000001	0	0	0	0	0	1	100000	32
2	000010	0	0	0	0	1	0	010000	16
3	000011	0	0	0	0	1	1	110000	48
4	000100	0	0	0	1	0	0	001000	8
5	000101	0	0	0	1	0	1	101000	40
6	000110	0	0	0	1	1	0	011000	24
7	000111	0	0	0	1	1	1	111000	56
8	001000	0	0	1	0	0	0	000100	4
9	001001	0	0	1	0	0	1	100100	36
10	001010	0	0	1	0	1	0	010100	20
11	001011	0	0	1	0	1	1	110100	52
12	001100	0	0	1	1	0	0	001100	12
13	001101	0	0	1	1	0	1	101100	44
14	001110	0	0	1	1	1	0	011100	28
15	001111	0	0	1	1	1	1	111100	60
16	010000	0	1	0	0	0	0	000010	2
17	010001	0	1	0	0	0	1	100010	34
18	010010	0	1	0	0	1	0	010010	18
19	010011	0	1	0	0	1	1	110010	50
20	010100	0	1	0	1	0	0	001010	10
21	010101	0	1	0	1	0	1	101010	42
22	010110	0	1	0	1	1	0	011010	26
23	010111	0	1	0	1	1	1	111010	58
24	011000	0	1	1	0	0	0	000110	6
25	011001	0	1	1	0	0	1	100110	38
26	011010	0	1	1	0	1	0	010110	22
27	011011	0	1	1	0	1	1	110110	54
28	011100	0	1	1	1	0	0	001110	14
29	011101	0	1	1	1	0	1	101110	46
30	011110	0	1	1	1	1	0	011110	30
31	011111	0	1	1	1	1	1	111110	62
32	100000	1	0	0	0	0	0	000001	1
33	100001	1	0	0	0	0	1	100001	33
34	100010	1	0	0	0	1	0	010001	17
35	100011	1	0	0	0	1	1	110001	49
36	100100	1	0	0	1	0	0	001001	9
37	100101	1	0	0	1	0	1	101001	41
38	100110	1	0	0	1	1	0	011001	25
39	100111	1	0	0	1	1	1	111001	57
40	101000	1	0	1	0	0	0	000101	5
41	101001	1	0	1	0	0	1	100101	37
42	101010	1	0	1	0	1	0	010101	21
43	101011	1	0	1	0	1	1	110101	53
44	101100	1	0	1	1	0	0	001101	13
45	101101	1	0	1	1	0	1	101101	45
46	101110	1	0	1	1	1	0	011101	29
47	101111	1	0	1	1	1	1	111101	61
48	110000	1	1	0	0	0	0	000011	3
49	110001	1	1	0	0	0	1	100011	35
50	110010	1	1	0	0	1	0	010011	19
51	110011	1	1	0	0	1	1	110011	51
52	110100	1	1	0	1	0	0	001011	11
53	110101	1	1	0	1	0	1	101011	43
54	110110	1	1	0	1	1	0	011011	27
55	110111	1	1	0	1	1	1	111011	59
56	111000	1	1	1	0	0	0	000111	7
57	111001	1	1	1	0	0	1	100111	39
58	111010	1	1	1	0	1	0	010111	23
59	111011	1	1	1	0	1	1	110111	55
60	111100	1	1	1	1	0	0	001111	15
61	111101	1	1	1	1	0	1	101111	47
62	111110	1	1	1	1	1	0	011111	31
63	111111	1	1	1	1	1	1	111111	63

Figure 10-1: Codetable for base spreading factor 64

HARDWARD						PTRVERSE								
0	000000	0	0	0	0	0	0	0	0	0	0	000000	0	
1	000001	0	0	0	0	0	0	1	1	0	0	0	0	64
2	000010	0	0	0	0	0	1	0	0	1	0	0	0	32
3	000011	0	0	0	0	0	1	1	1	0	0	0	0	96
4	000100	0	0	0	1	0	0	0	0	0	0	0	0	16
5	000101	0	0	0	1	0	1	1	0	0	0	0	0	80
6	000110	0	0	0	1	1	0	0	0	0	0	0	0	48
7	000111	0	0	0	1	1	1	1	0	0	0	0	0	112
8	0001000	0	0	1	0	0	0	0	0	1	0	0	0	8
9	0001001	0	0	1	0	0	1	1	0	0	1	0	0	72
10	0001010	0	0	1	0	1	0	0	1	0	1	0	0	40
11	0001011	0	0	1	0	1	1	1	0	1	0	0	0	104
12	0001100	0	0	1	1	0	0	0	0	1	1	0	0	24
13	0001101	0	0	1	1	0	1	1	0	1	1	0	0	88
14	0001110	0	0	1	1	1	0	0	0	1	1	0	0	56
15	0001111	0	0	1	1	1	1	1	0	0	0	0	0	120
16	0010000	0	0	1	0	0	0	0	0	0	0	1	0	4
17	0010001	0	0	1	0	0	0	1	1	0	0	0	0	68
18	0010010	0	0	1	0	0	1	0	0	1	0	0	0	36
19	0010011	0	0	1	0	0	1	1	1	0	0	1	0	100
20	0010100	0	0	1	0	1	0	0	0	0	1	0	0	20
21	0010101	0	0	1	0	1	0	1	1	0	1	0	0	84
22	0010110	0	0	1	0	1	1	0	0	1	0	1	0	52
23	0010111	0	0	1	0	1	1	1	1	0	1	0	0	116
24	0011000	0	0	1	1	0	0	0	0	0	1	1	0	12
25	0011001	0	0	1	1	0	0	1	1	0	1	0	0	76
26	0011010	0	0	1	1	0	1	0	0	1	0	1	0	44
27	0011011	0	0	1	1	0	1	1	1	0	1	0	0	108
28	0011100	0	0	1	1	1	0	0	0	0	1	1	0	28
29	0011101	0	0	1	1	1	0	1	1	1	0	0	0	92
30	0011110	0	0	1	1	1	1	0	0	1	1	1	0	60
31	0011111	0	0	1	1	1	1	1	1	0	0	0	0	124
32	0100000	0	1	0	0	0	0	0	0	0	0	1	0	2
33	0100001	0	1	0	0	0	0	1	1	0	0	0	0	66
34	0100010	0	1	0	0	0	1	0	0	0	1	0	0	34
35	0100011	0	1	0	0	0	1	1	1	0	0	0	0	98
36	0100100	0	1	0	0	1	0	0	0	0	1	0	0	18
37	0100101	0	1	0	0	1	0	1	1	0	0	1	0	82
38	0100110	0	1	0	0	1	1	0	0	1	0	0	0	50
39	0100111	0	1	0	0	1	1	1	1	0	0	1	0	114
40	0101000	0	1	0	1	0	0	0	0	0	1	0	0	10
41	0101001	0	1	0	1	0	0	1	1	0	0	1	0	74
42	0101010	0	1	0	1	0	1	0	0	1	0	1	0	42
43	0101011	0	1	0	1	0	1	1	1	0	0	1	0	106
44	0101100	0	1	0	1	1	0	0	0	0	1	1	0	26
45	0101101	0	1	0	1	1	0	1	1	0	1	0	0	90
46	0101110	0	1	0	1	1	1	0	0	1	1	0	0	58
47	0101111	0	1	0	1	1	1	1	1	0	0	1	0	122
48	0110000	0	1	1	0	0	0	0	0	0	1	1	0	6
49	0110001	0	1	1	0	0	0	1	1	0	0	1	0	70
50	0110010	0	1	1	0	0	1	0	0	1	0	1	0	38
51	0110011	0	1	1	0	0	1	1	1	0	0	1	0	102
52	0110100	0	1	1	0	1	0	0	0	0	1	0	1	22
53	0110101	0	1	1	0	1	0	1	1	0	0	1	0	86
54	0110110	0	1	1	0	1	1	0	0	1	0	1	0	54
55	0110111	0	1	1	0	1	1	1	1	0	0	1	0	118
56	0111000	0	1	1	1	0	0	0	0	0	1	1	0	14
57	0111001	0	1	1	1	0	0	1	1	0	0	1	0	78
58	0111010	0	1	1	1	0	1	0	0	1	1	0	0	46
59	0111011	0	1	1	1	0	1	1	1	0	0	1	0	110
60	0111100	0	1	1	1	1	0	0	0	0	1	1	0	30
61	0111101	0	1	1	1	1	0	1	1	1	0	0	0	94
62	0111110	0	1	1	1	1	1	0	0	1	1	1	0	62
63	0111111	0	1	1	1	1	1	1	1	0	0	0	0	126

Figure 10-2: Code table for base spreading factor 128 (part1)

HARDWARD					PTRVERSE							
64	1000000	1	0	0	0	0	0	0	0	1	0000001	1
65	1000001	1	0	0	0	0	0	0	1	1	0000011	65
66	1000010	1	0	0	0	0	0	1	0	0	0100001	33
67	1000011	1	0	0	0	0	0	1	1	1	0000011	97
68	1000100	1	0	0	0	1	0	0	0	0	0010001	17
69	1000101	1	0	0	0	1	0	0	1	1	0010011	81
70	1000110	1	0	0	0	1	0	1	0	0	0110001	49
71	1000111	1	0	0	0	1	0	1	1	1	0010011	113
72	1001000	1	0	0	1	0	0	0	0	0	0001001	9
73	1001001	1	0	0	1	0	0	0	1	1	0001011	73
74	1001010	1	0	0	1	0	0	1	0	0	0101001	41
75	1001011	1	0	0	1	0	0	1	1	1	0010011	105
76	1001100	1	0	0	1	1	0	0	0	0	0011001	25
77	1001101	1	0	0	1	1	0	0	1	1	0011011	89
78	1001110	1	0	0	1	1	0	1	0	0	0111001	57
79	1001111	1	0	0	1	1	0	1	1	1	0011011	121
80	1010000	1	0	1	0	0	0	0	0	0	0000101	5
81	1010001	1	0	1	0	0	0	0	1	1	0000111	69
82	1010010	1	0	1	0	0	0	1	0	0	0100101	37
83	1010011	1	0	1	0	0	0	1	1	1	0000111	101
84	1010100	1	0	1	0	1	0	0	0	0	0010101	21
85	1010101	1	0	1	0	1	0	0	1	1	0010111	85
86	1010110	1	0	1	0	1	0	1	0	0	0110101	53
87	1010111	1	0	1	0	1	0	1	1	1	0010111	117
88	1011000	1	0	1	1	0	0	0	0	0	0001101	13
89	1011001	1	0	1	1	0	0	0	1	1	0001111	77
90	1011010	1	0	1	1	0	0	1	0	0	0101101	45
91	1011011	1	0	1	1	0	0	1	1	1	0001111	109
92	1011100	1	0	1	1	1	0	0	0	0	0011101	29
93	1011101	1	0	1	1	1	0	0	1	1	0011111	93
94	1011110	1	0	1	1	1	0	1	0	0	0111101	61
95	1011111	1	0	1	1	1	0	1	1	1	0011111	125
96	1100000	1	1	0	0	0	0	0	0	0	0000011	3
97	1100001	1	1	0	0	0	0	0	1	1	0000011	67
98	1100010	1	1	0	0	0	0	1	0	0	0100001	35
99	1100011	1	1	0	0	0	0	1	1	1	0000011	99
100	1100100	1	1	0	0	1	0	0	0	0	0000101	19
101	1100101	1	1	0	0	1	0	0	1	1	0000111	83
102	1100110	1	1	0	0	1	0	1	0	0	0100101	51
103	1100111	1	1	0	0	1	0	1	1	1	0000111	115
104	1101000	1	1	0	1	0	0	0	0	0	0001001	11
105	1101001	1	1	0	1	0	0	0	1	1	0001011	75
106	1101010	1	1	0	1	0	0	1	0	0	0101001	43
107	1101011	1	1	0	1	0	0	1	1	1	0001011	107
108	1101100	1	1	0	1	1	0	0	0	0	0011001	27
109	1101101	1	1	0	1	1	0	0	1	1	0011011	91
110	1101110	1	1	0	1	1	0	1	0	0	0111001	59
111	1101111	1	1	0	1	1	0	1	1	1	0011011	123
112	1110000	1	1	1	0	0	0	0	0	0	0000111	7
113	1110001	1	1	1	0	0	0	0	1	1	0000111	71
114	1110010	1	1	1	0	0	0	1	0	0	0100111	39
115	1110011	1	1	1	0	0	0	1	1	1	0000111	103
116	1110100	1	1	1	0	1	0	0	0	0	0010111	23
117	1110101	1	1	1	0	1	0	0	1	1	0010111	87
118	1110110	1	1	1	0	1	0	1	0	0	0110111	55
119	1110111	1	1	1	0	1	0	1	1	1	0010111	119
120	1111000	1	1	1	1	0	0	0	0	0	0001111	15
121	1111001	1	1	1	1	0	0	0	1	1	0001111	79
122	1111010	1	1	1	1	0	0	1	0	0	0101111	47
123	1111011	1	1	1	1	0	0	1	1	1	0001111	111
124	1111100	1	1	1	1	1	0	0	0	0	0011111	31
125	1111101	1	1	1	1	1	0	0	1	1	0011111	95
126	1111110	1	1	1	1	1	0	1	0	0	0111111	63
127	1111111	1	1	1	1	1	0	1	1	1	0011111	127

Figure 10-3: Code table for base spreading factor 128 (part 2)

## List of Commands

[SENSe:]ADJust:ALL.....	252
[SENSe:]ADJust:CONFIguration:HYSTeresis:LOWer.....	252
[SENSe:]ADJust:CONFIguration:HYSTeresis:UPPer.....	253
[SENSe:]ADJust:CONFIgure:LEVel:DURation.....	253
[SENSe:]ADJust:CONFIgure:LEVel:DURation:MODE.....	253
[SENSe:]ADJust:FREQuency.....	254
[SENSe:]ADJust:LEVel.....	254
[SENSe:]AVERAge<n>:COUNT.....	289
[SENSe:]AVERAge<n>[:STATe<Trace>].....	290
[SENSe:]BANDwidth BWIDth:VIDeo.....	268
[SENSe:]BANDwidth BWIDth:VIDeo:AUTO.....	269
[SENSe:]BANDwidth BWIDth:VIDeo:RATio.....	269
[SENSe:]BANDwidth BWIDth:VIDeo:TYPE.....	269
[SENSe:]BANDwidth BWIDth[:RESolution].....	266
[SENSe:]BANDwidth BWIDth[:RESolution]:AUTO.....	267
[SENSe:]BANDwidth BWIDth[:RESolution]:FFT.....	267
[SENSe:]BANDwidth BWIDth[:RESolution]:RATio.....	268
[SENSe:]BANDwidth BWIDth[:RESolution]:TYPE.....	268
[SENSe:]CDPower:ANTenna.....	244
[SENSe:]CDPower:CODE.....	244
[SENSe:]CDPower:ICThreshold.....	245
[SENSe:]CDPower:IQLength.....	245
[SENSe:]CDPower:LCODE:MASK.....	246
[SENSe:]CDPower:LCODE:MODE.....	247
[SENSe:]CDPower:LCODE:OFFSet.....	246
[SENSe:]CDPower:LEVel:ADJust.....	245
[SENSe:]CDPower:MAPPING.....	245
[SENSe:]CDPower:NORMALize.....	247
[SENSe:]CDPower:ORDER.....	247
[SENSe:]CDPower:OVERview.....	248
[SENSe:]CDPower:PNOffset.....	248
[SENSe:]CDPower:PPReference.....	249
[SENSe:]CDPower:PREference.....	249
[SENSe:]CDPower:QINVert.....	249
[SENSe:]CDPower:SBAND.....	250
[SENSe:]CDPower:SET.....	250
[SENSe:]CDPower:SET:COUNT.....	250
[SENSe:]CDPower:SFACTor.....	250
[SENSe:]CDPower:SLOT.....	251
[SENSe:]CDPower:TPMeas.....	251
[SENSe:]ESpectrum:BWID.....	255
[SENSe:]ESpectrum:FILTer[:RRC]:ALPHa.....	256
[SENSe:]ESpectrum:FILTer[:RRC][:STATe].....	255
[SENSe:]ESpectrum:HighSPeed.....	256
[SENSe:]ESpectrum:PRESet:REStore.....	257
[SENSe:]ESpectrum:PRESet:StORe.....	257
[SENSe:]ESpectrum:PRESet[:STANdard].....	257

[SENSe:]ESpectrum:RANGe<range>:BANDwidth:VIDeo.....	258
[SENSe:]ESpectrum:RANGe<range>:BANDwidth[:RESolution].....	257
[SENSe:]ESpectrum:RANGe<range>:COUNT.....	258
[SENSe:]ESpectrum:RANGe<range>:DELEte.....	258
[SENSe:]ESpectrum:RANGe<range>:FILTer:TYPE.....	259
[SENSe:]ESpectrum:RANGe<range>:INPut:ATTenuation.....	260
[SENSe:]ESpectrum:RANGe<range>:INPut:ATTenuation:AUTO.....	261
[SENSe:]ESpectrum:RANGe<range>:INPut:GAIN:STATE.....	261
[SENSe:]ESpectrum:RANGe<range>:INSert.....	261
[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:ABSolute:START.....	262
[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:ABSolute:STOP.....	262
[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:RELative:START.....	263
[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:RELative:STOP.....	263
[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:STATE.....	263
[SENSe:]ESpectrum:RANGe<range>:RLEVel.....	264
[SENSe:]ESpectrum:RANGe<range>:SWEep:TIME.....	264
[SENSe:]ESpectrum:RANGe<range>:SWEep:TIME:AUTO.....	265
[SENSe:]ESpectrum:RANGe<range>:TRANsducer.....	265
[SENSe:]ESpectrum:RANGe<range>[:FREQuency]:START.....	259
[SENSe:]ESpectrum:RANGe<range>[:FREQuency]:STOP.....	260
[SENSe:]ESpectrum:RRANGe.....	266
[SENSe:]ESpectrum:RTYPE.....	266
[SENSe:]FREQuency:CENTer.....	270
[SENSe:]FREQuency:CENTer:STEP.....	270
[SENSe:]FREQuency:CENTer:STEP:AUTO.....	271
[SENSe:]FREQuency:CENTer:STEP:LINK.....	271
[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor.....	271
[SENSe:]FREQuency:OFFSet.....	272
[SENSe:]FREQuency:SPAN.....	272
[SENSe:]FREQuency:SPAN:FULL.....	272
[SENSe:]FREQuency:START.....	272
[SENSe:]FREQuency:STOP.....	273
[SENSe:]POWer:ACHannel:ACPairs.....	273
[SENSe:]POWer:ACHannel:BANDwidth BWIDth:ACHannel.....	274
[SENSe:]POWer:ACHannel:BANDwidth BWIDth:ALTErnate<channel>.....	275
[SENSe:]POWer:ACHannel:BANDwidth BWIDth[:CHANnel<channel>].....	274
[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel.....	275
[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTErnate<channel>.....	275
[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel>.....	276
[SENSe:]POWer:ACHannel:FILTer[:STATE]:ACHannel.....	276
[SENSe:]POWer:ACHannel:FILTer[:STATE]:ALTErnate<channel>.....	276
[SENSe:]POWer:ACHannel:FILTer[:STATE]:CHANnel<channel>.....	276
[SENSe:]POWer:ACHannel:MODE.....	277
[SENSe:]POWer:ACHannel:NAME:ACHannel.....	277
[SENSe:]POWer:ACHannel:NAME:ALTErnate<channel>.....	278
[SENSe:]POWer:ACHannel:NAME:CHANnel<channel>.....	278
[SENSe:]POWer:ACHannel:PRESet.....	278
[SENSe:]POWer:ACHannel:PRESet:RLEVel.....	279
[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE.....	279
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO.....	279

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual.....	280
[SENSe:]POWer:ACHannel:SPACing:ALTerate<channel>.....	281
[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel>.....	281
[SENSe:]POWer:ACHannel:SPACing[:ACHannel].....	280
[SENSe:]POWer:ACHannel:TXCHannel:COUNT.....	281
[SENSe:]POWer:BANDwidth BWIDth.....	282
[SENSe:]POWer:HSPeed.....	282
[SENSe:]POWer:NCORrection.....	282
[SENSe:]POWer:TRACe.....	283
[SENSe:]SWEep:COUNT.....	284
[SENSe:]SWEep:EGATE.....	284
[SENSe:]SWEep:EGATE:HOLDoff.....	285
[SENSe:]SWEep:EGATE:LENGth.....	285
[SENSe:]SWEep:EGATE:POLarity.....	285
[SENSe:]SWEep:EGATE:SOURce.....	285
[SENSe:]SWEep:EGATE:TRACe<k>:PERiod.....	286
[SENSe:]SWEep:EGATE:TRACe<k>:STOP<range>.....	287
[SENSe:]SWEep:EGATE:TRACe<k>:COMMENT.....	286
[SENSe:]SWEep:EGATE:TRACe<k>:START<range>.....	286
[SENSe:]SWEep:EGATE:TRACe<k>[:STATE<range>].....	287
[SENSe:]SWEep:EGATE:TYPE.....	287
[SENSe:]SWEep:POINTS.....	288
[SENSe:]SWEep:TIME.....	288
[SENSe:]SWEep:TIME:AUTO.....	288
[SENSe:]SWEep:TYPE.....	289
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CALCulate<n>:DELTamarker<m>:FUNction:FIXed:RPOint:Y.....	192
CALCulate<n>:DELTamarker<m>:FUNction:FIXed[:STATE].....	192
CALCulate<n>:DELTamarker<m>:FUNction:PNOise:AUTO.....	193
CALCulate<n>:DELTamarker<m>:FUNction:PNOise[:STATE].....	193
CALCulate<n>:DELTamarker<m>:LINK.....	194
CALCulate<n>:DELTamarker<m>:MAXimum:LEFT.....	194
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT.....	194
CALCulate<n>:DELTamarker<m>:MAXimum:RIGHT.....	195
CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK].....	195
CALCulate<n>:DELTamarker<m>:MINimum:LEFT.....	195
CALCulate<n>:DELTamarker<m>:MINimum:NEXT.....	196
CALCulate<n>:DELTamarker<m>:MINimum:RIGHT.....	196
CALCulate<n>:DELTamarker<m>:MINimum[:PEAK].....	196
CALCulate<n>:DELTamarker<m>:TRACe.....	197
CALCulate<n>:DELTamarker<m>:X.....	198
CALCulate<n>:DELTamarker<m>:X:RELative?.....	198
CALCulate<n>:DELTamarker<m>:Y?.....	198
CALCulate<n>:DELTamarker<m>[:STATE].....	197
CALCulate<n>:ESpectrum:PSEarch[:PEAKsearch:PSHow].....	223
CALCulate<n>:FEED.....	182
CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute.....	199
CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATE.....	200
CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult.....	201

CALCulate<n>:LIMit<k>:ACPowEr:ACHannEl[:RELative].....	201
CALCulate<n>:LIMit<k>:ACPowEr:ACHannEl[:RELative]:STATe.....	202
CALCulate<n>:LIMit<k>:ACPowEr:ALTErnate<Channel>:ABSolute.....	203
CALCulate<n>:LIMit<k>:ACPowEr:ALTErnate<channel>[:RELative].....	204
CALCulate<n>:LIMit<k>:ACPowEr:ALTErnate<Channel>[:RELative]:STATe.....	204
CALCulate<n>:LIMit<k>:ACPowEr[:STATe].....	205
CALCulate<n>:LIMit<k>:ESPectrum:LIMits.....	206
CALCulate<n>:LIMit<k>:ESPectrum:MODE.....	207
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNT.....	208
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe].....	208
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum.....	209
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum.....	209
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive].....	207
CALCulate<n>:LIMit<k>:ESPectrum:RESTore.....	210
CALCulate<n>:LIMit<k>:ESPectrum:VALue.....	210
CALCulate<n>:LIMit<k>:FAIL?.....	206
CALCulate<n>:MARKer<m>:AOFF.....	211
CALCulate<n>:MARKer<m>:FUNctIon:CDPowEr[:BTS]:RESult?.....	184
CALCulate<n>:MARKer<m>:FUNctIon:CENTer.....	186
CALCulate<n>:MARKer<m>:FUNctIon:PICh.....	186
CALCulate<n>:MARKer<m>:FUNctIon:POWEr:MODE.....	187
CALCulate<n>:MARKer<m>:FUNctIon:POWEr:RESult:PHZ.....	188
CALCulate<n>:MARKer<m>:FUNctIon:POWEr:RESult?.....	187
CALCulate<n>:MARKer<m>:FUNctIon:POWEr:SElect.....	189
CALCulate<n>:MARKer<m>:FUNctIon:TDPich.....	190
CALCulate<n>:MARKer<m>:MAXimum:LEFT.....	211
CALCulate<n>:MARKer<m>:MAXimum:NEXT.....	212
CALCulate<n>:MARKer<m>:MAXimum:RIGHT.....	212
CALCulate<n>:MARKer<m>:MAXimum[:PEAK].....	212
CALCulate<n>:MARKer<m>:MINimum:LEFT.....	213
CALCulate<n>:MARKer<m>:MINimum:NEXT.....	213
CALCulate<n>:MARKer<m>:MINimum:RIGHT.....	214
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CALCulate<n>:MARKer<m>:TRACe.....	215
CALCulate<n>:MARKer<m>:X.....	215
CALCulate<n>:MARKer<m>:X:SLIMits[:STATe].....	216
CALCulate<n>:MARKer<m>:X:SSIZe.....	216
CALCulate<n>:MARKer<m>:Y?.....	217
CALCulate<n>:MARKer<m>[:STATe].....	214
CALCulate<n>:PEAKsearch PSEarch:AUTO.....	218
CALCulate<n>:PEAKsearch PSEarch:MARGin.....	218
CALCulate<n>:PEAKsearch PSEarch:PSHow.....	219
CALCulate<n>:PEAKsearch PSEarch:SUBRanges.....	219
CALCulate<n>:PEAKsearch PSEarch[:IMMediate].....	218
CALCulate<n>:STATistics:CCDF[:STATe].....	219
CALCulate<n>:STATistics:NSAMples.....	220
CALCulate<n>:STATistics:PRESet.....	220
CALCulate<n>:STATistics:RESult<Trace>.....	220
CALCulate<n>:STATistics:SCALe:AUTO ONCE.....	221
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