

# R&S® FSV-K76/-K77

## 3GPP TD-SCDMA BTS and UE

### Measurement Application

### Operating Manual



1173.0743.02 – 06

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

- R&S FSV-K76 (1310.8603.02)
- R&S FSV-K77 (1310.8655.02)

This manual is applicable for the following analyzer models with firmware version 1.70 and higher:

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

The firmware of the instrument makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" on the user documentation CD-ROM (included in delivery).

Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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Muehldorfstr. 15, 81671 Munich, Germany

Phone: +49 89 41 29 - 0

Fax: +49 89 41 29 12 164

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

Internet: <http://www.rohde-schwarz.com>

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

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# 1 Preface

## 1.1 Documentation Overview

The user documentation for the R&S FSV 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 1	Printer Interface
Appendix 2	LAN Interface

### Operating Manuals

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

The Operating Manual for the base unit provides basic information on operating the R&S FSV 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 is not included in the option manuals.

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

- R&S FSV base unit; in addition:
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K7 Analog Demodulation and R&S FSV-K7S FM Stereo Measurements
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis 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 802.11a/b/g/j/n
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application
- R&S FSV-K101/K105 EUTRA / LTE Uplink Measurement Application

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

### Service Manual

This manual is available in PDF format on the CD delivered with the instrument. It describes how to check compliance with rated specifications, instrument function, repair, troubleshooting and fault elimination. It contains all information required for repairing the R&S FSV 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 and all available options. It describes both manual and remote operation. The online help is installed on



the R&S FSV 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 touch screen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the 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.

## 1.3 How to Use the Help System

### Calling context-sensitive and general help

- ▶ To display the general help dialog box, press the HELP key on the front panel.  
The help dialog box "View" tab is displayed. A topic containing information about the current menu or the currently opened dialog box and its function is displayed.



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

---

- ▶ If the help is already displayed, press the softkey for which you want to display help.  
A topic containing information about the softkey and its function is displayed.



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

---

### Contents of the help dialog box

The help dialog box contains four tabs:

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

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

### Navigating in the table of contents

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

### Navigating in the help topics

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

### Searching for a topic

1. Change to the "Index" tab.

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

### **Changing the zoom**

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

### **Closing the help window**

- ▶ Press the ESC key or a function key on the front panel.

## 2 Introduction

Equipped with the firmware application R&S FSV-K76, the R&S FSV performs code domain measurements on forward link signals according to the 3GPP standard (Third Generation Partnership Project).

Equipped with the firmware application R&S FSV-K77, the R&S FSV performs code domain measurements on downlink signals according to the 3GPP standard (Third Generation Partnership Project).

The basic standards are 3GPP TS 25.142 "Base Station Conformance Testing (TDD)", version V8.1.0, 3GPP TS 25.221 "Physical channels and mapping of transport channels onto physical channels (TDD)". When TD-SCDMA specifications are mentioned in the document, this standard is meant.

In addition to the code domain measurements specified in the TD-SCDMA standard, the firmware application features measurements in the spectral range such as channel power, adjacent channel power, occupied bandwidth and spectrum emission mask with predefined settings.

### **Overview of the Firmware Options R&S FSV-K76 and R&S FSV-K77**

This section contains all information required for operation of an R&S FSV equipped with Application Firmware R&S FSV-K76 and R&S FSV-K77. It covers operation via menus and the remote control commands for the 3GPP TD-SCDMA BTS and UE Measurement Application.

#### **To open the TD-SCDMA BTS and UE measurement application**

- Press the MODE key and select "TDS BTS" (R&S FSV-K76) or TDS UE (R&S FSV-K77) from the softkey menu.

The TD-SCDMA main menu opens. This is identical to the "Measurement" menu (MEAS key).

Note that you can return to the main menu anytime by pressing either the MEAS key or the HOME key.

This part of the documentation contains of the following topics:

## 3 Instrument Functions

The following chapters describe all functions available with the firmware application in detail, beginning with some background information on the various measurements.

### Channel Characteristics

Depending on the symbol rate of a code channel, it has a different spreading factor and a different number of symbols per slot. The following table shows the relationships:

Spreading Factor	Symbols / Slot	QPSK		8PSK		16QAM		64QAM	
		Bits per Slot	ksps	Bits per slot	ksps	Bits per slot	ksps	Bits per slot	ksps
1	704	1408	281.6	2112	422.4	2816	563.2	4224	844.8
2	352	704	140.8	1056	211.2	1408	281.6	2112	422.4
4	176	352	70.4	528	105.6	704	140.8	1056	211.2
8	88	176	35.2	264	52.8	352	70.4	528	105.6
16	44	88	17.6	132	26.4	176	35.2	264	52.8

The data rates in the table result from the bits per slot referred to a subframe length of 5 ms.

You can select the code channel and the slot to be analyzed with the "Select Channel" and the "Select Slot" softkeys. For example, select code channel 1.16 (code number 1 for spreading factor 16) and slot 2. Activate the Code Domain Power result display in one screen and EVM vs Symbol in a second screen. Screen A shows the Code Domain Power of slot number 2 and selects code channel 1.16, which turns red. Screen B shows the results of the EVM vs Symbol measurement of code channel 1.16 in slot 2 with 44 corresponding values (derived from the table above).

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## 3.1 Code Domain Analysis

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

Result Display	Description
Code Domain Power	Result display for the Code Domain Power
Composite EVM	Error Vector Magnitude on slot level.
Peak Code Domain Error	Maximum error between test signal and reference signal of the selected slot.
Code Domain Error Power	Error between test signal and reference signal.
Power vs Symbol	Channel power on symbol level.
Channel Power vs Slot	Average power of a specific channel over all slots.
Result Summary	Summary of results in tabular form.
Channel Table	Summary of channel configuration in tabular form.
Channel Constellation	Channel constellation diagram.
EVM vs Symbol	Error Vector Magnitude on symbol level.
Channel Bitstream	Summary of bits in a specific channel.
Composite Constellation	Constellation diagram on chip level.

You can display up to four result displays at the same time. Any result can be displayed in either screen. For further details on the display configuration refer to the [Display Configuration](#) softkey. Just above the measurement screen(s), the most common settings and parameters are summarized:

Ref Level	-10.00 dBm	Freq	15.0 GHz	Channel	1.16	Code Power	Relative
		Att	10 dB	Slot	0 of 7	Data Rate	17.6 ksps

The default settings of the Code Domain Analyzer are summarized in the [Settings Overview](#) dialog box. There you can also reset the instrument to its default values by pressing the "Set to Default" button.

### 3.1.1 Menu and Softkey Description

The following chapters describe the menus and softkeys specific to the R&S FSV-76 and 77 options for CDA measurements.

The "Bandwidth", "Span" and "Marker" menus are not available for CDA 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-K76/-K77, 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.

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### 3.1.1.1 Softkeys of the Code Domain Analyzer

The following chapter describes all softkeys available in the "Code Domain Analyzer" menu of the TD-SCDMA BTS and UE measurement applications.



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

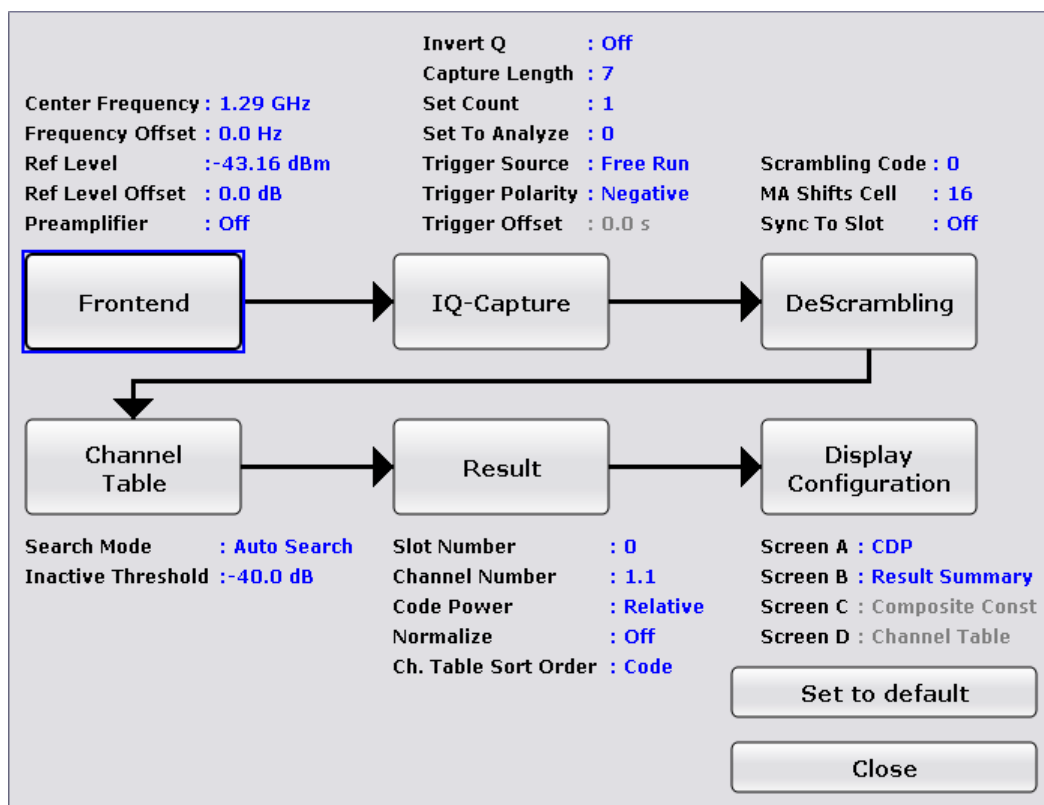
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### Settings Overview

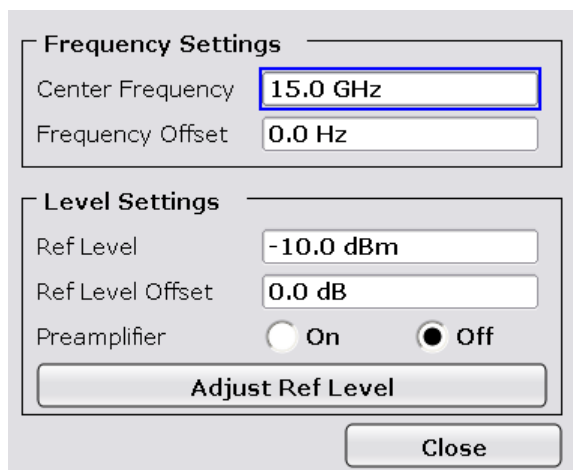
This softkey opens the "Settings Overview" dialog box that visualizes the data flow of the Code Domain Analyzer and summarizes all of the current settings. In addition, you can change the current settings via this dialog box.



To change the settings press one of the buttons on the touchscreen.

### Frontend Settings

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



### Center ← Frontend Settings

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

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

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

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

SCPI command:

[SENSe:]FREQuency:CENTer on page 205

#### Frequency Offset ← Frontend Settings

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

SCPI command:

[SENSe:]FREQuency:OFFSet on page 207

#### Ref Level ← Frontend Settings

Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dB $\mu$ V, etc).

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

SCPI command:

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 178

#### 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.

SCPI command:

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet on page 179

#### Preamp On/Off (option RF Preamplifier, B22/B24) ← Frontend Settings

Switches the preamplifier on or off.

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

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

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

SCPI command:

INPut:GAIN:STATe on page 237

#### Adjust Ref Lvl ← Frontend Settings

Defines the optimal reference level for the current measurement automatically.

SCPI command:

[SENSe:]ADJust:LEVel on page 190

#### IQ-Capture Settings

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

The screenshot shows a settings dialog box with the following fields and values:

- Common Settings:** Invert Q (radio buttons: On, Off) - Off is selected.
- Data Capture Settings:** Capture Length (text box: 7), Set Count (text box: 1), Set To Analyze (text box: 0).
- Trigger Settings:** Trigger Source (radio buttons: External, Free Run) - Free Run is selected; Trigger Polarity (radio buttons: Positive, Negative) - Positive is selected; Trigger Offset (text box: 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.

SCPI command:

[\[SENSe:\]CDPower:QINVert](#) on page 184

**Capture Length ← IQ-Capture Settings**

Sets the number of slots you want to analyze. The input value is always in multiples of the slots. The default value is 7. The maximum capture length is 63.

The "Capture Length" field is available if [Set Count](#) equals 1.

SCPI command:

[\[SENSe:\]CDPower:IQLength](#) on page 182

**Set Count ← IQ-Capture Settings**

Defines the number of consecutive sets to be stored in the instrument's IQ memory. One set consists of 63 slots. The R&S FSV can capture up to 6300 slots in a single sweep, i.e. the possible value range is from 1 to 100 sets.

The default setting is 1. In that case you can still define the number of slots. In case you want to capture more than one set, the capture length is always 63. The R&S FSV automatically sets the capture length to 63 and the [Capture Length](#) field is not available for modification.

SCPI command:

[\[SENSe:\]CDPower:SET:COUNT](#) on page 185

**Set to Analyze ← IQ-Capture Settings**

Selects a specific set for further analysis. The value range depends on the "[IQ-Capture Settings](#)" on page 19 and is between 0 and [Set Count-1].

SCPI command:

[\[SENSe:\]CDPower:SET](#) on page 184

**Trigger Source Free Run ← IQ-Capture Settings**

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

This softkey is available for code domain measurements.

SCPI command:

TRIG:SOUR IMM, see TRIGger<n>[:SEQuence]:SOURce on page 241

**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.

This softkey is available for code domain measurements.

SCPI command:

TRIG:SOUR EXT, see TRIGger<n>[:SEQuence]:SOURce on page 241

**Trigger Polarity ← IQ-Capture Settings**

Sets the polarity of the trigger source.

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

This softkey is available for code domain measurements.

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

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

SCPI command:

TRIGger<n>[:SEQuence]:SLOPe on page 240

[SENSe:]SWEep:EGATe:POLarity on page 220

**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.

SCPI command:

[TRIGger<n>\[:SEquence\]:HOLDoff\[:TIME\]](#) on page 240

### Sync Settings

This softkey opens the "Synchronization Settings" dialog box.

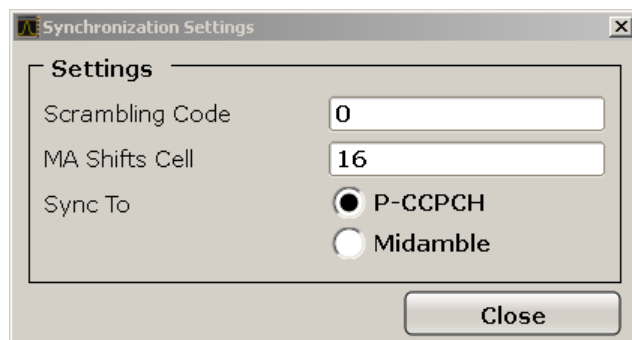


Fig. 3-1: Synchronization Settings for forward link measurements (K76)

#### Scrambling Code ← Sync Settings

Sets the Scrambling Code of the base station. Possible values are between 0 and 127 and have to be entered as decimals.

SCPI command:

[\[SENSe:\]CDPower:SCODE](#) on page 184

#### MA Shift Cells ← Sync Settings

Sets the maximum number of usable midamble shifts of the base station. Possible values are in the range from 2 to 16 in steps of 2 midamble shifts.

If you use a predefined channel table, this value is replaced by that of the channel table.

SCPI command:

[\[SENSe:\]CDPower:MSHift](#) on page 183

#### Sync To (forward link, K76) ← Sync Settings

Toggles the phase reference.

"P-CCPCH" By default, the R&S FSV-K76 determines the phase reference for all downlink data slots from the downlink pilot channel (P-CCPCH) in slot 0. For some measurements like beamforming or repeater measurements, it might be necessary to apply different phase offsets to each time slot. In these timeslots, using the P-CCPCH as phase reference leads to rotated constellation diagrams and bad EVM results.

"Midamble" The R&S FSV-K76 determines the phase reference from the midamble of the selected slot. With this method, the data slots can be phase rotated to each other and a degradation of the EVM results can be avoided. For a successful synchronization, the selected slot must contain at least one data channel with sufficient power.

SCPI command:

`[SENSe:]CDPower:STSLot` on page 185

#### **Sync To (downlink, K77) ← Sync Settings**

Toggles the phase reference. For a successful synchronization, the selected slot must contain at least one data channel with sufficient power.

"Code Channel" The R&S FSV-K77 determines the phase reference from the code channel of the selected slot. This is useful when synchronization fails in bad SNR environments. For code channel synchronization, at least one of the code channels must be QPSK or 8PSK modulated.

"Midamble" By default, the R&S FSV-K77 determines the phase reference from the midamble of the selected slot. With this method, the data slots can be phase rotated to each other and a degradation of the EVM results can be avoided.

SCPI command:

`[SENSe:]CDPower:STSLot:MODE` on page 186

#### **Rotate code channel to associated midamble ← Sync Settings**

By default, the R&S FSV-K76/77 determines one phase reference for all midambles and code channels of a data slot. If this option is selected, phase rotations between the code channels are allowed. Each code channel gets its own phase reference from the associated midamble according to section AA.2 of the standard document 3GPP TS 25.221. If the associated midamble is missing, the common phase reference is used for this code channel.

SCPI command:

`[SENSe:]CDPower:STSLot:ROTate` on page 186

#### **Channel Table Settings**

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

#### **Max Modulation ← Channel Table Settings**

Defines the highest modulation to be considered in the automatic channel search. In low SNR environments it may be necessary to limit the channel search to lower modulations than 64QAM. The following types are available:

- QPSK
- 8PSK
- 16QAM
- 64QAM

SCPI command:

`[SENSe:]CDPower:MMAx` on page 183

**Channel Search Mode ← Channel Table Settings**

Defines the kind of channel table used for the measurement.

Predefined channel tables are a way to customize measurements. The RECENT channel table contains the last configuration used before switching from Auto Search to Predefined. In addition, new channel tables can be created and saved to be used in measurements.

- "Auto Search" 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 [Inactive Channel Threshold](#) or select the Predefined channel search type.
- "Predefined" 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 [Inactive Channel Threshold](#) field and the "Predefined Channel Tables"

SCPI command:

[CONFigure:CDPower\[:BTS\]:CTABLE\[:STATe\]](#) on page 169

[CONFigure:CDPower\[:BTS\]:CTABLE:SElect](#) on page 173

**Inactive Channel Threshold ← Channel Table Settings**

Defines the minimum power which a single channel must have compared to the total signal in order to be recognized as an active channel. Channels below the specified threshold are regarded as "inactive". The parameter is available in the Auto Search mode of the "Channel Table Settings" dialog box. The default value is -40 dB. With this value all channels with signals such as the TD-SCDMA test models are located by the Code Domain Power analysis. Decrease the Inactive Channel Threshold value, if not all channels contained in the signal are detected.

SCPI command:

[\[SENSe:\]CDPower:ICThreshold](#) on page 182

**Channel Tables ← Channel Table Settings**

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

An active channel table must completely describe the supplied signal. Using the softkeys, customized channel tables can be defined or existing channel tables can be modified.

SCPI command:

[CONFigure:CDPower\[:BTS\]:CTABLE:CATalog](#) on page 169

**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. Remember to save your channel tables before ending the application.

**Note:** Prerequisite. The code domain analyzer requires an active channel 1.16 (e.g. P-CCPCH1) and a valid midamble in slot 0 for synchronization. The parameters "Scrambling Code" and "MA Shifts Cell" must comply with the base station.

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:

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.
MA Shift Cells	Sets the maximum number of usable midamble shifts of the base station.
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).
Data Rate / kbps	Display of the data rate.
Modulation	Enter the modulation type for the channel.
Midamble Shift	Shift of the associated midamble if a common or default midamble allocation is detected.
State	Indicates whether a channel is active or inactive.
Domain Conflict	A red bullet indicates if there's a conflict of any sorts between two or more channels (e.g. two conflicting channel codes).

SCPI command:

```
CONFigure:CDPower[:BTS]:CTABLE:NAME
```

```
CONFigure:CDPower[:BTS]:CTABLE:COPY
```

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

Inserts a new channel below the one selected. For a description of the parameters of the channel refer to the [Channel Table Settings](#) softkey. The default values for a new channel are:

Channel Type	Midamble
Walsh Ch.SF	2.64
Data Rate / kbps	19.2 (automatically calculated)
Modulation	QPSK

Midamble Shift	---
State	Off
Domain Conflict	No (automatically determined)

To change the channel type use the dropdown menu that opens when selecting / highlighting the "Channel Type" field that you want to change. Modulation settings are changed in the same way.

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

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

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

SCPI command:

[CONFigure:CDPower\[:BTS\]:CTable:DATA](#) on page 170

#### **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 "Channel Search Mode" on page 24 mode. The measurement results are applied to the active channel table. The active channel table is overwritten without further notice.

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

#### **Select Slot ← New / Copy / Edit ← Channel Table Settings**

Selects the slot for which the channel table is valid.

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

Sets the [Result Settings](#) to midamble order.

This softkey is available for the 3GPP TD-SCDMA BTS Measurement Application.

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

Sets the [Result Settings](#) to Code order.

#### **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.

#### **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.

**Delete ← Channel Table Settings**

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

**Result Settings**

This softkey opens the "Result Settings" dialog box

The screenshot shows a dialog box titled "Result Settings". It has two main sections: "Common Settings" and "Channel Table Settings".

- Common Settings:**
  - Slot Number: 0
  - Channel(Code) Number: 1.16
  - Code Power:  Absolute  Relative
  - Normalize:  On  Off
- Channel Table Settings:**
  - Ch. Table Sort Order:  Code  Midamble

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

**Slot Number ← Result Settings**

Selects the slot number for further evaluation. In result displays that evaluate specific slot, the currently selected slot is highlighted red.

The number of measured slots depends on the [IQ-Capture Settings](#) defined in the IQ Capture Settings dialog box. Therefore the range is (0 to Capture Length-1).

SCPI command:  
CDP:SLOT 6

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

Selects the channel or code number for further evaluation. In result displays that evaluate specific channels, the currently selected channel is highlighted red.

The number of codes depends on the spreading factor. Therefore it is between 1 and 16.

SCPI command:  
[\[SENSe:\]CDPower:SLOT](#) on page 185

**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.

SCPI command:  
[CALCulate<n>:FEED](#) on page 128

**Normalize ← Result Settings**

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

SCPI command:  
[\[SENSe:\]CDPower:NORMALize](#) on page 184

**Channel Table Sort Order ← Result Settings**

You can sort channels in the Channel Table result display in two ways:

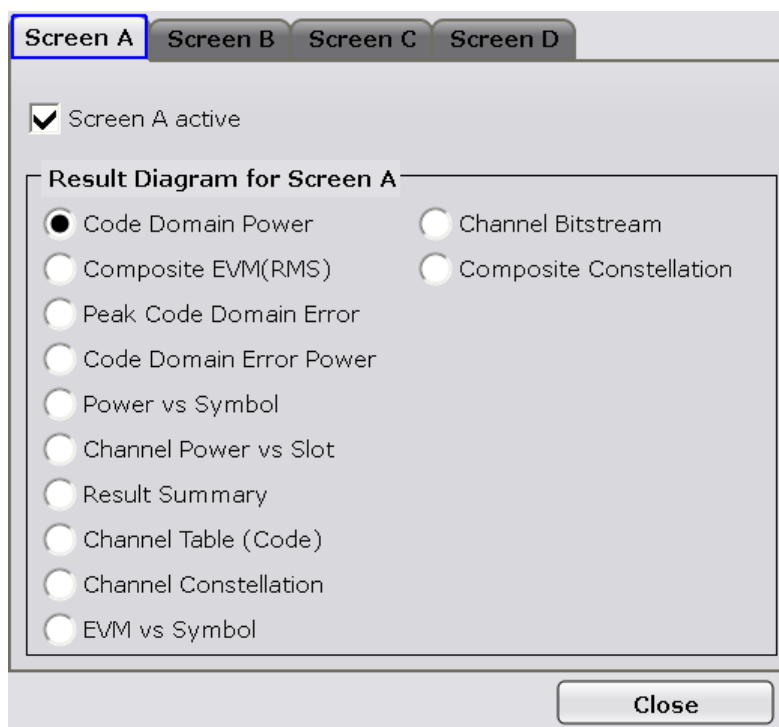
- Code Order: first, all midambles are listed, then all control channels and last all data channels.
- Midamble Order: allocates all control and data channels to the midambles they belong to and then sorts the midambles in ascending order.

SCPI command:

[CONFigure:CDPower\[:BTS\]:CTABLE:ORDER](#) on page 172

**Display Configuration**

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



The dialog box contains the following elements:

Item	Description
Screen A/B/C/D tab	Choose the screen to be configured.
Screen A/B/C/D active	Activate or deactivate one of the four available measurement screens via this check box. The size of the screens depends on the number of active screens. For example, if four screens are active, each screen takes up a quarter of the display size.

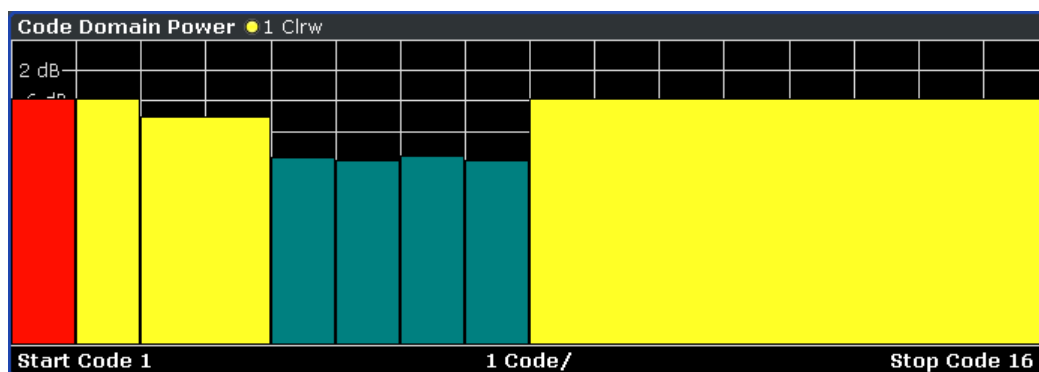
Item	Description
Result diagram for Screen A/B/C/D	Choose the result diagram for each screen. Find a short description of each result display below.
Screen Focus	The currently active screen is indicated by a blue frame. Trace and marker settings can only be changed for the active screen. Changing the focus and screen size is just like in the base unit

### Code Domain Power ← Display Configuration

Starts the Code Domain Power (CDP) result display. By default the scaling is relative. This result display determines the power of all codes of a specific channel and plots it in a diagram. The x-axis represents the code number. The number of codes depends on the channel type. Each bar in the diagram represents one code, up to a maximum of 16 (the maximum spreading factor). Codes are always sorted in ascending order and projected to a spreading factor of 16.

The y-axis is a logarithmic level axis that shows the power of each code.

The measurement evaluates the total signal of a specific channel over a single slot. Configure this result display via the [Result Settings](#) dialog box.



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

- Yellow: active channel
- Cyan: inactive channel
- Red: selected channel; if a channel is made up of more than one code, all codes that belong to the channel turn red.

When working with predefined channel tables, every code is regarded as active.

It is possible to select more detailed result displays for inactive codes, but the results for these are not valid.

SCPI command:

[CALCulate<n>:FEED](#) on page 128

[CALCulate<n>:FEED](#) on page 128

### Composite EVM ← Display Configuration

Starts the Composite EVM (Error Vector Magnitude) result display.

This result display is for measuring the modulation accuracy. It determines the error vector magnitude (EVM) over the total signal. The EVM is the root of the ratio of the mean error power to the power of an ideally generated reference signal. To calculate the mean error power, the root mean square average (of the real and imaginary parts of the signal) is used. The EVM is shown in %.

The diagram consists of a composite EVM for each captured slot.

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



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.

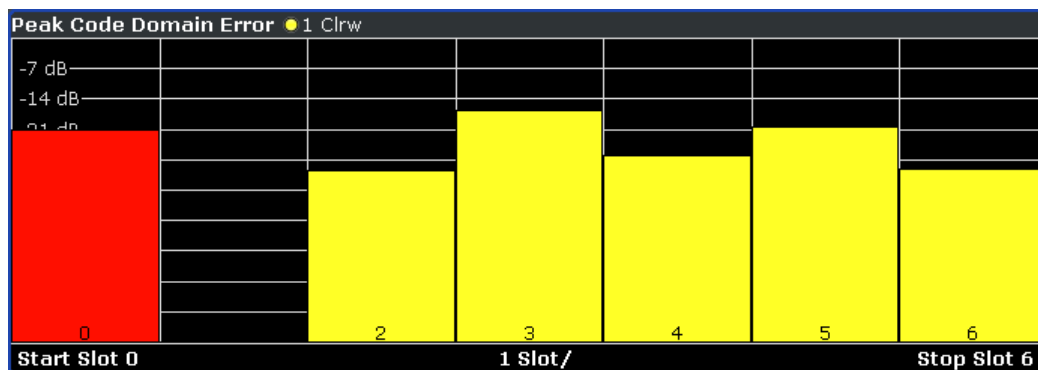
SCPI command:

`CALCulate<n>:FEED` on page 128

#### Peak Code Domain Error ← Display Configuration

Starts the Peak Code Domain Error result display. 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" on page 31 is projected onto the code domain at a specific base spreading factor. In the diagram, each bar of the x-axis represents one captured slot. The selected slot turns red. The y-axis represents the error power.

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



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

SCPI command:

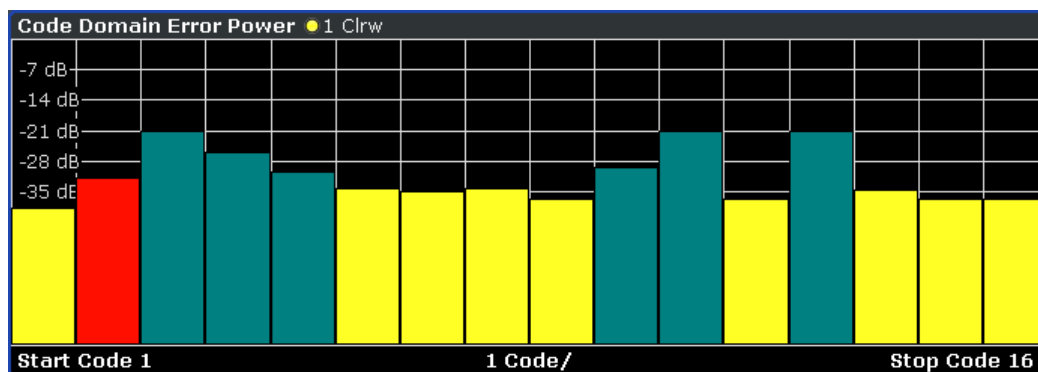
[CALCulate<n>:FEED](#) on page 128

**Code Domain Error ← Display Configuration**

Starts the Code Domain Error Power result display.

This result display shows the difference in power of the test signal and an ideally generated reference signal. In the diagram, the codes are plotted on the x-axis. The number of codes corresponds to the base spreading factor. The y-axis is a logarithmic level axis that shows the error power for each code. Since it is an error power, active and inactive channels can be rated jointly at a glance.

The measurement evaluates the total signal over a single slot.



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

- Yellow: active channel
- Cyan: inactive channel
- Red: selected channel; if a channel is made up of more than one code, all codes that belong to the channel turn red.

When working with predefined channel tables, every code is regarded as active.

SCPI command:

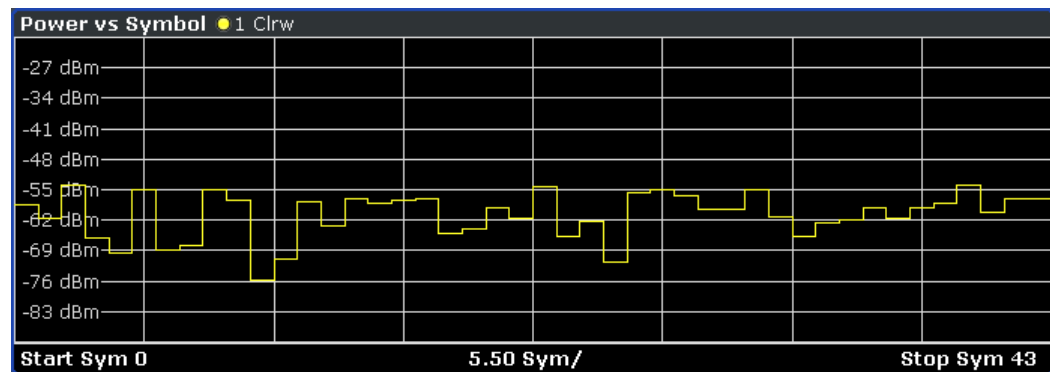
[CALCulate<n>:FEED](#) on page 128

### Power vs Symbol ← Display Configuration

Starts the Power vs Symbol result display.

This result display shows the power of a specific channel on symbol level. The number of symbols on the x-axis depends on the spreading factor.

The measurement evaluates a single channel over a single slot.



SCPI command:

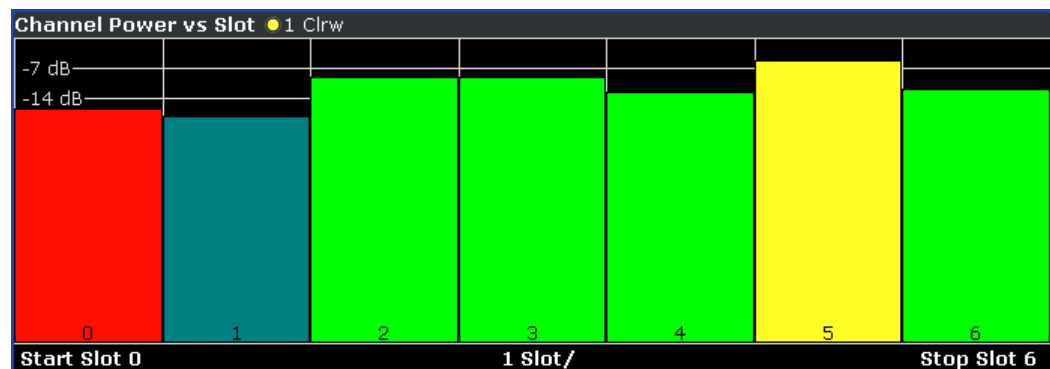
[CALCulate<n>:FEED](#) on page 128

### Channel Power vs Slot ← Display Configuration

Starts the Channel Power vs Slot result display.

This result display shows the average power of a specific channel over all captured slots. The scaling is either relative or absolute. Therefore, the unit of the y-axis is either dBm or dB. By default, the display is relative to the mean total power of the data parts of the slot. Each bar on the x-axis represents one of the captured slots.

The measurement evaluates a single channel over all slots. The currently selected slot turns red.



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

- Yellow: active channel
- Cyan: inactive channel
- Green: channel with alias power



- Red: selected channel; if a channel is made up of more than one code, all codes that belong to the channel turn red.

Alias power results from channels with a different code class.

When working with predefined channel tables, every code is regarded as active.

SCPI command:

[CALCulate<n>:FEED](#) on page 128

### Result Summary ← Display Configuration

The Result Summary shows the data of various measurements in numerical form.

Result Summary (Set : 1) ● 1 Clrw			
Chip Rate Error	-0.13 ppm	Trigger To Frame	--,--
Slot Result (Slot : 0)			
P Data	-28.89 dBm	Carrier Frequency Error	3.39 Hz
P D1/D2	-28.89dBm/-28.88dB	IQ Imbalance/Offset	0.46%/2.23%
P Midamble	-30.15 dBm	Rho	0.96761
Average RCDE	-19.47 dB	Composite EVM	18.30 %
Active Channels	10	Pk CDE (SF 16)	-21.03 dB
Channel Result (Channel 2.16 )			
Channel.SF	2.16	Data Rate	17.6 kbps
Channel Pwr Abs/Rel	-45.28dBm/-16.40dB	Modulation Type	QPSK
Symbol EVM	16.72 % rms	Symbol EVM	27.40 % Pk

SCPI command:

[CALCulate<n>:FEED](#) on page 128

[CALCulate<n>:FEED](#) on page 128

### Result Summary (Set: #) ← Result Summary ← Display Configuration

The Result Summary shows results measured over the total signal or a selected set.

- **Chip Rate Error**  
Shows the chip rate error (1.28 Mcps) in ppm. A large chip rate error results in symbol errors and, therefore, in possible synchronization errors for code domain measurements. This measurement result is also valid if the R&S FSV could not synchronize to the TD-SCDMA signal.
- **Trigger to Frame**  
Reflects the time offset from the beginning of the recorded signal section to the start of the first slot. 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 to the TD-SCDMA signal, this measurement result is meaningless. For the "Free Run" trigger mode, dashes are displayed.

### Slot Result (Slot: #) ← Result Summary ← Display Configuration

The Slot Results show results measured over all channels and one specific slot.

- **P Data**  
Shows the average power of the slot's data parts.
- **P D1/D2**  
Shows the power for each of the slot's data parts.
- **P Midamble**

- Shows the power for the slot's midamble.
- **Average RCDE**  
Shows the average RCDE (Relative Code Domain Error). The Average RCDE is calculated according to release 8 of the standard.
- **Active Channels**  
Shows the number of active channels in the slot.
- **Carrier Frequency Error**  
Shows the frequency error referred to the center frequency of the R&S FSV. The absolute frequency error is the sum of the frequency error of the R&S FSV 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.
- **IQ Imbalance / Offset**  
Shows the IQ imbalance and the DC offset of the signal in %.
- **Rho**  
Shows the quality parameter Rho. According to the TD-SCDMA standard, Rho is the normalized, correlated power between the measured and the ideally generated reference signal. When Rho is measured, the TD-SCDMA standard requires that only the pilot channel be supplied.
- **Composite EVM**  
Shows the [Composite EVM](#) of the signal. The Composite EVM is the difference between the test signal and an ideal reference signal.
- **Pk CDE (SF16)**  
Shows the "[Peak Code Domain Error](#)" on page 30 of the signal for a spreading factor of 16.

#### Channel Result (Channel: #) ← Result Summary ← Display Configuration

The Channel Results show results measured over a specific channel in a specific slot.

- **Channel.SF**  
Shows the number of the channel and its spreading factor.
- **Channel Pwr. Abs/Rel**  
Shows the absolute and the relative powers of the channel.  
The relative channel power is in relation to the total power of the data parts of the signal.
- **Symbol EVM**  
Shows the channel's peak and average Error Vector Magnitude.
- **Data Rate**  
Shows the data rate of the channel.
- **Modulation Type**  
Shows the modulation type of the channel.

#### Channel Table ← Display Configuration

Starts the Channel Table result display.

This result display shows all channels of the signal. The sorting of the channels depends on the [Result Settings](#).

- Sorting by code means that the midambles are listed first, followed by the active data channels. Inactive channels are listed at the end of the table.

The R&S FSV sorts midambles according to their midamble shifts. Active and inactive channels are projected to a SF of 16 and sorted according to their code numbers.

- Sorting by midamble means that after each midamble, the corresponding code is listed. The R&S FSV automatically distinguishes between common and default midamble allocation. The allocation of code to midamble is specified in the TD-SCDMA standard.

If neither a common nor a default midamble allocation is found, sorting is in code order.

The measurement evaluates the total signal over a single slot.

Channel Type	Walsh Ch.SF	DataRate /ksp	Mod	Power /dBm	Power /dB	MA. shift	ΔMiD1 /dB	ΔMiD2 /dB
Midamble	-,	---	----	-55.85	-25.94	1	-106.5	-106.5
Midamble	-,	---	----	-60.90	-30.99	2	-106.5	-106.5
Midamble	-,	---	----	-59.15	-29.24	3	-106.5	-106.5
DPCH	1.16	17.6	QPSK	-35.27	-5.36	---	---	---
DPCH	2.16	17.6	QPSK	-35.25	-5.35	---	---	---
DPCH	2.8	35.2	QPSK	-40.30	-10.39	---	---	---
DPCH	2.2	140.8	QPSK	-35.20	-5.29	---	---	---
---	5.16	---	----	-50.95	-21.04	---	---	---
---	6.16	---	----	-51.60	-21.69	---	---	---

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

- **Channel Type**  
Shows the channel type.
- **Walsh.SF**  
Channel number including the spreading factor (in the form <Channel>.<SF>).
- **Data Rate/kbps**  
Data rate with which the channel is transmitted. The data rate is between 17.6 kbps and 281.6 kbps for QPSK modulation and between 26.4 and 422.4 kbps for 8PSK modulation.
- **Mod**  
Shows the modulation type (QPSK, 8PSK, 16QAM or 64QAM).
- **Power/dBm**  
Shows the absolute channel power.
- **Power/dB**  
Shows the relative channel power. The relative channel power is in relation to the total power of the data parts of the signal.
- **MA.Shift**  
Shows the midamble shift. For code channels, this is the shift of the associated midamble if a common or default midamble allocation is detected.

The TD-SCDMA specifications require that the midamble and its code channels must have the same power. The following two parameters show if a common or default midamble allocation is detected.

- **ΔMiD1/dB**  
Shows the power offset of the midamble and the sum power of its channels in data part 1.
- **ΔMiD2/dB**

Inactive channels are marked with dashes in the "Channel Type", "DataRate" and "Modulation" columns. When working with predefined channel tables, every code is regarded as active.

SCPI command:

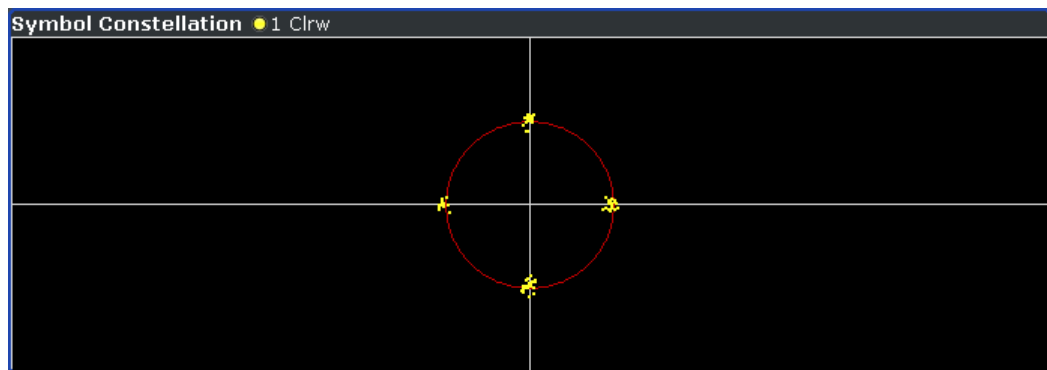
`CALCulate<n>:FEED` on page 128

### Channel Constellation ← Display Configuration

Starts the Channel Constellation result display.

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

The measurement evaluates a single channel over a single slot.



The R&S FSV-K76 supports QPSK, 8PSK, 16QAM and 64QAM modulation types.

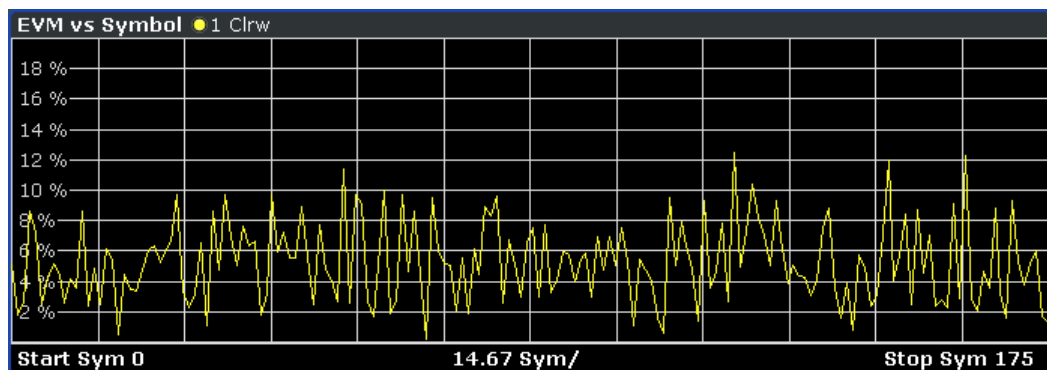
SCPI command:

`CALCulate<n>:FEED` on page 128

### EVM vs Symbol ← Display Configuration

Starts the Symbol Error Vector Magnitude result display. 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 slot.



The number of symbols is in the range from 44 to 704 and depends on the spreading factor.

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

SCPI command:

[CALCulate<n>:FEED](#) on page 128

### Channel Bitstream ← Display Configuration

Starts the Channel Bitstream result display.

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 64QAM modulation '----' is displayed, for 16QAM modulation '---', for 8PSK '--' and for QPSK '-'.

The measurement evaluates a single channel over a single slot.

Bitstream Table ● 1 Clrw																
	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
0	00	11	01	01	11	11	11	01	01	10	11	11	00	00	01	10
32	01	11	10	11	10	11	00	01	10	10	11	11	01	01	01	01
64	01	10	00	11	01	01	00	00	01	01	00	10	11	01	11	10
96	01	00	11	01	00	00	01	10	11	11	11	11	11	10	00	11
128	10	01	01	01	00	11	00	00	01	00	10	00	10	11	00	11
160	00	10	00	11	11	00	01	10	00	10	10	00	10	10	10	01
192	01	00	11	10	10	10	10	00	11	10	10	00	01	11	11	10
224	00	00	01	00	01	11	00	11	01	11	00	00	11	01	11	10
256	11	00	10	01	01	01	01	00	11	00	01	01	10	00	01	10
288	10	11	11	10	11	01	00	11	00	11	10	01	10	10	10	11

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 slot may contain a minimum of 44 and a maximum of 704 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:

- QPSK: 2bits
- 8PSK: 3 bits
- 16QAM: 4 bits
- 64QAM: 6 bits

SCPI command:

[CALCulate<n>:FEED](#) on page 128

### Composite Constellation ← Display Configuration

Starts the Composite Constellation result display.

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 slot.

SCPI command:

[CALCulate<n>:FEED](#) on page 128

**Select Ch Slot**

Opens a dialog box to select a specific channel and / or slot. The results of that channel / slot are then shown in the result display.

**Adjust Ref Lvl**

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 or limiting the dynamic range by a too small S/N ratio. For details on manual settings see "Settings of CP/ACLR test parameters" in the description of the base unit.

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

SCPI command:

[SENSe:]POWER:ACHannel:PRESet:RLEVEL on page 214

**3.1.1.2 Softkeys of the Frequency Menu**

The following chapter describes all softkeys available in the "Frequency" menu of the TD-SCDMA BTS and UE Measurement Application. 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.

This menu contains the following softkeys:

Center.....	38
Center Stepsize.....	38
Frequency Offset.....	39

**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.

SCPI command:

[SENSe:]FREQUENCY:CENTer on page 205

**Center Stepsize**

This softkey is identical to the "Manual" on page 85 softkey for RF measurements.

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

**Frequency Offset**

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

SCPI command:

`[SENSe:]FREQuency:OFFSet` on page 207

**3.1.1.3 Softkeys of the Amplitude Menu**

The following table shows all softkeys available in the "Amplitude" menu of the TD-SCDMA BTS and UE measurement applications for CDA and Power vs Time measurements. (Note: The softkeys in the "Amplitude" menu for other RF measurements are described in [chapter 3.2.7.4, "Softkeys of the Amplitude Menu for RF Measurements"](#), on page 87.)

This menu contains the following softkeys:

**Ref Level**

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

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

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 178

**Scale**

Opens a submenu with the following softkeys:

This softkey and its submenu is available for code domain and Power vs Time measurements.

**Auto Scale Once ← Scale**

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

The softkey is available for code domain measurements.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO` on page 177

**Y-Axis Maximum ← Scale**

Opens a dialog box to set the maximum value for the y-axis of the grid of the selected screen.

The softkey is available for code domain measurements.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum` on page 177

**Y-Axis Minimum ← Scale**

Opens a dialog box to set the minimum value for the y-axis of the grid of the selected screen.

The softkey is available for code domain measurements.

SCPI command:

[DISPlay\[:WINDow<n>\]:TRACe:Y\[:SCALe\]:MINimum](#) on page 177

**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.

SCPI command:

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]:RLEVel:OFFSet](#) on page 179

**Preamp On/Off (option RF Preamplifier, B22/B24)**

Switches the preamplifier on or off.

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

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

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

SCPI command:

[INPut:GAIN:STATe](#) on page 237

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

This function is not available for 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!

SCPI command:

[INPut:ATTenuation](#) on page 232

**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).

SCPI command:

`INPut:ATTenuation:AUTO` on page 233

### 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.

SCPI command:

`INPut:EATT:AUTO` on page 237

### 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.

SCPI command:

`INPut:EATT:AUTO` on page 237

`INPut:EATT` on page 236

### Input (AC/DC)

Toggles the RF input of the R&S FSV 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).

SCPI command:

[INPut:COUPling](#) on page 233

#### 3.1.1.4 Softkeys of the Auto Set Menu

The following chapter describes all softkeys available in the "Auto Set" menu of the TD-SCDMA BTS and UE Measurement Applications for CDA measurements.

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

##### **Auto All**

Performs all automatic settings.

- ["Auto Freq"](#) on page 42
- ["Auto Level"](#) on page 42

SCPI command:

[\[SENSe:\]ADJust:ALL](#) on page 188

##### **Auto Freq**

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

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

SCPI command:

[\[SENSe:\]ADJust:FREQuency](#) on page 190

##### **Auto Level**

Defines the optimal reference level for the current measurement automatically.

The measurement time for automatic leveling can be defined using the [Settings](#) softkey.

SCPI command:

[\[SENSe:\]ADJust:LEVel](#) on page 190

##### **Settings**

Opens a submenu to define settings for automatic leveling.

Possible settings are:

- ["Meas Time Manual"](#) on page 42
- ["Meas Time Auto"](#) on page 43

##### **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 42). The default value is 1 ms.

SCPI command:

[\[SENSe:\]ADJust:CONFigure:LEVel:DURation](#) on page 189

**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.

SCPI command:

[\[SENSe:\]ADJust:CONFiguration:HYSTeresis:UPPer](#) on page 189

**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.

SCPI command:

[\[SENSe:\]ADJust:CONFiguration:HYSTeresis:LOWer](#) on page 188

**3.1.1.5 Softkeys of the Sweep Menu**

The following table shows all softkeys available in the "Sweep" menu of the TD-SCDMA BTS and UE Measurement Application for CDA measurements. For all other measurements, the softkeys are described in [chapter 3.2.7.6, "Softkeys of the Sweep Menu"](#), on page 98.

<a href="#">Continuous Sweep</a> .....	43
<a href="#">Single Sweep</a> .....	43
<a href="#">Continue Single Sweep</a> .....	44
<a href="#">Sweep Count</a> .....	44

**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 44).

SCPI command:

INIT:CONT ON, see [INITiate<n>:CONTinuous](#) on page 243

**Single Sweep**

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

SCPI command:

INIT:CONT OFF, see [INITiate<n>:CONTinuous](#) on page 243

**Continue Single Sweep**

Repeats the number of sweeps set by using the [Sweep Count](#) softkey, without deleting the trace of the last measurement.

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

SCPI command:

[INITiate<n>:CONMeas](#) on page 242

**Sweep Count**

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

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

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

SCPI command:

[\[SENSe:\]SWEep:COUNT](#) on page 219

**3.1.1.6 Softkeys of the Trace Menu for CDA Measurements**

The following list shows all softkeys available in the "Trace" menu of the "TD-SCDMA BTS" and UE measurement applications for Code Domain Analysis measurements.

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

<a href="#">Clear Write</a> .....	44
<a href="#">Max Hold</a> .....	44
<a href="#">Min Hold</a> .....	45
<a href="#">Average</a> .....	45
<a href="#">View</a> .....	45

**Clear Write**

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

All available detectors can be selected.

SCPI command:

[DISP:TRAC:MODE WRIT](#), see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 175

**Max Hold**

The maximum value is determined over several sweeps and displayed. The R&S FSV saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

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

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MAXH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 175

### Min Hold

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

The detector is automatically set to "Negative Peak".

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

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MINH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 175

### 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 3.3.1, "Detector Overview"](#), on page 103).


This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE AVER, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 175

### 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 automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

SCPI command:

DISP:TRAC:MODE VIEW, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 175

### 3.1.1.7 Softkeys of the Trigger Menu for CDA Measurements

The following list shows all softkeys available in the "Trigger" menu of the "TD-SCDMA BTS" and "UE" measurement applications for Code Domain Analysis measurements.

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

#### Trigger Source Free Run

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

This softkey is available for code domain measurements.

SCPI command:

TRIG:SOUR IMM, see TRIGger<n>[:SEQuence]:SOURce on page 241

#### 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.

This softkey is available for code domain measurements.

SCPI command:

TRIG:SOUR EXT, see TRIGger<n>[:SEQuence]:SOURce on page 241

#### Trg/Gate Polarity

Sets the polarity of the trigger/gate source.

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

This softkey is available for RF measurements.

For details also see "Using Gated Sweep Operation" in the base unit description.

"Pos"	Level triggering: the sweep is stopped by the logic "0" signal and restarted by the logical "1" signal after the gate delay time has elapsed.
"Neg"	Edge triggering: the sweep is continued on a "0" to "1" transition for the gate length duration after the gate delay time has elapsed.

SCPI command:

TRIGger<n>[:SEQuence]:SLOPe on page 240

#### 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.

SCPI command:

[TRIGger<n>\[:SEQUENCE\]:HOLDoff\[:TIME\]](#) on page 240

### 3.1.1.8 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 3.2.7.7, "Softkeys of the Input/Output Menu for RF Measurements"](#), on page 102.

Input (AC/DC).....	47
Noise Source.....	48
Signal Source.....	48
L Input Path.....	48
L Connected Device.....	48
L Input Sample Rate.....	48
L Full Scale Level.....	48
L Level Unit.....	48
L Adjust Reference Level to Full Scale Level.....	49
Digital IQ Info.....	49
EXIQ.....	49
L TX Settings.....	49
L RX Settings.....	49
L Send To.....	49
L Firmware Update.....	50
L R&S Support.....	50
L DigIConf.....	50

#### Input (AC/DC)

Toggles the RF input of the R&S FSV 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).

SCPI command:

[INPut:COUPling](#) on page 233

**Noise Source**

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

SCPI command:

[DIAGnostic<n>:SERvice:NSource](#) on page 242

**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.

SCPI command:

[INPut:SElect](#) on page 238

**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.

SCPI command:

[INPut:DIQ:CDEvice](#) on page 233

**Input Sample Rate ← Signal Source**

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

SCPI command:

[INPut:DIQ:SRATe](#) on page 236

**Full Scale Level ← Signal Source**

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

The level can be defined either in dBm or Volt.

SCPI command:

[INPut:DIQ:RANGe \[:UPPer\]](#) on page 235

**Level Unit ← Signal Source**

Defines the unit used for the full scale level.

SCPI command:

[INPut:DIQ:RANGe \[:UPPer\] :UNIT](#) on page 235



**Adjust Reference Level to Full Scale Level ← Signal Source**

If enabled, the reference level is adjusted to the full scale level automatically if any change occurs.

SCPI command:

`INPut:DIQ:RANGe:COUPling` on page 235

**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.

SCPI command:

`INPut:DIQ:CDEvice` on page 233

**EXIQ**

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

If the optional R&S DigIConf software is installed, the submenu consists only of one key to access the software. **Note that R&S DigIConf requires a USB connection (not LAN!) from the R&S FSV 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 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 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 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 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 once again.

SCPI command:

Remote commands for the R&S DigIConf software always begin with `SOURce:EBOX`.

Such commands are passed on from the R&S FSV to the R&S DigIConf automatically which then configures the R&S EX-IQ-BOX via the USB connection.

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

**Example 1:**

```
SOURce:EBOX:*RST
```

```
SOURce:EBOX:*IDN?
```

Result:

```
"Rohde&Schwarz,DigIConf,02.05.436 Build 47"
```

**Example 2:**

```
SOURce:EBOX:USER:CLOCK:REFERENCE:FREQUENCY 5MHZ
```

Defines the frequency value of the reference clock.

## 3.2 RF Measurements

### 3.2.1 Signal Channel Power

The Signal Channel Power measurement analyses the power of the RF signal. One trace shows the evaluation of a single channel with a bandwidth of 1.2288 MHz. The results are based on the root mean square.

Below the measurement screen the bandwidth and associated channel power are displayed. The other screen elements match those of the spectrum analyzer in the base unit.

The configuration of the measurement and the default settings comply to the TD-SCDMA requirements.

Parameter	Default Value
Frequency Span	3 MHz
Measurement BW	1.6 MHz
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.

### 3.2.2 Adjacent Channel Power (CH Power ACLR)

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.

Below 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 other screen elements match those of the spectrum analyzer in the base unit.

The configuration of the measurement and the default settings comply to the TD-SCDMA requirements.

Parameter	Default Value
Adjacent Channel Power	On
ACP Standard	TD-SCDMA
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.

### 3.2.3 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 standard does not distinguish between spurious and spectral emissions.

Below 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.

Parameter	Default Value
Frequency Span	8 MHz
Sweep Time	20 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.

### 3.2.4 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.

Parameter	Default Value
Occupied Bandwidth	ON
Frequency Span	4.8 MHz
Sweep Time	1.3 s
RBW	30 kHz
VBW	300 kHz
Detector	RMS

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

### 3.2.5 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.

Parameter	Default Value
CCDF	On
RBW	10 MHz
Detector	Sample

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

### 3.2.6 Power vs Time

The Power vs Time measurement determines the start of the subframe and compares the averaged power in time domain against a transmit On/Off mask according to the specification.

The scaling of the x-axis and therefore also the scaling of the limit line are defined by the [Switching Point](#). Below the measurement screen you can view a list of the measured data.

Parameter	Default Value
Span	Zero Span
Sweep Time	2.4 ms
RBW	1.28 MHz
VBW	10 MHz
Trace Mode	Average

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

### 3.2.7 Softkeys and Menus for RF Measurements (K76/K77)

The following chapter describes the softkeys and menus available for RF measurements in 3GPP TD-SCDMA BTS and UE Measurement Applications.

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

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3.2.7.3	Softkeys of the Span Menu for RF Measurements.....	86
3.2.7.4	Softkeys of the Amplitude Menu for RF Measurements.....	87
3.2.7.5	Softkeys of the Bandwidth Menu.....	92
3.2.7.6	Softkeys of the Sweep Menu.....	98
3.2.7.7	Softkeys of the Input/Output Menu for RF Measurements.....	102

#### 3.2.7.1 Softkeys of the Measurement Menu

The TD-SCDMA BTS and UE Measurement Applications provide the various test measurements and result displays. All measurements are accessed via the MEAS key.

The following list shows all softkeys available in the "Measurement" menu of the TD-SCDMA BTS and UE Measurement Application. 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.



#### Behaviour of the MEAS CONFIG key

The MEAS CONFIG key always returns to the root menu of the currently active measurement.

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**Code Domain Analyzer**

Opens the submenu to configure a code domain analysis. The menu is described in [chapter 3.1.1.1, "Softkeys of the Code Domain Analyzer"](#), on page 16.

For details on Code Domain Analysis, see [chapter 3.1, "Code Domain Analysis"](#), on page 14.

**Power**

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

For details on screen layout and default values, refer to the description of the [Signal Channel Power](#).

SCPI command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 173

[CALCulate<n>:MARKer:FUNction:CDPower\[:BTS\]:RESult](#) on page 130

**Adapt to Signal ← Power**

Opens a submenu to configure the measurEment with the following softkeys:

**Auto Level & Time ← Adapt to Signal ← Power**

The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

SCPI command:

[\[SENSe:\]POWER:ACHannel:AUTO:LTIME](#) on page 187

**Start Slot ← Adapt to Signal ← Power**

Sets the first slot of the measurement.

SCPI command:

[\[SENSe:\]POWER:ACHannel:SLOT:STarT](#) on page 187

**Stop Slot ← Adapt to Signal ← Power**

Sets the last slot of the measurement.

SCPI command:

[\[SENSe:\]POWER:ACHannel:SLOT:STOP](#) on page 187

**Ch Power ACLR**

Starts the Adjacent Channel Power measurement.

In this measurement the power of the carrier and its adjacent and alternate channels is determined. For details on screen layout and default values see the description of the [Adjacent Channel Power \(CH Power ACLR\)](#).

Also opens the Adjacent Channel Power submenu.

SCPI command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 173

[CALCulate<n>:MARKer:FUNction:CDPower\[:BTS\]:RESult](#) on page 130

**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 3.3.10, "Predefined CP/ACLR Standards"](#), on page 120 and [chapter 3.3.11, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 121).

**# of TX Chan ← CP/ACLR Settings ← Ch Power ACLR**

Opens an edit dialog box to enter the number of carrier signals to be taken into account in channel and adjacent-channel power measurements. Values from 1 to 18 are allowed.

SCPI command:

[\[SENSe:\]POWer:ACHannel:TXChannel:COUNT](#) on page 216

**# of Adj Chan ← CP/ACLR Settings ← Ch Power ACLR**

Opens an edit dialog box to enter the number of adjacent channels to be considered in the adjacent-channel power measurement. Values from 0 to 12 are allowed.

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

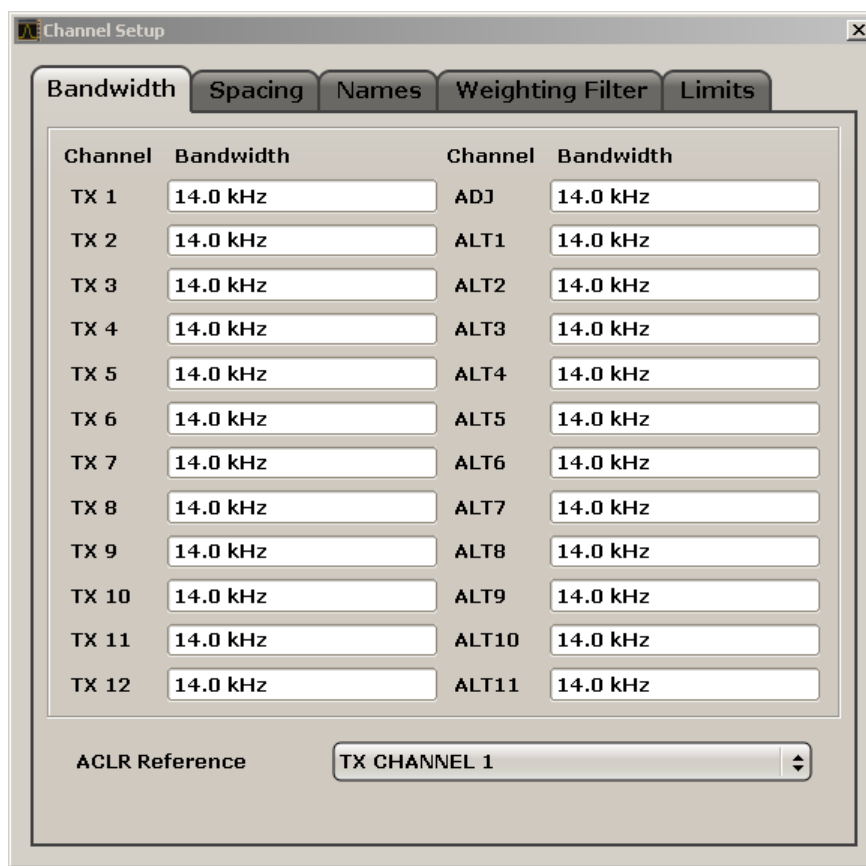
0	Only the channel powers are measured.
1	The channel powers and the power of the upper and lower adjacent channel are measured.
2	The channel powers, the power of the upper and lower adjacent channel, and of the next higher and lower channel (alternate channel 1) are measured.
3	The channel power, the power of the upper and lower adjacent channel, the power of the next higher and lower channel (alternate channel 1), and of the next but one higher and lower adjacent channel (alternate channel 2) are measured.
...	...
12	The channel power, the power of the upper and lower adjacent channel, and the power of the all higher and lower channels (alternate channel 1 to 11) are measured.

SCPI command:

[\[SENSe:\]POWer:ACHannel:ACPairs](#) on page 209

**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 59
- "Spacing" on page 60
- "Names" on page 61
- "Weighting Filter" on page 61
- "Limits" on page 62

#### **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 3.3.11, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 121).

- 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 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106.

SCPI command:

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

on page 209

`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel` on page 209

`[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTErnate<channel>`

on page 210

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

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

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

SCPI command:

`[SENSe:]POWer:ACHannel:REFErence:TXCHannel:MANual` on page 215

`[SENSe:]POWer:ACHannel:REFErence:TXCHannel:AUTO` on page 214

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

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

- TX channels (left column)

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

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

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

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

- **Adjacent channels (right column)**  
 Since all the adjacent channels often have the same distance to each other, the modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, ...): they are all multiplied by the same factor (new spacing value/old spacing value). Thus only one value needs to be entered in case of equal channel spacing. A modification of a higher adjacent-channel spacing (ALT1, ALT2, ...) causes a change by the same factor in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.

**Example:**

In the default setting, the adjacent channels have the following spacing: 20 kHz ("ADJ"), 40 kHz ("ALT1"), 60 kHz ("ALT2"), 80 kHz ("ALT3"), 100 kHz ("ALT4"), ...  
 If the spacing of the first adjacent channel ("ADJ") is set to 40 kHz, the spacing of all other adjacent channels is multiplied by factor 2 to result in 80 kHz ("ALT1"), 120 kHz ("ALT2"), 160 kHz ("ALT3"), ...

If, starting from the default setting, the spacing of the 5th adjacent channel ("ALT4") is set to 150 kHz, the spacing of all higher adjacent channels is multiplied by factor 1.5 to result in 180 kHz ("ALT5"), 210 kHz ("ALT6"), 240 kHz ("ALT7"), ...

If a ACLR or MC-ACLR measurement is started, all settings according to the standard including the channel bandwidths and channel spacings are set and can be adjusted afterwards.

SCPI command:

[\[SENSe:\]POWER:ACHannel:SPACing:CHANnel<channel>](#) on page 216

[\[SENSe:\]POWER:ACHannel:SPACing\[:ACHannel\]](#) on page 215

[\[SENSe:\]POWER:ACHannel:SPACing:ALternate<channel>](#) on page 216

**Names ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR**

Define user-specific channel names for each channel. The names defined here are displayed in the result diagram and result table.

SCPI command:

[\[SENSe:\]POWER:ACHannel:NAME:ACHannel](#) on page 212

[\[SENSe:\]POWER:ACHannel:NAME:ALternate<channel>](#) on page 213

[\[SENSe:\]POWER:ACHannel:NAME:CHANnel<channel>](#) on page 213

**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

SCPI command:

POW:ACH:FILT:CHAN1 ON, see [SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel> on page 212

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 211

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 211

Activates the weighting filter for the adjacent channel.

POW:ACH:FILT:ALPH:ACH 0, 35 see [SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel on page 210

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 211

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 210

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 checks adherence to the limits irrespective of whether the limits are absolute or relative or whether the measurement is carried out with absolute or rel-

ative levels. If both limits are active and if the higher of both limit values is exceeded, the measured value is marked by a preceding asterisk.

SCPI command:

[CALCulate<n>:LIMit<k>:ACPoweR\[:STATe\]](#) on page 150

[CALCulate<n>:LIMit<k>:ACPoweR:ACHannel:RESult](#) on page 146

[CALCulate<n>:LIMit<k>:ACPoweR:ALternate<channel>\[:RELative\]](#)  
on page 149

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

Defines a limit relative to the carrier signal.

SCPI command:

`CALC:LIM:ACP ON`, see [CALCulate<n>:LIMit<k>:ACPoweR\[:STATe\]](#)  
on page 150

`CALC:LIM:ACP:<adjacent-channel> 0dBc,0dBc`

`CALC:LIM:ACP:<adjacent-channel>:STAT ON`

#### **Absolute Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR**

Defines an absolute limit.

SCPI command:

`CALC:LIM:ACP ON`, see [CALCulate<n>:LIMit<k>:ACPoweR\[:STATe\]](#)  
on page 150

`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 145

#### **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 64 and "[ACLR Reference](#)" on page 60 to obtain the signal to noise ratio.

SCPI command:

[CALCulate<n>:MARKer<m>:FUNction:POWer:RESult:PHZ](#) on page 133

#### **Power Mode ← CP/ACLR Settings ← Ch Power ACLR**

Opens a submenu to select the power mode.

**Clear/Write ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR**

If this mode is activated, the channel power and the adjacent channel powers are calculated directly from the current trace (default mode).

SCPI command:

CALC:MARK:FUNC:POW:MODE WRIT, see [CALCulate<n>:MARKer<m>:FUNCTION:POWer:MODE](#) on page 132

**Max Hold ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR**

If this mode is activated, the power values are calculated from the current trace and compared with the previous power value using a maximum algorithm. The higher value is retained. If activated, the enhancement label "Pwr Max" is displayed.

SCPI command:

CALC:MARK:FUNC:POW:MODE MAXH, see [CALCulate<n>:MARKer<m>:FUNCTION:POWer:MODE](#) on page 132

**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 3.3.2, "Trace Mode Overview"](#), on page 105).

SCPI command:

[\[SENSe:\]POWer:TRACe](#) on page 218

**ACLR (Abs/Rel) ← CP/ACLR Settings ← Ch Power ACLR**

Switches between absolute and relative power measurement in the adjacent channels.

Abs	The absolute power in the adjacent channels is displayed in the unit of the y-axis, e.g. in dBm, dBμV.
Rel	The level of the adjacent channels is displayed relative to the level of the transmission channel in dBc.

SCPI command:

[\[SENSe:\]POWer:ACHannel:MODE](#) on page 212

**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 3.3.11, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 121.

SCPI command:

[\[SENSe:\]POWer:ACHannel:PRESet](#) on page 213

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

SCPI command:

[SENSe:] SWEep:TIME on page 224

#### **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 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 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106.

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 sets in coupled mode. Approx. 5000 measured values are required for a reproducibility of 0.1 dB (99 %), i.e. the measurement time is to be increased to 200 ms.

SCPI command:

[SENSe:] POWer:HSPEED on page 217

#### **Set CP Reference ← Ch Power ACLR**

Defines the currently measured channel power as the reference value if channel power measurement is activated. The reference value is displayed in the "Tx1 (Ref) Power" field; the default value is 0 dBm.

The softkey is available only for multi carrier ACLR measurements.

In adjacent-channel power measurement with one or several carrier signals, the power is always referenced to a transmission channel, i.e. no value is displayed for "Tx1 (Ref) Power".

SCPI command:

[SENSe:] POWer:ACHannel:REFERENCE:AUTO ONCE on page 214

**Noise Correction ← Ch Power ACLR**

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

"ON"	A reference measurement of the instrument's inherent noise is carried out. The noise power measured is then subtracted from the power in the channel that is being examined. The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A disable message is displayed on the screen. Noise correction must be switched on again manually after the change.
"OFF"	No noise correction is performed.
"AUTO"	Noise correction is performed. After a parameter change, noise correction is restarted automatically and a new correction measurement is performed.

SCPI command:

[\[SENSe:\]POWer:NCORrection](#) on page 217

**Adapt to Signal ← Ch Power ACLR**

Opens a submenu to configure the measurEment with the following softkeys:

**Auto Level & Time ← Adapt to Signal ← Ch Power ACLR**

The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

SCPI command:

[\[SENSe:\]POWer:ACHannel:AUTO:LTIME](#) on page 187

**Start Slot ← Adapt to Signal ← Ch Power ACLR**

Sets the first slot of the measurement.

SCPI command:

[\[SENSe:\]POWer:ACHannel:SLOT:STarT](#) on page 187

**Stop Slot ← Adapt to Signal ← Ch Power ACLR**

Sets the last slot of the measurement.

SCPI command:

[\[SENSe:\]POWer:ACHannel:SLOT:STOP](#) on page 187

**Spectrum Emission Mask**

Performs a comparison of the signal power in different carrier offset ranges with the maximum values specified in the standard.

For details on screen layout and default values see the description of the [Spectrum Emission Mask](#).

Also opens the Spectrum Emission Mask submenu containing the following softkeys:

SCPI command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 173

[CALCulate<n>:MARKer:FUNction:CDPower\[:BTS\]:RESult](#) on page 130

### **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 70).

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 3.3.7, "Format Description of Spectrum Emission Mask XML Files"](#), on page 111).

If you load one of the provided XML files ("Load Standard" softkey, see ["Load Standard"](#) on page 74), the sweep list contains ranges and parameters according to the selected standard. For further details refer also to [chapter 3.3.8, "Provided XML Files for the Spectrum Emission Mask Measurement"](#), on page 116.

**Note:** If you edit the sweep list, always follow the rules and consider the limitations described in [chapter 3.3.5, "Ranges and Range Settings"](#), on page 109.

#### **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 3.3.5, "Ranges and Range Settings"](#), on page 109.

In order to change the start/stop frequency of the first/last range, select the appropriate span with the SPAN key. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last ranges are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Frequency values for each range have to be defined relative to the center frequency. The reference range has to be centered on the center frequency. The minimum span of the reference range is given by the current TX Bandwidth.

SCPI command:

[\[SENSe:\]ESpectrum:RANGe<range>\[:FREQuency\]:START](#) on page 195

[\[SENSe:\]ESpectrum:RANGe<range>\[:FREQuency\]:STOP](#) on page 196

#### **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 3.3.9, "Fast Spectrum Emission Mask Measurements"](#), on page 119.

**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.

SCPI command:

`[SENSe:]ESpectrum:HighSPeed` on page 192

**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 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:FILTer:TYPE` on page 194

**RBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask**

Sets the RBW value for this range.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:BANDwidth[:RESolution]` on page 193

**VBW ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask**

Sets the VBW value for this range.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:BANDwidth:VIDeo` on page 194

**Sweep Time Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask**

Activates or deactivates the auto mode for the sweep time.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:SWEep:TIME:AUTO` on page 200

**Sweep Time ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask**

Sets the sweep time value for the range.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:SWEep:TIME` on page 200

**Ref. Level ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask**

Sets the reference level for the range.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:RLEVel` on page 199

**RF Att. Mode ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask**

Activates or deactivates the auto mode for RF attenuation.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:INPut:ATTenuation:AUTO` on page 196

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

Sets the attenuation value for that range.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:INPut:ATTenuation` on page 196

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

Switches the preamplifier on or off.

SCPI command:

[SENSe:]ESpectrum:RANGe<range>:INPut:GAIN:STATe on page 197

**Transd. Factor** ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask

Sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

- The transducer overlaps or equals the span of the range.
- The x-axis is linear.
- The unit is dB.

SCPI command:

[SENSe:]ESpectrum:RANGe<range>:TRANsducer on page 201

**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 69, "[Abs Limit Stop](#)" on page 69, "[Rel Limit Start](#)" on page 69, "[Rel Limit Stop](#)" on page 70).

Depending on the number of active power classes (see "Power Class" dialog box), the number of limits that can be set varies. Up to four limits are possible. The sweep list is extended accordingly.

SCPI command:

[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:STATe on page 199  
CALCulate<n>:LIMit<k>:FAIL on page 151

**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 69).

SCPI command:

[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:ABSolute:START on page 197

**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 69).

SCPI command:

[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:ABSolute:STOP on page 198

**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 69).

SCPI command:

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

on page 198

**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 67).

SCPI command:

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

on page 199

**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 3.3.5, "Ranges and Range Settings"](#), on page 109.

SCPI command:

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

on page 197

**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 3.3.5, "Ranges and Range Settings"](#), on page 109.

SCPI command:

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

on page 197

**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 3.3.5, "Ranges and Range Settings"](#), on page 109.

SCPI command:

`[SENSe:]ESpectrum:RANGe<range>:DELete` on page 194

**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:

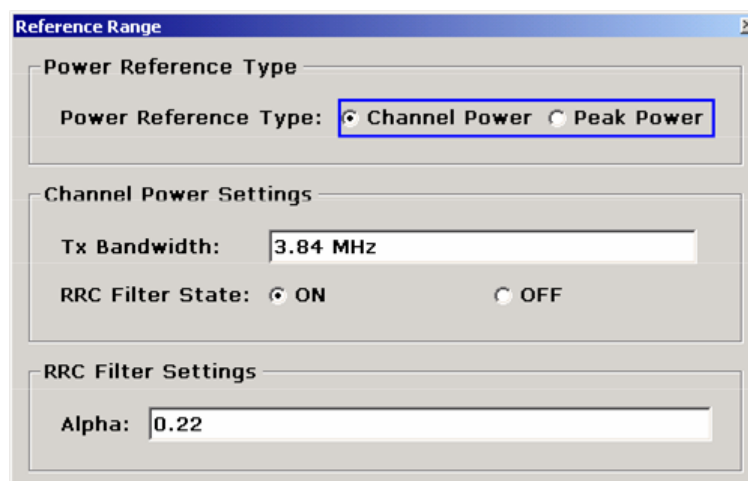
- Inserting ranges: a symmetrical range is inserted on the other side of the reference range
- Deleting ranges: the symmetrical range on the other side of the reference range is also deleted
- Editing range settings: the settings in the symmetrical range are adapted accordingly

**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 3.3.5, "Ranges and Range Settings"](#), on page 109.

SCPI command:

[SENSe:]ESpectrum:RTYPE on page 201

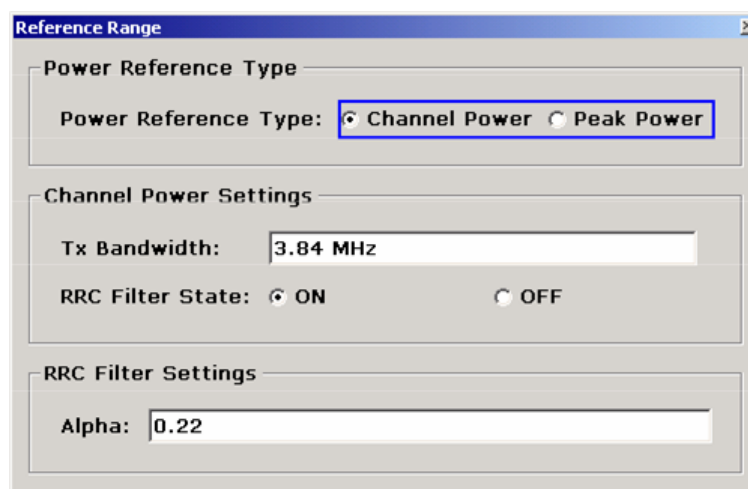
[SENSe:]ESpectrum:BWID on page 191

[SENSe:]ESpectrum:FILTer[:RRC][:STATe] on page 191

[SENSe:]ESpectrum:FILTer[:RRC]:ALPHa on page 191

### Edit Reference Range ← Spectrum Emission Mask

Opens the "Reference Range" dialog box to edit the additional settings used for SEM measurements.



Two different power reference types are supported:

- "Peak Power"  
Measures the highest peak within the reference range.
- "Channel Power"  
Measures the channel power within the reference range (integral bandwidth method).  
If the "Channel Power" reference power type is activated, the dialog box is extended to define additional settings:
- "Tx Bandwidth"  
Defines the bandwidth used for measuring the channel power:  
minimum span ≤ value ≤ span of reference range
- "RRC Filter State"  
Activates or deactivates the use of an RRC filter.
- "RRC Filter Settings"  
Sets the alpha value of the RRC filter. This window is only available if the RRC filter is activated.

For further details refer to [chapter 3.3.5, "Ranges and Range Settings"](#), on page 109.

SCPI command:

[SENSe:]ESpectrum:RTYPE on page 201

[SENSe:]ESpectrum:BWID on page 191

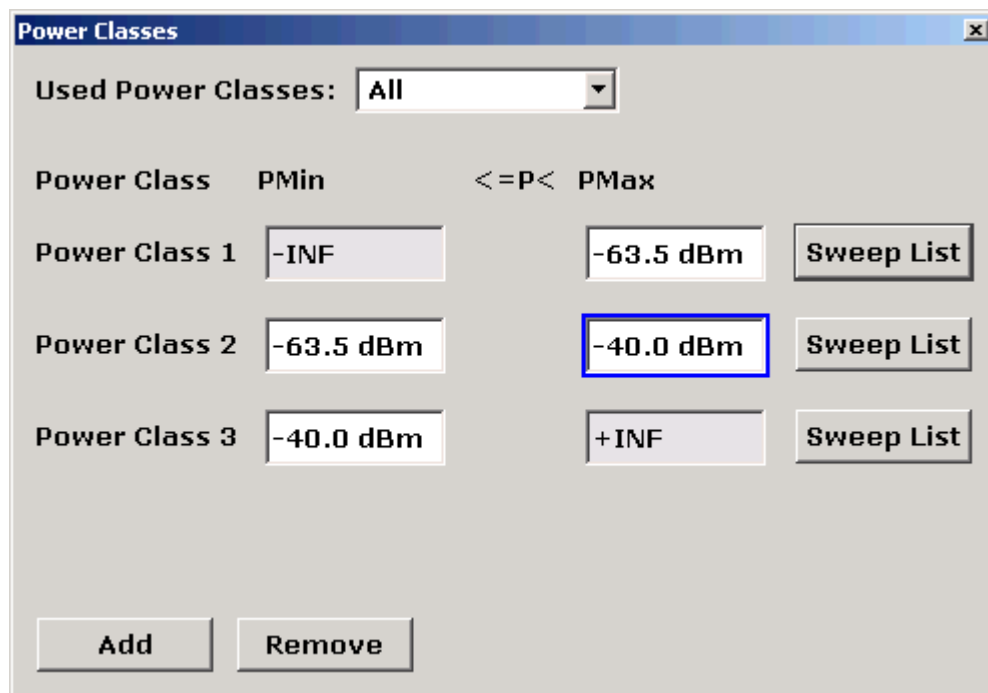
[SENSe:]ESpectrum:FILTer[:RRC][:STATe] on page 191

[SENSe:]ESpectrum:FILTer[:RRC]:ALPHa on page 191



**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 73).

SCPI command:

```
CALCulate<n>:LIMit<k>:ESpectrum:PClass<Class>[:EXCLUSIVE]
```

on page 152

To define all limits in one step:

```
CALCulate<n>:LIMit<k>:ESpectrum:PClass<Class>:LIMit[:STATE]
```

on page 153

**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:

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

SCPI command:

[CALCulate<n>:LIMit<k>:ESpectrum:PClass<Class>:MINimum](#) on page 154

[CALCulate<n>:LIMit<k>:ESpectrum:PClass<Class>:MAXimum](#) on page 154

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

See "[Sweep List](#)" on page 67

### **Add/Remove ← Edit Power Classes ← Spectrum Emission Mask**

Activates or deactivates power classes to be defined. Up to four power classes can be defined. The number of active power classes affects the availability of the items of the Used Power Classes dropdown menu.

SCPI command:

[CALCulate<n>:LIMit<k>:ESpectrum:PClass<Class>\[:EXCLUSIVE\]](#)

on page 152

### **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 3.3.8, "Provided XML Files for the Spectrum Emission Mask Measurement"](#), on page 116.

SCPI command:

[\[SENSe:\]ESpectrum:PRESet\[:STANDARD\]](#) on page 192

### **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 3.3.7, "Format Description of Spectrum Emission Mask XML Files"](#), on page 111.

SCPI command:

[\[SENSe:\]ESpectrum:PRESet:STORe](#) on page 193

### **Meas Start/Stop ← Spectrum Emission Mask**

Aborts/restarts the current measurement and displays the status:

"Start"                    The measurement is currently running.

"Stop"                    The measurement has been stopped, or, in single sweep mode, the end of the sweep has been reached.

SCPI command:

[ABORt](#) on page 241

[INITiate<n>:ESpectrum](#) on page 243

### **Restore Standard Files ← Spectrum Emission Mask**

Copies the XML files from the C:\R\_S\instr\sem\_backup folder to the C:\R\_S\instr\sem\_std folder. Files of the same name are overwritten.

SCPI command:

[\[SENSe:\]ESpectrum:PRESet:RESTore](#) on page 193

**Adapt to Signal ← Spectrum Emission Mask**

Opens a submenu to configure the measurement with the following softkeys:

**Auto Level & Time ← Adapt to Signal ← Spectrum Emission Mask**

The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

SCPI command:

[\[SENSe:\] POWER:ACHannel:AUTO:LTIME](#) on page 187

**Start Slot ← Adapt to Signal ← Spectrum Emission Mask**

Sets the first slot of the measurement.

SCPI command:

[\[SENSe:\] POWER:ACHannel:SLOT:STarT](#) on page 187

**Stop Slot ← Adapt to Signal ← Spectrum Emission Mask**

Sets the last slot of the measurement.

SCPI command:

[\[SENSe:\] POWER:ACHannel:SLOT:STOP](#) on page 187

**Occupied Bandwidth**

Starts measurement of the bandwidth assigned to the signal.

For details on screen layout and default values see the description of the [Occupied Bandwidth](#).

Also opens the Occupied Bandwidth submenu containing the following softkeys:

SCPI command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 173

[CALCulate<n>:MARKer:FUNction:CDPower\[:BTS\]:RESult](#) on page 130

**% Power Bandwidth (span > 0) ← Occupied Bandwidth**

Opens an edit dialog box to enter the percentage of total power in the displayed frequency range which defines the occupied bandwidth. Values from 10% to 99.9% are allowed.

SCPI command:

[\[SENSe:\] POWER:BANDwidth|BWIDth](#) on page 217

**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 3.3.11, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 121). The default setting is 14 kHz.

For measurements in line with a specific transmission standard, the bandwidth specified by the standard for the transmission channel must be entered.

SCPI command:

[\[SENSe:\] POWER:ACHannel:BANDwidth|BWIDth\[:CHANnel<channel>\]](#)  
on page 209

**Adapt to Signal ← Occupied Bandwidth**

Opens a submenu to configure the measurement with the following softkeys:

**Auto Level & Time ← Adapt to Signal ← Occupied Bandwidth**

The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

SCPI command:

[\[SENSe:\]POWER:ACHannel:AUTO:LTIME](#) on page 187

**Start Slot ← Adapt to Signal ← Occupied Bandwidth**

Sets the first slot of the measurement.

SCPI command:

[\[SENSe:\]POWER:ACHannel:SLOT:STarT](#) on page 187

**Stop Slot ← Adapt to Signal ← Occupied Bandwidth**

Sets the last slot of the measurement.

SCPI command:

[\[SENSe:\]POWER:ACHannel:SLOT:STOP](#) on page 187

**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 3.3.11, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 121.

SCPI command:

[\[SENSe:\]POWER:ACHannel:PRESet](#) on page 213

**CCDF**

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

For details on screen layout and default values see the description of the [Complementary Cumulative Distribution Function \(CCDF\)](#).

SCPI command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 173

**Percent Marker ← CCDF**

Opens an edit dialog box to enter a probability value and to position marker 1. Thus, the power which is exceeded with a given probability can be determined very easily. If marker 1 is deactivated, it will be switched on automatically.

As all markers, the percent marker can be moved simply by touching it with a finger or mouse cursor and dragging it to the desired position.

SCPI command:

[CALCulate<n>:MARKer<m>:Y:PERCent](#) on page 162

#### **Res BW ← CCDF**

Opens an edit dialog box to set the resolution bandwidth directly.

For correct measurement of the signal statistics the resolution bandwidth has to be wider than the signal bandwidth in order to measure the actual peaks of the signal amplitude correctly. In order not to influence the peak amplitudes the video bandwidth is automatically set to 10 MHz. The sample detector is used for detecting the video voltage.

SCPI command:

[\[SENSe:\]BANDwidth|BWIDth\[:RESolution\]](#) on page 202

#### **# of Samples ← CCDF**

Opens an edit dialog box to set the number of power measurements that are taken into account for the statistics.

Apart from the number of measurements the overall measurement time depends also on the set resolution bandwidth as the resolution bandwidth directly influences the sampling rate.

SCPI command:

[CALCulate<n>:STATistics:NSAMples](#) on page 165

#### **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 19).

For the APD function this value is mapped to the right diagram border. For the CCDF function there is no direct representation of this value on the diagram as the x-axis is scaled relatively to the measured mean power.

SCPI command:

[CALCulate<n>:STATistics:SCALE:X:RLEVel](#) on page 167

#### **x-Axis Range ← Scaling ← CCDF**

Opens the "Range" submenu to select a value for the level range to be covered by the statistics measurement selected.

SCPI command:

[CALCulate<n>:STATistics:SCALE:X:RANGe](#) on page 166

**Range Log 100 dB ← x-Axis Range ← Scaling ← CCDF**

Sets the level display range to 100 dB.

SCPI command:

```
DISP:WIND:TRAC:Y:SPAC LOG
```

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

```
DISP:WIND:TRAC:Y 100DB (see DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\] on page 176).
```

**Range Log 50 dB ← x-Axis Range ← Scaling ← CCDF**

Sets the level display range to 50 dB.

SCPI command:

```
DISP:WIND:TRAC:Y:SPAC LOG
```

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

```
DISP:WIND:TRAC:Y 50DB
```

Sets the level display range to 50 dB (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 176).

**Range Log 10 dB ← x-Axis Range ← Scaling ← CCDF**

Sets the level display range to 10 dB.

SCPI command:

```
DISP:WIND:TRAC:Y:SPAC LOG
```

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

```
DISP:WIND:TRAC:Y 10DB (see DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\] on page 176).
```

**Range Log 5 dB ← x-Axis Range ← Scaling ← CCDF**

Sets the level display range to 5 dB.

SCPI command:

```
DISP:WIND:TRAC:Y:SPAC LOG
```

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

```
DISP:WIND:TRAC:Y 5DB (see DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\] on page 176).
```

**Range Log 1 dB ← x-Axis Range ← Scaling ← CCDF**

Sets the level display range to 1 dB.

SCPI command:

```
DISP:WIND:TRAC:Y:SPAC LOG
```

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

```
DISP:WIND:TRAC:Y 1DB (see DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\] on page 176).
```

**Range Log Manual ← x-Axis Range ← Scaling ← CCDF**

Opens an edit dialog box to enter a value for logarithmic scaling for the level display range.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALe\]](#) on page 176

**Range Linear % ← x-Axis Range ← Scaling ← CCDF**

Selects linear scaling in % for the level display range, i.e. the horizontal grid lines are labeled in %. The grid is divided in decadal steps.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in % referenced to the voltage value at the position of marker 1. This is the default setting for linear scaling.

SCPI command:

DISP:TRAC:Y:SPAC LIN, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180

**Range Lin. Unit ← x-Axis Range ← Scaling ← CCDF**

Selects linear scaling in dB for the level display range, i.e. the horizontal lines are labeled in dB.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in dB referenced to the power value at the position of marker 1.

SCPI command:

DISP:TRAC:Y:SPAC LDB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180

**y-Axis Max Value ← Scaling ← CCDF**

Opens an edit dialog box to define the upper limit of the displayed probability range. Values on the y-axis are normalized which means that the maximum value is 1.0. The y-axis scaling is defined via the "Y-unit %/Abs" softkey (see ["y-Unit %/Abs"](#) on page 80). The distance between max and min value must be at least one decade.

SCPI command:

[CALCulate<n>:STATistics:SCALe:Y:UPPer](#) on page 168

**y-Axis Min Value ← Scaling ← CCDF**

Opens an edit dialog box to define the lower limit of the displayed probability range. Values in the range  $1e^{-9} < value < 0.1$  are allowed. The y-axis scaling is defined via the ["y-Unit %/Abs"](#) on page 80 softkey. The distance between max and min value must be at least one decade.

SCPI command:

[CALCulate<n>:STATistics:SCALe:Y:LOWer](#) on page 167

**y-Unit %/Abs ← Scaling ← CCDF**

Defines the scaling type of the y-axis. The default value is absolute scaling.

SCPI command:

[CALCulate<n>:STATistics:SCALE:Y:UNIT](#) on page 167

**Default Settings ← Scaling ← CCDF**

Resets the x- and y-axis scalings to their preset values.

x-axis ref level:	-10 dBm
x-axis range APD:	100 dB
x-axis range CCDF:	20 dB
y-axis upper limit:	1.0
y-axis lower limit:	1E-6

SCPI command:

[CALCulate<n>:STATistics:PRESet](#) on page 165

**Adjust Settings ← Scaling ← CCDF**

Adjusts the level settings according to the measured difference between peak and minimum power for APD measurement or peak and mean power for CCDF measurement in order to obtain maximum power resolution. Adjusts the reference level to the current input signal. For details see also the "Adjust Ref Lvl" softkey ("[Adjust Ref Lvl](#)" on page 38).

SCPI command:

[CALCulate<n>:STATistics:SCALE:AUTO ONCE](#) on page 166

**Gated Trigger (On/Off) ← CCDF**

Activates and deactivates the gating for statistics functions for the ACP and the CCDF channel. The trigger source is changed to "EXTERN" if this function is switched on. The gate ranges are defined using the "Gate Ranges" softkey (see "[Gate Ranges](#)" on page 80).

SCPI command:

[\[SENSe:\] SWEep:EGATe](#) on page 219

[\[SENSe:\] SWEep:EGATe:SOURce](#) on page 221

**Gate Ranges ← CCDF**

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

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



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

SCPI command:

SWE:EGAT ON (see [SENSe:]SWEep:EGATe on page 219)

Switches on the external gate mode.

SWE:EGAT:TRAC1:COMM "SlotA" (see [SENSe:]SWEep:EGATe:TRACe<k>:COMMENT on page 221)

Adds a comment to trace 1.

SWE:EGAT:TRAC1:STAT1 ON (see [SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>] on page 222)

Activates tracing for range 1 of trace 1.

SWE:EGAT:TRAC1:STAR1 3ms (see [SENSe:]SWEep:EGATe:TRACe<k>:START<range> on page 222)

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 223)

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 221)

Defines the period for gated triggering to 5 ms.

#### Adapt to Signal ← CCDF

Opens a submenu to configure the measurEment with the following softkeys:

##### Auto Level & Time ← Adapt to Signal ← CCDF

The Auto Level and Time softkey automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when pressing the softkey and resumed after the automatic level detection is finished.

SCPI command:

[SENSe:]POWER:ACHannel:AUTO:LTIME on page 187

##### Start Slot ← Adapt to Signal ← CCDF

Sets the first slot of the measurement.

SCPI command:

[SENSe:]POWER:ACHannel:SLOT:STarT on page 187

**Stop Slot ← Adapt to Signal ← CCDF**

Sets the last slot of the measurement.

SCPI command:

[\[SENSe:\]POWER:ACHannel:SLOT:STOP](#) on page 187

**Adjust Settings ← CCDF**

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 3.3.11, "Optimized Settings for CP/ACLR Test Parameters"](#), on page 121.

SCPI command:

[\[SENSe:\]POWER:ACHannel:PRESet](#) on page 213

**Power vs Time**

Starts the Power vs Time measurement. This measurement is required by the standard for the Emission Envelope Mask.

For details on screen layout and default values see the description of the [Power vs Time](#).

Also opens the Power vs Time submenu containing the following softkeys:

SCPI command:

[CONFigure:CDPower\[:BTS\]:MEASurement](#) on page 173

**Switching Point ← Power vs Time**

Opens a dialog box to enter the switching point.

The switching point is between 1 and 6 and defines the border of uplink slots and downlink slots.

SCPI command:

[CONFigure:CDPower\[:BTS\]:PVTime:SPOint](#) on page 174

**Start Meas ← Power vs Time**

Starts the measurement and does a single sweep.

SCPI command:

[INITiate:CONT OFF](#), see [INITiate<n>:CONTinuous](#) on page 243

[INITiate<n>\[:IMMediate\]](#) on page 243

**No of Subframes ← Power vs Time**

Defines the number of subframes that the R&S FSV includes in the measurement. The results of the Power vs Time measurement are based on the average of the number of the subframes.

SCPI command:

[CONFigure:CDPower\[:BTS\]:PVTime:SFRames](#) on page 174

**List Evaluation ← Power vs Time**

Toggles the list evaluation on and off. The table shows the following data:

- **Start and Stop**  
Defines the start time and the stop time of one of the sections of the limit line in  $\mu$ s. Each row in the table represents one section of the limit line.
- **Avg**  
Shows the average power of the signal in the corresponding section of the limit line in relative and absolute values.
- **Max**  
Shows the maximum power of the signal in the corresponding section of the limit line in relative and absolute values.
- **Time @ MaxPower**  
Shows the exact moment in time at which the maximum power level occurs.

**Auto Level & Time ← Power vs Time**

Starts the autorange routine for the reference level. This also creates the relationship between trigger and subframe start.

SCPI command:

[SENSe:]POWER:ACHannel:AUTO:LTIME on page 187

**3.2.7.2 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.....	83
CF Stepsize.....	84
L 0.1*Span (span > 0).....	84
L 0.1*RBW (span > 0).....	84
L 0.5*Span (span > 0).....	84
L 0.5*RBW (span > 0).....	84
L x*Span (span > 0).....	85
L x*RBW (span > 0).....	85
L =Center.....	85
L =Marker.....	85
L Manual.....	85
Start.....	85
Stop.....	86
Frequency Offset.....	86

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

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

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

SCPI command:

[SENSe:]FREQuency:CENTer on page 205

### CF Stepsize

Opens a submenu to set the step size of the center frequency. Apart from the =Center, =Marker and Manual softkeys, the other softkeys are displayed depending on the selected frequency span.

The step size can be 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.

This softkey is available for RF measurements.

#### 0.1\*Span (span > 0) ← CF Stepsize

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

SCPI command:

FREQ:CENT:STEP:LINK SPAN, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 206

FREQ:CENT:STEP:LINK:FACT 10PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 207

#### 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.

SCPI command:

FREQ:CENT:STEP:LINK RBW, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 206

FREQ:CENT:STEP:LINK:FACT 10PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 207

#### 0.5\*Span (span > 0) ← CF Stepsize

Sets the step size for the center frequency to 50 % of the span.

SCPI command:

FREQ:CENT:STEP:LINK SPAN, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 206

FREQ:CENT:STEP:LINK:FACT 50PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 207

#### 0.5\*RBW (span > 0) ← CF Stepsize

Sets the step size for the center frequency to 50 % of the resolution bandwidth.

SCPI command:

FREQ:CENT:STEP:LINK RBW, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 206

FREQ:CENT:STEP:LINK:FACT 50PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 207

**x\*Span (span > 0) ← CF Stepsize**

Opens an edit dialog box to set the step size for the center frequency as % of the span.

SCPI command:

FREQ:CENT:STEP:LINK SPAN, see [SENSe:]FREQuency:CENTer:STEP:LINK

on page 206

FREQ:CENT:STEP:LINK:FACT 20PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 206

**x\*RBW (span > 0) ← CF Stepsize**

Opens an edit dialog box to set the step size for the center frequency as % of the resolution bandwidth. Values between 1 and 100 % in steps of 1 % are allowed. The default setting is 10 %.

SCPI command:

FREQ:CENT:STEP:LINK RBW, see [SENSe:]FREQuency:CENTer:STEP:LINK

on page 206

FREQ:CENT:STEP:LINK:FACT 20PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 206

**=Center ← CF Stepsize**

Sets the step size to the value of the center frequency and removes the coupling of the step size to span or resolution bandwidth. This function is especially useful during measurements of the signal harmonic content because by entering the center frequency each stroke of the arrow key selects the center frequency of another harmonic.

**=Marker ← CF Stepsize**

Sets the step size to the value of the current marker and removes the coupling of the step size to span or resolution bandwidth. This function is especially useful during measurements of the signal harmonic content at the marker position because by entering the center frequency each stroke of the arrow key selects the center frequency of another harmonic.

**Manual ← CF Stepsize**

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

SCPI command:

[SENSe:]FREQuency:CENTer:STEP[:VALue] on page 206

**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.

This softkey is available for RF measurements.

SCPI command:

[SENSe:]FREQuency:START on page 208

**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.

This softkey is available for RF measurements.

SCPI command:

[SENSe:] FREQuency: STOP on page 208

**Frequency Offset**

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

SCPI command:

[SENSe:] FREQuency: OFFSet on page 207

**3.2.7.3 Softkeys of the Span Menu for RF Measurements**

The following chapter describes all softkeys available in the "Span" menu for RF measurements, except for "Power" and "Power vs Time" measurements.

Span Manual.....86  
 Sweeptime Manual.....86  
 Full Span.....87  
 Last Span.....87

**Span Manual**

Opens an edit dialog box to enter the frequency span. The center frequency is kept constant. The following range is allowed:

span = 0: 0 Hz

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

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

SCPI command:

[SENSe:] FREQuency: SPAN on page 207

**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 μs
	span > 0: depends on device model (refer to data sheet)

Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.

Numeric input is always rounded to the nearest possible sweep time. For rotary knob or UPARROW/DNARROW key inputs, the sweep time is adjusted in steps either downwards or upwards.

The manual input mode of the sweep time is indicated by a green bullet next to the "SWT" display in the channel bar. If the selected sweep time is too short for the selected bandwidth and span, level measurement errors will occur due to a too short settling time for the resolution or video filters. In this case, the R&S FSV displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF or Power vs Time measurements.

SCPI command:

SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 224

[SENSe:]SWEep:TIME on page 224

### Full Span

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

SCPI command:

[SENSe:]FREQuency:SPAN:FULL on page 207

### 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.

#### 3.2.7.4 Softkeys of the Amplitude Menu for RF Measurements

The following table shows all softkeys available in the "Amplitude" menu of the TD-SCDMA BTS and UE measurement application for RF measurements except for Power vs Time measurements. The softkeys in the "Amplitude" menu for CDA and Power vs Time measurements are described in [chapter 3.1.1.3, "Softkeys of the Amplitude Menu"](#), on page 39.

Ref Level.....	88
Range.....	88
L Range Log 100 dB.....	88
L Range Log 50 dB.....	88
L Range Log 10 dB.....	88
L Range Log 5 dB.....	89
L Range Log 1 dB.....	89
L Range Log Manual.....	89
L Range Linear %.....	89
L Range Lin. Unit.....	89
Preamp On/Off (option RF Preamplifier, B22/B24).....	90
RF Atten Manual/Mech Att Manual.....	90
RF Atten Auto/Mech Att Auto.....	90
EI Atten On/Off.....	90
EI Atten Mode (Auto/Man).....	91
Ref Level Offset.....	91

Ref Level Position.....	91
Grid Abs/Rel .....	91
Input (AC/DC).....	92

### Ref Level

Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dB $\mu$ V, etc).

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

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVEL` on page 178

### Range

Opens a submenu to define the level display range.

This softkey and its submenu are available for RF measurements except for Power vs Time measurements.

#### Range Log 100 dB ← Range

Sets the level display range to 100 dB.

SCPI command:

`DISP:WIND:TRAC:Y:SPAC LOG`

(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 180.)

`DISP:WIND:TRAC:Y 100DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 176).

#### Range Log 50 dB ← Range

Sets the level display range to 50 dB.

SCPI command:

`DISP:WIND:TRAC:Y:SPAC LOG`

(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 180.)

`DISP:WIND:TRAC:Y 50DB`

Sets the level display range to 50 dB (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 176).

#### Range Log 10 dB ← Range

Sets the level display range to 10 dB.

SCPI command:

`DISP:WIND:TRAC:Y:SPAC LOG`

(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 180.)

`DISP:WIND:TRAC:Y 10DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 176).



**Range Log 5 dB ← Range**

Sets the level display range to 5 dB.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

DISP:WIND:TRAC:Y 5DB (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALE\]](#) on page 176).

**Range Log 1 dB ← Range**

Sets the level display range to 1 dB.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

DISP:WIND:TRAC:Y 1DB (see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALE\]](#) on page 176).

**Range Log Manual ← Range**

Opens an edit dialog box to enter a value for logarithmic scaling for the level display range.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180.)

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALE\]](#) on page 176

**Range Linear % ← Range**

Selects linear scaling in % for the level display range, i.e. the horizontal grid lines are labeled in %. The grid is divided in decadal steps.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in % referenced to the voltage value at the position of marker 1. This is the default setting for linear scaling.

SCPI command:

DISP:TRAC:Y:SPAC LIN, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180

**Range Lin. Unit ← Range**

Selects linear scaling in dB for the level display range, i.e. the horizontal lines are labeled in dB.

Markers are displayed in the selected unit ("Unit" softkey). Delta markers are displayed in dB referenced to the power value at the position of marker 1.

SCPI command:

DISP:TRAC:Y:SPAC LDB, see [DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180

**Preamp On/Off (option RF Preamplifier, B22/B24)**

Switches the preamplifier on or off.

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

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

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

SCPI command:

`INPut:GAIN:STATe` on page 237

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

This function is not available for 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!

SCPI command:

`INPut:ATTenuation` on page 232

**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).

SCPI command:

`INPut:ATTenuation:AUTO` on page 233

**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.

SCPI command:

[INPut:EATT:AUTO](#) on page 237

### **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.

SCPI command:

[INPut:EATT:AUTO](#) on page 237

[INPut:EATT](#) on page 236

### **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.

SCPI command:

[DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALE\]:RLEVEL:OFFSet](#) on page 179

### **Ref Level Position**

Opens an edit dialog box to enter the reference level position, i.e. the position of the maximum AD converter value on the level axis. The setting range is from -200 to +200 %, 0 % corresponding to the lower and 100 % to the upper limit of the diagram.

Only available for RF measurements except for Power vs Time measurements.

### **Grid Abs/Rel**

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

Only available for RF measurements except for Power vs Time measurements.

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

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 178

### Input (AC/DC)

Toggles the RF input of the R&S FSV 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).

SCPI command:

`INPut:COUPling` on page 233

### 3.2.7.5 Softkeys of the Bandwidth Menu

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



For Spurious Emission Measurements, the settings are defined in the "Sweep List" dialog, see the description in the base unit.

Res BW Manual.....	93
Res BW Auto.....	93
Video BW Manual.....	93
Video BW Auto.....	94
Sweeptime Manual.....	94
Sweeptime Auto.....	95
Sweep Type.....	95
L Sweep.....	95
L FFT.....	95
L Auto.....	96
L FFT Filter Mode.....	96
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L RBW/VBW Sine [1/1].....	96
L RBW/VBW Pulse [1].....	96
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L RBW/VBW Manual.....	97
L Span/RBW Auto [100].....	97
L Span/RBW Manual.....	97
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Filter Type.....	98
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### 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 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106.

Numeric input is always rounded to the nearest possible bandwidth. For rotary knob or UP/DNARROW key inputs, the bandwidth is adjusted in steps either upwards or downwards.

The manual input mode of the resolution bandwidth is indicated by a green bullet next to the "RBW" display in the channel bar.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF. It is also available for Power vs Time measurements.

SCPI command:

`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 202

`[SENSe:]BANDwidth|BWIDth[:RESolution]` on page 202

### Res BW Auto

Couples the resolution bandwidth to the selected span (for span > 0). If the span is changed, the resolution bandwidth is automatically adjusted.

This setting is recommended, if a favorable setting of the resolution bandwidth in relation to the selected span is desired.

This softkey is available for measuring the Adjacent Channel Power, the Occupied Bandwidth and the CCDF. It is also available for Power vs Time measurements.

SCPI command:

`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 202

### 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 3.3.1, "Detector Overview"](#), on page 103.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth. It is also available for Power vs Time measurements.

SCPI command:

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 204

[SENSe:]BANDwidth|BWIDth:VIDeo on page 204

### Video BW Auto

Couples the video bandwidth to the resolution bandwidth. If the resolution bandwidth is changed, the video bandwidth is automatically adjusted.

This setting is recommended, if a minimum sweep time is required for a selected resolution bandwidth. Narrow video bandwidths require longer sweep times due to the longer settling time. Wide bandwidths reduce the signal/noise ratio.

This softkey is available for measuring the Adjacent Channel Power, the Spectrum Emission Mask and the Occupied Bandwidth. It is also available for Power vs Time measurements.

SCPI command:

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 204

### 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 displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF or Power vs Time measurements.

SCPI command:

SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 224

[SENSe:]SWEep:TIME on page 224

**Sweptime Auto**

Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If the span, resolution bandwidth or video bandwidth is changed, the sweep time is automatically adjusted.

The R&S FSV always selects the shortest sweep time that is possible without falsifying the signal. The maximum level error is < 0.1 dB, compared to using a longer sweep time.

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

SCPI command:

[SENSe:] SWEep:TIME:AUTO on page 224

**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 95
- "FFT" on page 95 (not available with 5-Pole filters, channel filters or RRC filters, see [chapter 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106)
- "Auto" on page 96

**Sweep ← Sweep Type**

Sets the [Sweep Type](#) to standard analog frequency sweep.

In the standard sweep mode, the local oscillator is set to provide the spectrum quasi analog from the start to the stop frequency.

SCPI command:

SWE:TYPE SWE, see [SENSe:] SWEep:TYPE on page 224

**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, or the Quasi peak detector. 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.

SCPI command:

SWE:TYPE FFT, see [SENSe:] SWEep:TYPE on page 224

**Auto ← Sweep Type**

Automatically sets the fastest available [Sweep Type](#) for the current measurement. Auto mode is set by default.

SCPI command:

`SWE:TYPE AUTO`, see [\[SENSe:\]SWEep:TYPE](#) on page 224

**FFT Filter Mode ← Sweep Type**

Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

**Auto ← FFT Filter Mode ← Sweep Type**

The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

SCPI command:

[\[SENSe:\]BANDwidth|BWIDth\[:RESolution\]:FFT](#) on page 203

**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.

SCPI command:

[\[SENSe:\]BANDwidth|BWIDth\[:RESolution\]:FFT](#) on page 203

**Coupling Ratio**

Opens a submenu to select the coupling ratios for functions coupled to the bandwidth.

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

**RBW/VBW Sine [1/1] ← Coupling Ratio**

Sets the following coupling ratio:

"video bandwidth = resolution bandwidth"

This is the default setting for the coupling ratio resolution bandwidth/video bandwidth.

This is the coupling ratio recommended if sinusoidal signals are to be measured.

This setting is only effective for [Video BW Auto](#).

SCPI command:

`BAND:VID:RAT 1`, see [\[SENSe:\]BANDwidth|BWIDth:VIDeo:RATio](#) on page 204

**RBW/VBW Pulse [.1] ← Coupling Ratio**

Sets the following coupling ratio:

"video bandwidth = 10 × resolution bandwidth or"

"video bandwidth = 10 MHz (= max. VBW)."

This coupling ratio is recommended whenever the amplitudes of pulsed signals are to be measured correctly. The IF filter is exclusively responsible for pulse shaping. No additional evaluation is performed by the video filter.



This setting is only effective for [Video BW Auto](#).

SCPI command:

BAND:VID:RAT 10, see [\[SENSe:\]BANDwidth|BWIDth:VIDeo:RATio](#)  
on page 204

#### **RBW/VBW Noise [10] ← Coupling Ratio**

Sets the following coupling ratio:

"video bandwidth = resolution bandwidth/10"

At this coupling ratio, noise and pulsed signals are suppressed in the video domain. For noise signals, the average value is displayed.

This setting is only effective for the [Video BW Auto](#) selection in the main menu.

SCPI command:

BAND:VID:RAT 0.1, see [\[SENSe:\]BANDwidth|BWIDth:VIDeo:RATio](#)  
on page 204

#### **RBW/VBW Manual ← Coupling Ratio**

Activates the manual input of the coupling ratio.

The resolution bandwidth/video bandwidth ratio can be set in the range 0.001 to 1000.

This setting is only effective for the [Video BW Auto](#) selection in the main menu.

SCPI command:

BAND:VID:RAT 10, see [\[SENSe:\]BANDwidth|BWIDth:VIDeo:RATio](#)  
on page 204

#### **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.

This setting is only effective for the [Res BW Auto](#) selection in the main menu.

SCPI command:

BAND:VID:RAT 0.001, see [\[SENSe:\]BANDwidth|BWIDth:VIDeo:RATio](#)  
on page 204

#### **Span/RBW Manual ← Coupling Ratio**

Activates the manual input of the coupling ratio.

This setting is only effective for the [Res BW Auto](#) selection in the main menu.

The span/resolution bandwidth ratio can be set in the range 1 to 10000.

SCPI command:

BAND:VID:RAT 0.1, see [\[SENSe:\]BANDwidth|BWIDth:VIDeo:RATio](#)  
on page 204

#### **Default Coupling ← Coupling Ratio**

Sets all coupled functions to the default state ("AUTO"). In addition, the ratio "RBW/VBW" is set to "SINE [1/1]" and the ratio "SPAN/RBW" to 100.

This softkey is available for Power vs Time measurements.

SCPI command:

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO on page 202

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 204

[SENSe:]SWEep:TIME:AUTO on page 224

### 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 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106 and [chapter 3.3.4, "List of Available RRC and Channel Filters"](#), on page 107.

SCPI command:

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE on page 203

### 3.2.7.6 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.....	99
Single Sweep.....	99
Continue Single Sweep.....	99
Sweptime Manual.....	99
Sweptime Auto.....	100
Sweep Type.....	100
L Sweep.....	100
L FFT.....	100
L Auto.....	101
L FFT Filter Mode.....	101
L Auto.....	101
L Narrow.....	101
Sweep Count.....	101
Sweep Points.....	101

**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 44).

SCPI command:

INIT:CONT ON, see INITiate<n>:CONTinuous on page 243

**Single Sweep**

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

SCPI command:

INIT:CONT OFF, see INITiate<n>:CONTinuous on page 243

**Continue Single Sweep**

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

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

SCPI command:

INITiate<n>:CONMeas on page 242

**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 displays the error message "UNCAL" and marks the indicated sweep time with a red bullet.

This softkey is available for RF measurements, but not for CCDF or Power vs Time measurements.

SCPI command:

`SWE:TIME:AUTO OFF`, see [\[SENSe:\]SWEep:TIME:AUTO](#) on page 224

[\[SENSe:\]SWEep:TIME](#) on page 224

### Sweeptime Auto

Couples the sweep time to the span, video bandwidth (VBW) and resolution bandwidth (RBW) (not available for zero span). If the span, resolution bandwidth or video bandwidth is changed, the sweep time is automatically adjusted.

The R&S FSV always selects the shortest sweep time that is possible without falsifying the signal. The maximum level error is < 0.1 dB, compared to using a longer sweep time.

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

SCPI command:

[\[SENSe:\]SWEep:TIME:AUTO](#) on page 224

### 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 95
- "FFT" on page 95 (not available with 5-Pole filters, channel filters or RRC filters, see [chapter 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106)
- "Auto" on page 96

### Sweep ← Sweep Type

Sets the [Sweep Type](#) to standard analog frequency sweep.

In the standard sweep mode, the local oscillator is set to provide the spectrum quasi analog from the start to the stop frequency.

SCPI command:

`SWE:TYPE SWE`, see [\[SENSe:\]SWEep:TYPE](#) on page 224

### 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, or the Quasi peak detector. 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.

SCPI command:

SWE:TYPE FFT, see [SENSe:]SWEep:TYPE on page 224

#### **Auto ← Sweep Type**

Automatically sets the fastest available **Sweep Type** for the current measurement. Auto mode is set by default.

SCPI command:

SWE:TYPE AUTO, see [SENSe:]SWEep:TYPE on page 224

#### **FFT Filter Mode ← Sweep Type**

Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

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

The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

SCPI command:

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT on page 203

#### **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.

SCPI command:

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT on page 203

#### **Sweep Count**

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

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

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

SCPI command:

[SENSe:]SWEep:COUNT on page 219

#### **Sweep Points**

Opens an edit dialog box to enter the number of measured values to be collected during one sweep.

- Entry via rotary knob:
  - In the range from 101 to 1001, the sweep points are increased or decreased in steps of 100 points.

- In the range from 1001 to 32001, the sweep points are increased or decreased in steps of 1000 points.
- Entry via keypad:  
All values in the defined range can be set.

The default value is 691 sweep points.

This softkey is available for RF measurements.

SCPI command:

[\[SENSe:\] SWEEp: POINts](#) on page 223

### 3.2.7.7 Softkeys of the Input/Output Menu for RF Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for RF measurements. For CDA measurements, see [chapter 3.1.1.8, "Softkeys of the Input/Output Menu for CDA Measurements"](#), on page 47.

<a href="#">Input (AC/DC)</a> .....	102
<a href="#">Noise Source</a> .....	102
<a href="#">Video Output</a> .....	102
<a href="#">Power Sensor</a> .....	102
<a href="#">Trigger Out</a> .....	103

#### Input (AC/DC)

Toggles the RF input of the R&S FSV 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).

SCPI command:

[INPut:COUPling](#) on page 233

#### Noise Source

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

SCPI command:

[DIAGnostic<n>:SERVice:NSOurce](#) on page 242

#### Video Output

Sends a video output signal according to the measured level to the connector on the rear panel of the R&S FSV.

**Note:** Video output does not return valid values in IQ or FFT mode.

SCPI command:

[OUTPut:IF VID](#) , see [OUTPut:IF\[:SOURce\]](#) on page 245

#### 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 option Power Sensor (R&S FSV-K9) is installed.

For details see the chapter "Instrument Functions Power Sensor (K9)" in the base unit description.

This softkey is available for RF measurements.

#### Trigger Out

Sets the Trigger Out port in the Additional Interfaces (option R&S FSV-B5 only) to low or high. Thus, you can trigger an additional device via the external trigger port, for example.

This softkey is available for RF measurements.

SCPI command:

[OUTPut:TRIGger](#) on page 245

## 3.3 Further Information

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### 3.3.1 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. 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 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 3-1: Detector types**

Detector	Indicator	Function
Auto Peak	Ap	Determines the maximum and the minimum value within a measurement point (not available for SEM)
Positive Peak	Pk	Determines the maximum value within a measurement point
Negative Peak (min peak)	Mi	Determines the minimum value within a measurement point
RMS	Rm	Determines the root mean square power within a measurement point
Average	Av	Determines the linear average power within a measurement point
Sample	Sa	Selects the last value within a measurement point
Quasi Peak	QP	Determines the quasipeak power within a measurement point for EMI measurements (not available for SEM)

The result obtained from the selected detector within a measurement point is displayed as the power value at this measurement point.

All detectors work in parallel in the background, which means that the measurement speed is independent of the detector combination used for different traces.



#### Number of measured values

During a frequency sweep, the R&S FSV 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.



### 3.3.2 Trace Mode Overview

The traces can be activated individually for a measurement or frozen after completion of a measurement. Traces that are not activated are hidden. Each time the trace mode is changed, the selected trace memory is cleared.

The R&S FSV offers 6 different trace modes:

#### Clear Write

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

All available detectors can be selected.

SCPI command:

DISP:TRAC:MODE WRIT, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 175

#### Max Hold

The maximum value is determined over several sweeps and displayed. The R&S FSV saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

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

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MAXH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 175

#### Min Hold

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

The detector is automatically set to "Negative Peak".

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

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MINH, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#)  
on page 175

#### 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 3.3.1, "Detector Overview"](#), on page 103).


This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE AVER, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 175

#### 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 automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

SCPI command:

DISP:TRAC:MODE VIEW, see [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 175

#### Blank

Hides the selected trace.

SCPI command:

DISP:TRAC OFF, see [DISPlay\[:WINDow<n>\]:TRACe<t>\[:STATe\]](#) on page 176

### 3.3.3 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 3.3.4, "List of Available RRC and Channel Filters"](#), on page 107 .  
Channel filters do not support FFT mode.
- RRC filters

For details see [chapter 3.3.4, "List of Available RRC and Channel Filters"](#), on page 107 .

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.

### 3.3.4 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 ( $\alpha$ ) is also indicated.

**Table 3-2: Filter types**

Filter Bandwidth	Filter Type	Application
100 Hz	CFILter	
200 Hz	CFILter	A0
300 Hz	CFILter	
500 Hz	CFILter	
1 kHz	CFILter	
1.5 kHz	CFILter	
2 kHz	CFILter	
2.4 kHz	CFILter	SSB
2.7 kHz	CFILter	
3 kHz	CFILter	
3.4 kHz	CFILter	
4 kHz	CFILter	DAB, Satellite
4.5 kHz	CFILter	
5 kHz	CFILter	
6 kHz	CFILter	
6 kHz, $\alpha=0.2$	RRC	APCO
8.5 kHz	CFILter	ETS300 113 (12.5 kHz channels)
9 kHz	CFILter	AM Radio
10 kHz	CFILter	
12.5 kHz	CFILter	CDMAone
14 kHz	CFILter	ETS300 113 (20 kHz channels)

Filter Bandwidth	Filter Type	Application
15 kHz	CFILter	
16 kHz	CFILter	ETS300 113 (25 kHz channels)
18 kHz, $\alpha=0.35$	RRC	TETRA
20 kHz	CFILter	
21 kHz	CFILter	PDC
24.3 kHz, $\alpha=0.35$	RRC	IS 136
25 kHz	CFILter	
30 kHz	CFILter	CDPD, CDMAone
50 kHz	CFILter	
100 kHz	CFILter	
150 kHz	CFILter	FM Radio
192 kHz	CFILter	PHS
200 kHz	CFILter	
300 kHz	CFILter	
500 kHz	CFILter	J.83 (8-VSB DVB, USA)
1 MHz	CFILter	CDMAone
1.228 MHz	CFILter	CDMAone
1.28 MHz, $\alpha=0.22$	RRC	
1.5 MHz	CFILter	DAB
2 MHz	CFILter	
3 MHz	CFILter	
3.75 MHz	CFILter	
3.84 MHz, $\alpha=0.22$	RRC	W-CDMA 3GPP
4.096 MHz, $\alpha=0.22$	RRC	W-CDMA NTT DOCoMo
5 MHz	CFILter	
20 MHz	CFILter	
28 MHz	CFILter	
40 MHz	CFILter	

### 3.3.5 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 67.

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 symmetrical. 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 70.

Symmetrical ranges fulfill the conditions required for "Fast SEM" mode (see [chapter 3.3.9, "Fast Spectrum Emission Mask Measurements"](#), on page 119).

### 3.3.6 ASCII File Export Format

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

File contents: header and data section	Description
Type;FSV;	Instrument model
Version;1.50;	Firmware version
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display
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

File contents: header and data section	Description
Values;592;	Number of results
<values>	List of results

### 3.3.7 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 can only interpret XML files of a known structure. For example files look in the C:\r\_s\instr\sem\_std directory.

Spectrum Emission Mask							Standard: W-CDMA 3GPP (39,43)dBm DL		
Tx Power		-47.93 dBm	Tx Bandwidth		3.840 MHz	RBW		30.000 kHz	
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit			
-12.750 MHz	-8.000 MHz	1.000 MHz	14.99094 GHz*	-74.76 dBm*	-26.83 dB*	27.67 dB*			
-8.000 MHz	-4.000 MHz	1.000 MHz	14.99598 GHz	-36.79 dBm	11.14 dB	-25.29 dB			
-4.000 MHz	-3.515 MHz	30.000 kHz	14.99628 GHz	-100.18 dBm	-52.25 dB	-75.68 dB			
-3.515 MHz	-2.715 MHz	30.000 kHz	14.99648 GHz	-103.55 dBm	-55.63 dB	-79.05 dB			
-2.715 MHz	-2.515 MHz	30.000 kHz	14.99747 GHz	-108.91 dBm	-60.98 dB	-96.41 dB			
2.515 MHz	2.715 MHz	30.000 kHz	15.00251 GHz	-48.25 dBm	-0.32 dB	-35.75 dB			
2.715 MHz	3.515 MHz	30.000 kHz	15.00272 GHz	-52.48 dBm	-4.56 dB	-39.98 dB			
3.515 MHz	4.000 MHz	30.000 kHz	15.00398 GHz	-74.53 dBm	-26.60 dB	-50.03 dB			
4.000 MHz	8.000 MHz	1.000 MHz	15.00769 GHz	-74.76 dBm	-26.83 dB	-63.26 dB			
8.000 MHz	12.750 MHz	1.000 MHz	15.01273 GHz*	-36.79 dBm*	11.14 dB*	65.64 dB*			

Fig. 3-2: 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 is not able to interpret the XML file and error messages are shown on the screen. Therefore, we recommend you make a copy of an existing file (see "Save as Standard" softkey, "Save As Standard" on page 74) 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 3-3.

In the example above (PowerClass\_39\_43.xml under C:\r\_s\instr\sem\_std\WCDMA\3GPP, see [figure 3-2](#)), 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 67) and the corresponding parameter description. The child nodes and attributes of this element are shown in [table 3-4](#).

### 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 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 67) and the corresponding parameter description. The child nodes and attributes of this element are shown in [table 3-5](#).

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 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 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 3-4 -->
<!-- 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 3-5 -->
<!-- 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 3-3: 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<br>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  <br>None |                         | Yes   |
|                       | ShortName                                      | DL   UL                     |                         | No    |
| Reference-<br>Power   |                                                |                             |                         | Yes   |
| Method                | TX Channel Power  <br>TX Channel Peak<br>Power |                             |                         | Yes   |
| Reference-<br>Channel | <string>                                       |                             |                         | No    |

**Table 3-4: 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  <br>Absolute and Relative  <br>Absolute or Relative |                                                                                                                              | Yes   |

Table 3-5: Attributes and child nodes of the Range element (normal ranges)

| Child Node      | Attribute  | Value                                                              | Parameter Description                                                                                                                                            | Mand.                                                                                  |
|-----------------|------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|                 | Index      | 0...19                                                             | Indexes 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                                                                                    |
| 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 68                                                                                                                                                 | Yes                                                                                    |
|                 | Type       | NORM   PULS   CFIL   RRC                                           |                                                                                                                                                                  | No                                                                                     |
| VBW             | Bandwidth  | <bandwidth in Hz>                                                  | "VBW" on page 68                                                                                                                                                 | Yes                                                                                    |

| Child Node     | Attribute | Value                                      | Parameter Description                             | Mand.                                                 |
|----------------|-----------|--------------------------------------------|---------------------------------------------------|-------------------------------------------------------|
| Detector       |           | NEG   POS   SAMP<br>  RMS   AVER  <br>QUAS | If used, it has to be identical<br>in all ranges. | No                                                    |
| Sweep          | Mode      | Manual   Auto                              | "Sweep Time<br>Mode" on page 68                   | Yes                                                   |
|                | Time      | <time in sec>                              | "Sweep Time" on page 68                           | No                                                    |
| Amplitude      |           |                                            |                                                   | No                                                    |
| ReferenceLevel | Value     | <power in dBm>                             | "Ref. Level" on page 68                           | Yes, if the Refer-<br>enceLevel child<br>node is used |
|                | Unit      | dBm                                        | Defines dBm as unit                               | Yes, if the Refer-<br>enceLevel node<br>is used       |
| RFAttenuation  | Mode      | Manual   Auto                              | "RF Att. Mode" on page 68                         | Yes, if the Refer-<br>enceLevel child<br>node is used |
| Preamplifier   |           | ON   OFF                                   | "Preamp" on page 69                               | Yes                                                   |

### 3.3.8 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 3-6](#). You can also create and use your own XML files (for details see [chapter 3.3.7, "Format Description of Spectrum Emission Mask XML Files"](#), on page 111). 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 74).

**Table 3-6: 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             |

| Path                                                                            | XML file name                 | Displayed standard characteristics* |
|---------------------------------------------------------------------------------|-------------------------------|-------------------------------------|
|                                                                                 | 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                         |
| 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                 |

| Path                    | XML file name                 | Displayed standard characteristics* |
|-------------------------|-------------------------------|-------------------------------------|
| 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                 |
| 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

### 3.3.9 Fast Spectrum Emission Mask Measurements

In order to improve the performance of the R&S FSV for spectrum emission mask measurements, a "Fast SEM" mode is available. If this mode is activated, several consecutive ranges with identical sweep settings are combined to one sweep internally, which makes the measurement considerably more efficient. The displayed results remain unchanged and still consist of several ranges. Thus, measurement settings that apply only to the results, such as limits or transducer factors, can nevertheless be defined individually for each range.

#### Prerequisites

"Fast SEM" mode is available if the following criteria apply:

- The frequency ranges are consecutive, without frequency gaps
- The following sweep settings are identical:
  - "Filter Type", see ["Filter Type"](#) on page 68
  - "RBW", see ["RBW"](#) on page 68
  - "VBW", see ["VBW"](#) on page 68
  - "Sweep Time Mode", see ["Sweep Time Mode"](#) on page 68
  - "Ref Level", see ["Ref. Level"](#) on page 68
  - "Rf Att. Mode", see ["RF Att. Mode"](#) on page 68
  - "RF Attenuator", see ["RF Att. Mode"](#) on page 68
  - "Preamp", see ["Preamp"](#) on page 69

#### Activating Fast SEM mode

"Fast SEM" mode is activated in the sweep list (see ["Fast SEM"](#) on page 67) 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 192

#### 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 70).

---

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   |

Fig. 3-3: Sweep list using Fast SEM mode

In figure 3-3, a sweep list is shown for which Fast SEM is activated. The formerly 5 separately defined ranges are combined to 2 sweep ranges internally.

**3.3.10 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         |



| Standard                     | GUI-Parameter          | SCPI-Parameter |
|------------------------------|------------------------|----------------|
| W-CDMA 3.84 MHz forward      | W-CDMA 3GPP FWD        | FW3G           |
| W-CDMA 3.84 MHz reverse      | W-CDMA 3GPP REV        | RW3G           |
| 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           |



For the R&S FSV, 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 if the standards marked with an asterisk \*) are selected.

### 3.3.11 Optimized Settings for CP/ACLR Test Parameters

The "Adjust Settings" softkey (see ["Adjust Settings"](#) on page 64) 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 38).

## 4 Remote Control Commands

This chapter describes the remote commands specific to the TD-SCDMA Analysis option (R&S FSV-K76/K77). The abbreviation TDS stands for the operating mode of this option. For details on conventions used in this chapter refer to [chapter 4.1, "Notation"](#), on page 125.

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 4.2, "CALCulate Subsystem"](#), on page 127)
- FORMat subsystem
- INITiate subsystem
- INPut subsystem
- MMEM subsystem
- OUTput subsystem
- SENSE subsystem (except for the specific commands described in [chapter 4.6, "SENSe Subsystem"](#), on page 181)
- TRIGger subsystem

|            |                                                                                            |            |
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## 4.1 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)                   |
| ADEMODO      | 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.

## 4.2 CALCulate Subsystem

The CALCulate subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquisition, i.e. following the SENSE subsystem.

Note that most commands in the CALCulate subsystem are identical to the base unit; only the commands specific to this option are described here.

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## 4.2.1 CALCulate:FEED Commands

---

**CALCulate<n>:FEED** <result display>

This command selects the result display for the code domain analyzer.

**Suffix:**

|     |        |
|-----|--------|
| <n> | 1...4  |
|     | window |



**Parameters:**

&lt;result display&gt;

**'XPOW:CDP'**

Code Domain Power result display (absolute)

**'XPOW:CDP:RAT'**

Code Domain Power result display (relative)

**'XPOW:CDEP'**

Code Domain Error Power result display

**'XTIME:CDPower:BSTream'**

Channel Bitstream result display

**'XTIME:CDPower:COMPOSITE:CONST'**

Composite Constellation result display

**'XTIME:CDPower:COMPOSITE:EVM'**

Composite EVM result display

**'XTIME:CDPower:ERROR:CTABLE'**

Channel Table result display

**'XTIME:CDPower:ERROR:PCDomain'**

Peak Code Domain Error result display

**'XTIME:CDPower:ERROR:SUMMARY'**

Result Summary result display

**'XTIME:CDPower:MACCuracy'**

Composite EVM result display

**'XTIME:CDPower:PVSLOT'**

Channel Power vs Slot result display (absolute)

**'XTIME:CDPower:PVSLOT:RATIO'**

Channel Power vs Slot result display (relative)

**'XTIME:CDPower:PVSymbol'**

Power vs Symbol result display

**'XTIME:CDPower:SYMBOL:CONST'**

Channel Constellation result display

**'XTIME:CDPower:SYMBOL:EVM'**

EVM vs Symbol result display

\*RST: 'XPOW:CDP:RAT'

**Example:**

CALC2:FEED 'XTIME:CDP:MACC

Starts the Composite EVM result display in window 2.

**Mode:**

TDS

**4.2.2 CALCulate:MARKer:FUNCTion Commands**

This chapter describes commands of the CALCulate:MARKer subsystem that are specific to the measurement application.

|                                                        |     |
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---

**CALCulate<n>:MARKer:FUNction:CDPower[:BTS]:RESult? <ResultType>**

This command queries the results of the code domain measurement. Refer to the [Code Domain Analysis](#) result display for a detailed description of all results.

**Suffix:**

<n>                    1...4  
                         window

**Query parameters:**

&lt;ResultType&gt;

ACTive |  
 ARCD CDPabsolute CDPRelative CHANnel CERror EVMPeak  
 EVMRMS IQIMbalance IQOffset MACCuracy PCDerror PCDer-  
 ror PD1 PD2 PDATa PMIDamble RHO SFACtor SLOT SRATe  
 TFRame

**ACTive**

Returns the number of active channels.

**ARCD**

Returns the Average Relative Code Domain Error.

**CDPabsolute**

Returns the absolute channel power in dBm.

**CDPRelative**

Returns the relative channel power in dB.

**CHANnel**

Returns the current channel number.

**CERror**

Returns the Chip Rate Error in ppm.

**EVMPeak**

Returns the maximum Error Vector Magnitude of the selected channel.

**EVMRMS**

Returns the average Error Vector Magnitude of the selected channel.

**IQIMbalance**

Returns the IQ Imbalance in %.

**IQOffset**

Returns the IQ Offset in %.

**MACCuracy**

Returns the Composite EVM in %.

**PCDerror**

Returns the Peak Code Domain Error dB.

**PD1**

Returns the power of the slot's data part 1 in dBm.

**PD2**

Returns the power of the slot's data part 2 in dBm.

**PDATa**

Returns the average power of the data parts in dBm.

**PMIDamble**

Returns the power of the midamble in dBm.

**RHO**

Returns the parameter Rho.

**SFACtor**

Returns the spreading factor of the channel.

**SLOT**

Returns the currently analyzed slot number.

#### SRATe

Returns the symbol rate in kbps.

Note that TFRame returns a '9' if the trigger is at Free Run.

#### TFRame

Returns the Trigger to Frame time in seconds.

#### Example:

```
CALC:MARK:FUNC:CDP:RES? CERR
```

Returns the Chip Rate Error

#### Usage:

Query only

#### Mode:

TDS

### CALCulate<n>:MARKer<m>:FUNCTion:POWer:MODE <Mode>

This commands defines the method by which the channel power values are calculated from the current trace in the window specified by the suffix <n>.

#### Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m>

marker number

#### Parameters:

<Mode>

WRITe | MAXHold

#### WRITe

The channel power and the adjacent channel powers are calculated directly from the current trace

#### MAXHold

The power values are calculated from the current trace and compared with the previous power value using a maximum algorithm.

#### Example:

```
CALC:MARK:FUNC:POW:MODE MAXH
```

Sets the Maxhold channel power mode.

#### Mode:

A-F, CDMA, EVDO, TDS, WCDMA

### CALCulate<n>:MARKer<m>:FUNCTion:POWer:RESult? <ResultType>

This command queries the result of the performed power measurement in the window specified by the suffix <n>. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the SENSE:POWer subsystem.

To obtain a correct result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single sweep mode.

|                    |                                                                                                                                                                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                                                                                                                                                                                                                 |
| <n>                | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.                                                                                                                                                                                         |
| <m>                | marker number                                                                                                                                                                                                                                                                                   |
| <b>Parameters:</b> |                                                                                                                                                                                                                                                                                                 |
| <ResultType>       | ACPower   CPOWer                                                                                                                                                                                                                                                                                |
|                    | <b>ACPower</b>                                                                                                                                                                                                                                                                                  |
|                    | 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 <code>[SENSe:]POWer:ACHannel:ACPairs</code> .                                                                                                                                         |
|                    | 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 <code>[SENSe:]POWer:ACHannel:MODE</code> is set to "REL", the adjacent/alternate-channel power is output in dB. |
|                    | <b>CPOWer</b>                                                                                                                                                                                                                                                                                   |
|                    | 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.                                                                                                          |
| <b>Mode:</b>       | A-F, CDMA, EVDO, TDS, WCDMA                                                                                                                                                                                                                                                                     |

---

#### **CALCulate<n>:MARKer<m>:FUNction:POWer:RESult:PHZ <State>**

This command switches the query response of the power measurement results in the window specified by the suffix <n> between output of absolute values and output referred to the measurement bandwidth.

The measurement results are output with the `CALCulate<n>:MARKer<m>:FUNction:POWer:RESult` command.

|                |                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b> |                                                                                                         |
| <n>            | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |

<m> marker number

**Parameters:**

<State> ON | OFF  
**ON**  
 Results output: channel power density in dBm/Hz  
**OFF**  
 Results output: channel power is displayed in dBm  
 \*RST: OFF

**Example:**

CALC:MARK:FUNC:POW:RES:PHZ ON  
 Output of results referred to the channel bandwidth.  
 For details on a complete measurement example refer to  
[CALCulate<n>:MARKer<m>:FUNctIon:POWer:RESult](#)  
 on page 132.

**Mode:** A-F, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:MARKer<m>:FUNctIon:POWer:SElect <MeasType>**

This command selects – and switches on – the specified power measurement type in the window specified by the suffix <n>.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer` subsystem.

**Note:** If CPOWER is selected, the number of adjacent channels ( `[SENSe:]POWer:ACHannel:ACPairs`) is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.

The channel/adjacent-channel power measurement is performed for the trace selected with `[SENSe:]POWer:TRACe`.

The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of `CALCulate<n>:MARKer<m>:TRACe`.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Parameters:**

|            |                                                                                                                                                       |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <MeasType> | ACPower   CPOWer   MCACpower   OBANdwidth   OBWidth   CN   CNO                                                                                        |
|            | <b>ACPower</b><br>Adjacent-channel power measurement with a single carrier signal                                                                     |
|            | <b>CPOWer</b><br>Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with "NO. OF ADJ CHAN" = 0) |
|            | <b>MCACpower</b><br>Channel/adjacent-channel power measurement with several carrier signals                                                           |
|            | <b>OBANdwidth   OBWidth</b><br>Measurement of occupied bandwidth                                                                                      |
|            | <b>CN</b><br>Measurement of carrier-to-noise ratio                                                                                                    |
|            | <b>CNO</b><br>Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth                                                                      |

**Example:**

CALC:MARK:FUNC:POW:SEL ACP  
Switches on adjacent-channel power measurement.

**Mode:**

A-F, CDMA, EVDO, TDS, WCDMA

**4.2.3 Other CALCulate Commands Referenced in this Manual**

|         |                                             |     |
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**4.2.3.1 CALCulate:DELTamarker subsystem**

|                                                          |     |
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| CALCulate<n>:DELTamarker<m>:FUNction:FIXed:RPOint:X..... | 136 |
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|                                                 |     |
|-------------------------------------------------|-----|
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---

### CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed:RPOint:X <Reference>

For a measurement with a fixed reference value (see [CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed\[:STATe\]](#) on page 137), this command defines a new frequency reference (span > 0) or time (span = 0) for all delta markers in the window specified by the suffix <n>.

For phase-noise measurements (see [CALCulate<n>:DELTamarker<m>:FUNCTION:PNOise:AUTO](#) on page 137), the command defines a new frequency reference or time for delta marker 2.

#### Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

#### Parameters:

<Reference> **<numeric\_value>**  
 \*RST: ("CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed" is set to OFF)

**Example:** CALC:DELT:FUNC:FIX:RPO:X 128 MHz  
 Sets the frequency reference to 128 MHz.

**Mode:** A, ADEMOD, EVDO, TDS, WCDMA

---

### CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed:RPOint:Y <RefPointLevel>

For a measurement with a fixed reference point ( [CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed\[:STATe\]](#) ), this command defines a new reference point level for all delta markers in the window specified by the suffix <n>.

For phase-noise measurements ([CALCulate<n>:DELTamarker<m>:FUNCTION:PNOise\[:STATe\]](#) on page 138), the command defines a new reference point level for delta marker 2.

#### Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.



<m> marker number

**Parameters:**

<RefPointLevel> <numeric\_value>

\*RST: ("CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed" is set to OFF)

**Example:**

CALC:DELT:FUNC:FIX:RPO:Y -10dBm

Sets the reference point level for delta markers to -10 dBm.

**Mode:**

A, ADEMOD, EVDO, TDS, WCDMA

**CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed[:STATe] <State>**

This command switches the relative measurement to a fixed reference value on or off. Marker 1 is activated previously and a peak search is performed, if necessary. If marker 1 is activated, its position becomes the reference point for the measurement. The reference point can then be modified with the `CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed:RPOint:X` commands and `CALCulate<n>:DELTamarker<m>:FUNCTION:FIXed:RPOint:Y` independently of the position of marker 1 and of a trace. It applies to all delta markers in the window specified by the suffix <n> as long as the function is active.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Parameters:**

<State> ON | OFF

\*RST: OFF

**Example:**

CALC:DELT:FUNC:FIX ON

Switches on the measurement with fixed reference value for all delta markers.

CALC:DELT:FUNC:FIX:RPO:X 128 MHZ

Sets the frequency reference to 128 MHz.

CALC:DELT:FUNC:FIX:RPO:Y 30 DBM

Sets the reference level to +30 dBm.

**Mode:**

A, ADEMOD, EVDO, TDS, WCDMA

**CALCulate<n>:DELTamarker<m>:FUNCTION:PNOise:AUTO <State>**

This command activates an automatic peak search for the reference fixed marker 1 at the end of each particular sweep in the window specified by the suffix <n>.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> irrelevant

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:DELT:FUNC:PNO:AUTO ON

Activates an automatic peak search for the reference marker in a phase-noise measurement.

**Mode:**

A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM

**CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>**

This command switches on or off the phase-noise measurement with all active delta markers in the window specified by the suffix <n>. The correction values for the bandwidth and the log amplifier are taken into account in the measurement.

Marker 1 is activated, if necessary, and a peak search is performed. If marker 1 is activated, its position becomes the reference point for the measurement.

The reference point can then be modified with the `CALCulate<n>:`

`DELTamarker<m>:FUNCtion:FIXed:RPOint:X` and `CALCulate<n>:`

`DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` commands independently of the position of marker 1 and of a trace (the same commands used for the measurement with fixed reference point).

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> irrelevant

**Note:** marker 2 is always the deltamarker for phase noise measurement results.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:DELT:FUNC:PNO ON

Switches on the phase-noise measurement with all delta markers.

CALC:DELT:FUNC:FIX:RPO:X 128 MHZ

Sets the frequency reference to 128 MHz.

CALC:DELT:FUNC:FIX:RPO:Y 30 DBM

Sets the reference level to +30 dBm

**Mode:**

A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM

**CALCulate<n>:DELTamarker<m>:LINK <State>**

This command links delta marker 1 to marker 1. If you change the horizontal position of the marker, so does the delta marker.

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                         |
| <n>                | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <m>                | 1<br>irrelevant                                                                                         |
| <b>Parameters:</b> |                                                                                                         |
| <State>            | ON   OFF<br>*RST: OFF                                                                                   |
| <b>Example:</b>    | CALC:DELT:LINK ON                                                                                       |
| <b>Mode:</b>       | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM VSA                                                            |

#### CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command positions the delta marker to the next smaller maximum value to the left of the current value (i.e. descending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                               |
|-----------------|---------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                               |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.       |
| <m>             | marker number                                                                                                 |
| <b>Example:</b> | CALC:DELT:MAX:LEFT<br>Sets delta marker 1 to the next smaller maximum value to the left of the current value. |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA                                                                 |

#### CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command positions the delta marker to the next smaller maximum value on the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                         |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <m>             | marker number                                                                                           |
| <b>Example:</b> | CALC:DELT2:MAX:NEXT<br>Sets delta marker 2 to the next smaller maximum value.                           |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA                                                           |

**CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]**

This command positions the delta marker to the current maximum value on the measured curve in the window specified by the suffix <n>. If necessary, the corresponding delta marker is activated first.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:**

`CALC:DELT3:MAX`

Sets delta marker 3 to the maximum value of the associated trace.

**Mode:**

A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

**CALCulate<n>:DELTamarker<m>:MAXimum:RIGHT**

This command positions the delta marker to the next smaller maximum value to the right of the current value (i.e. ascending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:**

`CALC:DELT:MAX:RIGH`

Sets delta marker 1 to the next smaller maximum value to the right of the current value.

**Mode:**

A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

**CALCulate<n>:DELTamarker<m>:MINimum:LEFT**

This command positions the delta marker to the next higher minimum value to the left of the current value (i.e. descending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:** `CALC:DELT:MIN:LEFT`  
Sets delta marker 1 to the next higher minimum to the left of the current value.

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

#### **CALCulate<n>:DELTamarker<m>:MINimum:NEXT**

This command positions the delta marker to the next higher minimum value of the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:** `CALC:DELT2:MIN:NEXT`  
Sets delta marker 2 to the next higher minimum value.

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

#### **CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]**

This command positions the delta marker to the current minimum value on the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:** `CALC:DELT3:MIN`  
Sets delta marker 3 to the minimum value of the associated trace.

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

#### **CALCulate<n>:DELTamarker<m>:MINimum:RIGHT**

This command positions the delta marker to the next higher minimum value to the right of the current value (i.e. ascending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                                            |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                                            |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.                    |
| <m>             | marker number                                                                                                              |
| <b>Example:</b> | <code>CALC:DELT:MIN:RIGH</code><br>Sets delta marker 1 to the next higher minimum value to the right of the current value. |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA                                                                              |

#### **CALCulate<n>:DELTamarker<m>[:STATE] <State>**

This command defines the marker specified by the suffix <m> as a delta marker for the window specified by the suffix <n>. If the corresponding marker was not already active, it is activated and positioned on the maximum of the measurement curve.

If no suffix is given for DELTmarker, delta marker 1 is selected automatically.

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                         |
| <n>                | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <m>                | marker number                                                                                           |
| <b>Parameters:</b> |                                                                                                         |
| <State>            | ON   OFF<br>*RST: OFF                                                                                   |
| <b>Example:</b>    | <code>CALC:DELT1 ON</code><br>Switches marker 1 to delta marker mode.                                   |
| <b>Mode:</b>       | All                                                                                                     |

#### **CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>**

This command assigns the selected delta marker to the indicated trace in the window specified by the suffix <n>. The selected trace must be active, i.e. its state must be different from "BLANK".

|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                         |
| <n>                | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <m>                | marker number                                                                                           |
| <b>Parameters:</b> |                                                                                                         |
| <TraceNumber>      | <b>1 to 6</b><br>Selects trace 1 through 6.                                                             |
| <b>Example:</b>    | <code>CALC:DELT3:TRAC 2</code><br>Assigns delta marker 3 to trace 2.                                    |
| <b>Mode:</b>       | A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, SPECM, RT, VSA                                                  |

**CALCulate<n>:DELTamarker<m>:X <Position>**

This command positions the selected delta marker to the indicated value in the window specified by the suffix <n>. The input is in absolute values.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Parameters:**

<Position> 0 to maximum frequency or sweep time

**Example:**

`CALC:DELT:X?`

Outputs the absolute frequency/time of delta marker 1.

**Mode:**

A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, VSA

**CALCulate<n>:DELTamarker<m>:X:RELative**

This command queries the x-value of the selected delta marker relative to marker 1 or to the reference position (for `CALC:DELT:FUNC:FIX:STAT ON`) in the window specified by the suffix <n>. The command activates the corresponding delta marker, if necessary.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:**

`CALC:DELT3:X:REL?`

Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

**Mode:**

A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA

**CALCulate<n>:DELTamarker<m>:Y?**

This command queries the measured value of the selected delta marker in the specified window. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with `CALC:UNIT:POW` or on the activated measuring functions, the query result is output in the units below:

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

|                 |                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Example:</b> | <pre>INIT:CONT OFF Switches to single sweep mode. INIT;*WAI Starts a sweep and waits for its end. CALC:DELT2 ON Switches on delta marker 2. CALC:DELT2:Y? Outputs measurement value of delta marker 2.</pre> |
| <b>Usage:</b>   | Query only                                                                                                                                                                                                   |
| <b>Mode:</b>    | A, ADEMOD, BT, CDMA, EVDO, TDS, WCDMA, VSA                                                                                                                                                                   |

#### 4.2.3.2 CALCulate:LIMit subsystem

|                                                                        |     |
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| CALCulate<n>:LIMit<k>:ACPower[:STATe].....                             | 150 |
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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.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

**Parameters:**

<LowerLimit>, <UpperLimit> first value: -200DBM to 200DBM; limit for the lower and the upper adjacent channel

\*RST: -200DBM

**Example:**

```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```

Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

**Mode:** A, CDMA, EVDO, TDS, WCDMA



**CALCulate<n>:LIMit<k>: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> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

**Parameters:**

<State> ON | OFF

\*RST: OFF

**Example:**

```
CALC:LIM:ACP:ACH 30DB, 30DB
```

Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```

Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

```
CALC:LIM:ACP ON
```

Switches on globally the limit check for the channel/adjacent-channel measurement.

```
CALC:LIM:ACP:ACH:REL:STAT ON
```

Switches on the check of the relative limit values for adjacent channels.

```
CALC:LIM:ACP:ACH:ABS:STAT ON
```

Switches on the check of absolute limit values for the adjacent channels.

```
INIT;*WAI
```

Starts a new measurement and waits for the sweep end.

```
CALC:LIM:ACP:ACH:RES?
```

Queries the limit check result in the adjacent channels.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>: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> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

**Parameters:**

<LowerLimit>, <UpperLimit> 0 to 100dB; the value for the lower limit must be lower than the value for the upper limit

\*RST: 0 dB

**Example:**

```
CALC:LIM:ACP:ACH 30DB, 30DB
```

Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>: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> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

**Return values:**

Result The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Example:</b> | <pre>CALC:LIM:ACP:ACH 30DB, 30DB</pre> <p>Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.</p> <pre>CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM</pre> <p>Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dB.</p> <pre>CALC:LIM:ACP ON</pre> <p>Switches on globally the limit check for the channel/adjacent channel measurement.</p> <pre>CALC:LIM:ACP:ACH:STAT ON</pre> <p>Switches on the limit check for the adjacent channels.</p> <pre>INIT;*WAI</pre> <p>Starts a new measurement and waits for the sweep end.</p> <pre>CALC:LIM:ACP:ACH:RES?</pre> <p>Queries the limit check result in the adjacent channels.</p> |
| <b>Mode:</b>    | A, CDMA, EVDO, TDS, WLAN, WCDMA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

---

**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> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

**Parameters:**

<State> ON | OFF  
\*RST: OFF

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Example:</b> | <pre>CALC:LIM:ACP:ACH 30DB, 30DB</pre> <p>Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.</p> <pre>CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM</pre> <p>Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.</p> <pre>CALC:LIM:ACP ON</pre> <p>Switches on globally the limit check for the channel/adjacent channel measurement.</p> <pre>CALC:LIM:ACP:ACH:STAT ON</pre> <p>Switches on the check of the relative limit values for adjacent channels.</p> <pre>CALC:LIM:ACP:ACH:ABS:STAT ON</pre> <p>Switches on the check of absolute limit values for the adjacent channels.</p> <pre>INIT;*WAI</pre> <p>Starts a new measurement and waits for the sweep end.</p> <pre>CALC:LIM:ACP:ACH:RES?</pre> <p>Queries the limit check result in the adjacent channels.</p> |
| <b>Mode:</b>    | A, CDMA, EVDO, TDS, WCDMA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

---

**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>       | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <k>       | irrelevant                                                                                              |
| <Channel> | 1...11<br>the alternate channel                                                                         |

**Parameters:**

|                            |                                                                                              |
|----------------------------|----------------------------------------------------------------------------------------------|
| <LowerLimit>, <UpperLimit> | first value: -200DBM to 200DBM; limit for the lower and the upper alternate adjacent channel |
| *RST:                      | -200DBM                                                                                      |

**Example:**

```
CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM
```

Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

---

**CALCulate<n>:LIMit<k>:ACPowEr:ALTernate<channel>[:RELative]** <LowerLimit>, <UpperLimit>

This command defines the limit for the alternate adjacent channels for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

Note that the relative limit value has no effect on the limit check as soon as it is below the absolute limit defined with `CALCulate<n>:LIMit<k>:ACPowEr:ALTernate<Channel>:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

<Channel> 1...11  
the alternate channel

**Parameters:**

<LowerLimit>, <UpperLimit> first value: 0 to 100dB; limit for the lower and the upper alternate adjacent channel

\*RST: 0 DB

**Example:**

`CALC:LIM:ACP:ALT2 30DB, 30DB`

Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.

**Mode:** A, CDMA, EVDO, TDS, WLAN, WCDMA

---

**CALCulate<n>:LIMit<k>:ACPowEr:ALTernate<Channel>[:RELative]:STATe** <State>

This command activates the limit check for the alternate adjacent channels for adjacent channel power measurements. Before the command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPowEr[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPowEr:ALTernate<channel>[:RELative]`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are obtained.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

<Channel> 1...11  
the alternate channel

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:LIM:ACP:ALT2 30DB, 30DB

Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.

CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM

Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.

CALC:LIM:ACP ON

Switches on globally the limit check for the channel/adjacent channel measurement.

CALC:LIM:ACP:ALT2:STAT ON

Switches on the check of the relative limit values for the lower and upper second alternate adjacent channel.

CALC:LIM:ACP:ALT2:ABS:STAT ON

Switches on the check of absolute limit values for the lower and upper second alternate adjacent channel.

INIT; \*WAI

Starts a new measurement and waits for the sweep end.

CALC:LIM:ACP:ALT2:RES?

Queries the limit check result in the second alternate adjacent channels.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>: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> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:LIM:ACP ON

Switches on the ACLR limit check.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>:FAIL**

This command queries the result of the limit check of the indicated limit line. It should be noted that a complete sweep must have been performed for obtaining a correct result. A synchronization with \*OPC, \*OPC? or \*WAI should therefore be provided.

**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.
```

**Mode:** A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WLAN, WCDMA

**4.2.3.3 CALCulate:LIMit:ESpectrum subsystem**

The CALCulate:LIMit:ESpectrum subsystem defines the limit check for the Spectrum Emission Mask.

|                                                                  |     |
|------------------------------------------------------------------|-----|
| CALCulate<n>:LIMit<k>:ESpectrum:LIMits.....                      | 151 |
| CALCulate<n>:LIMit<k>:ESpectrum:MODE.....                        | 152 |
| CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>[:EXCLusive].....   | 152 |
| CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>:COUNT.....         | 153 |
| CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>:LIMit[:STATe]..... | 153 |
| CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>:MAXimum.....       | 154 |
| CALCulate<n>:LIMit<k>:ESpectrum:PCLass<Class>:MINimum.....       | 154 |
| CALCulate<n>:LIMit<k>:ESpectrum:RESTore.....                     | 155 |
| CALCulate<n>:LIMit<k>:ESpectrum:VALue.....                       | 155 |

**CALCulate<n>:LIMit<k>:ESpectrum:LIMits <Limits>**

This command sets or queries up to 4 power classes in one step.

**Suffix:**

<n> irrelevant  
<k> irrelevant

**Parameters:**

<Limits> 1–3 numeric values between -200 and 200, separated by commas  
-200, <0-3 numeric values between -200 and 200, in ascending order, separated by commas>, 200

**Example:** `CALC:LIM:ESP:LIM -50,50,70`  
 Defines the following power classes:  
`<-200, -50>`  
`<-50, 50>`  
`<50, 70>`  
`<70, 200>`  
**Query:**  
`CALC:LIM:ESP:LIM?`  
**Response:**  
`-200,-50,50,70,200`

**Mode:** A, CDMA, EVDO, TDS, WCDMA

#### **CALCulate<n>:LIMit<k>:ESPectrum:MODE <Mode>**

This command activates or deactivates the automatic selection of the limit line in the Spectrum Emission Mask measurement.

##### **Suffix:**

`<n>` 1...4  
window

`<k>` irrelevant

##### **Parameters:**

`<Mode>` AUTO | MANUAL

##### **AUTO**

The limit line depends on the measured channel power.

##### **MANUAL**

One of the three specified limit lines is set. The selection is made with the [chapter 4.2.3.3, "CALCulate:LIMit:ESPectrum subsystem"](#), on page 151 command.

\*RST: AUTO

**Example:** `CALC:LIM:ESP:MODE AUTO`  
 Activates automatic selection of the limit line.

**Mode:** A, CDMA, EVDO, TDS, WCDMA, VSA

#### **CALCulate<n>:LIMit<k>:ESPectrum:PClass<Class>[:EXCLusive] <State>**

This command sets the power classes used in the spectrum emission mask measurement. It is only possible to use power classes for which limits are defined. Also, either only one power class at a time or all power classes together can be selected.

##### **Suffix:**

`<n>` irrelevant

`<k>` irrelevant

`<Class>` 1...4  
the power class to be evaluated



**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:LIM:ESP:PCL1 ON  
 Activates the first defined power class.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNT <NoPowerClasses>**

This command sets the number of power classes to be defined.

**Suffix:**

<n> irrelevant  
 <k> irrelevant  
 <Class> irrelevant

**Parameters:**

<NoPowerClasses> 1 to 4  
 \*RST: 1

**Example:**

CALC:LIM:ESP:PCL:COUN 2  
 Two power classes can be defined.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe] <State>**

This command defines which limits are evaluated in the measurement.

**Suffix:**

<n> irrelevant  
 <k> irrelevant  
 <Class> 1...4  
 the power class to be evaluated

**Parameters:**

&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

**Mode:**

A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum <Level>**

This command sets the upper limit level for one power class. The unit is dBm. The limit always ends at + 200 dBm, i.e. the upper limit of the last power class can not be set. If more than one power class is in use, the upper limit must equal the lower limit of the next power class.

**Suffix:**

&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.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum <Level>**

This command sets the minimum lower level limit for one power class. The unit is dBm. The limit always start at - 200 dBm, i.e. the first lower limit can not be set. If more than one power class is in use, the lower limit must equal the upper limit of the previous power class.

**Suffix:**

&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.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>:ESpectrum:REStore**

This command restores the predefined limit lines for the Spectrum Emission Mask measurement. All modifications made to the predefined limit lines are lost and the factory-set values are restored.

**Suffix:**

<n> 1...4  
 window  
 <k> irrelevant

**Example:**

CALC:LIM:ESP:REST  
 Resets the limit lines for the Spectrum Emission Mask to the default setting.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

**CALCulate<n>:LIMit<k>:ESpectrum:VALue <Power>**

This command activates the manual limit line selection and specifies the expected power as a value. Depending on the entered value, one of the predefined limit lines is selected.

**Suffix:**

<n> 1...4  
 window  
 <k> irrelevant

**Parameters:**

<Power> 33 | 28 | 0  
**33**  
 $P \geq 33$   
**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.

**Mode:** A, CDMA, EVDO, TDS, WCDMA

#### 4.2.3.4 CALCulate:MARKer subsystem

---

##### CALCulate<n>:MARKer<m>:AOFF

This command switches off all active markers, delta markers, and marker measurement functions in the specified window.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode  
irrelevant

**Example:** `CALC:MARK:AOFF`  
 Switches off all markers.

**Mode:** all

---

##### CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command positions the marker to the next smaller maximum value to the left of the current value (i.e. in descending X values) on the trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:** `CALC:MARK2:MAX:LEFT`  
 Positions marker 2 to the next lower maximum value to the left of the current value.

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

---

##### CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command positions the marker to the next smaller maximum value of the corresponding trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                         |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <m>             | marker number                                                                                           |
| <b>Example:</b> | <code>CALC:MARK2:MAX:NEXT</code><br>Positions marker 2 to the next lower maximum value.                 |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM                                                           |

**CALCulate<n>:MARKer<m>:MAXimum[:PEAK]**

This command positions the marker to the current maximum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                                       |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.               |
| <m>             | depends on mode<br>marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant. |
| <b>Example:</b> | <code>CALC:MARK2:MAX</code><br>Positions marker 2 to the maximum value of the trace.                                  |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF                                                                     |

**CALCulate<n>:MARKer<m>:MAXimum:RIGHT**

This command positions the marker to the next smaller maximum value to the right of the current value (i.e. in ascending X values) on the corresponding trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                                            |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                                            |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.                    |
| <m>             | marker number                                                                                                              |
| <b>Example:</b> | <code>CALC:MARK2:MAX:RIGHT</code><br>Positions marker 2 to the next lower maximum value to the right of the current value. |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM                                                                              |

**CALCulate<n>:MARKer<m>:MINimum:LEFT**

This command positions the marker to the next higher minimum value to the left of the current value (i.e. in descending X direction) on the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:**

`CALC:MARK2:MIN`

Positions marker 2 to the minimum value of the trace.

`CALC:MARK2:MIN:LEFT`

Positions marker 2 to the next higher minimum value to the left of the current value.

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

**CALCulate<n>:MARKer<m>:MINimum:NEXT**

This command positions the marker to the next higher minimum value of the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Example:**

`CALC:MARK2:MIN`

Positions marker 2 to the minimum value of the trace.

`CALC:MARK2:MIN:NEXT`

Positions marker 2 to the next higher maximum value.

**Mode:** A, ADEMOD, CDMA, EVDO, SPECM, TDS, VSA, WCDMA

**CALCulate<n>:MARKer<m>:MINimum[:PEAK]**

This command positions the marker to the current minimum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                                       |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.               |
| <m>             | depends on mode<br>marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant. |
| <b>Example:</b> | <code>CALC:MARK2:MIN</code><br>Positions marker 2 to the minimum value of the trace.                                  |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF                                                                     |

### **CALCulate<n>:MARKer<m>:MINimum:RIGHT**

This command positions the marker to the next higher minimum value to the right of the current value (i.e. in ascending X direction) on the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

|                 |                                                                                                                                                                                                                    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>  |                                                                                                                                                                                                                    |
| <n>             | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.                                                                                                            |
| <m>             | marker number                                                                                                                                                                                                      |
| <b>Example:</b> | <code>CALC:MARK2:MIN</code><br>Positions marker 2 to the minimum value of the trace.<br><code>CALC:MARK2:MIN:RIGH</code><br>Positions marker 2 to the next higher minimum value to the right of the current value. |
| <b>Mode:</b>    | A, ADEMOD, CDMA, EVDO, SPECM, TDS, VSA, WCDMA                                                                                                                                                                      |

### **CALCulate<n>:MARKer<m>[:STATe] <State>**

This command activates a marker in the specified window. If no indication is made, marker 1 is selected automatically. If activate, the marker is switched to normal mode.

|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                                       |
| <n>                | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.               |
| <m>                | depends on mode<br>marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant. |
| <b>Parameters:</b> |                                                                                                                       |
| <State>            | ON   OFF<br>*RST: OFF                                                                                                 |
| <b>Example:</b>    | <code>CALC:MARK3 ON</code><br>Switches on marker 3 or switches to marker mode.                                        |

**Mode:** all

---

**CALCulate<n>:MARKer<m>:TRACe <Trace>**

This command assigns the selected marker to the indicated trace in the specified window. The corresponding trace must be active, i.e. its status must not be "BLANK".

If necessary, the corresponding marker is switched on prior to the assignment.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode  
marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

**Parameters:**

<Trace> **1 to 6**  
Trace number the marker is assigned to.

**Example:** `CALC:MARK3:TRAC 2`  
Assigns marker 3 to trace 2.

**Mode:** all

---

**CALCulate<n>:MARKer<m>:X <Position>**

This command positions the selected marker to the indicated x-value in the window specified by the suffix <n>.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Parameters:**

<Position> 0 to MAX (frequency | sweep time | level)

**Example:** `CALC:MARK2:X 1.7MHz`  
Positions marker 2 to frequency 1.7 MHz.

**Mode:** ALL

---

**CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] <State>**

This command switches between a limited (ON) and unlimited (OFF) search range.

If the power measurement in zero span is active, this command limits the evaluation range on the trace.



|                    |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                         |
| <n>                | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <m>                | marker                                                                                                  |
| <b>Parameters:</b> |                                                                                                         |
| <State>            | ON   OFF                                                                                                |
|                    | *RST: OFF                                                                                               |
| <b>Example:</b>    | CALC:MARK:X:SLIM ON<br>Switches on search limitation.                                                   |
| <b>Mode:</b>       | all                                                                                                     |

#### CALCulate<n>:MARKer<m>:X:SLIMits:ZOOM <State>

This command sets the limits of the search range for markers and delta markers to the zoom area in the window specified by the suffix <n>.

**Note:** The function is only available if the search limit for marker and delta marker is switched on (see [CALCulate<n>:MARKer<m>:X:SLIMits\[:STATe\]](#) on page 160).

|                    |                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                                                                          |
| <n>                | irrelevant                                                                                                                                               |
| <m>                | irrelevant                                                                                                                                               |
| <b>Parameters:</b> |                                                                                                                                                          |
| <State>            | ON   OFF                                                                                                                                                 |
|                    | *RST: OFF                                                                                                                                                |
| <b>Example:</b>    | CALC:MARK:X:SLIM:ZOOM ON<br>Switches the search limit function on.<br>CALC:MARK:X:SLIM:RIGH 20MHz<br>Sets the right limit of the search range to 20 MHz. |
| <b>Mode:</b>       | all                                                                                                                                                      |

#### CALCulate<n>:MARKer<m>:Y?

This command queries the measured value of the selected marker in the window specified by the suffix <n>. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed after the change of a parameter and before the query of the Y value. This is only possible in single sweep mode.

|                |                                                                                                         |
|----------------|---------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b> |                                                                                                         |
| <n>            | window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant. |
| <m>            | marker number                                                                                           |

**Return values:**

<Result> The measured value of the selected marker is returned.

**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

**Mode:**

ALL

**CALCulate<n>:MARKer<m>:Y:PERCent <Probability>**

This command positions the selected marker to the given probability in the window specified by the suffix <n>. If marker 2, 3 or 4 is selected and used as a delta marker, it is switched to marker mode.

**Note:** The command is only available with the CCDF measurement switched on. The associated level value can be determined with the `CALCulate<n>:MARKer<m>:X` command.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

**Parameters:**

<Probability> 0 to 100 %

**Example:**

```
CALC1:MARK:Y:PERC 95PCT
Positions marker 1 to a probability of 95 %.
```

**Mode:**

A, CDMA, EVDO, TDS

**4.2.3.5 CALCulate:PSE subsystem**

|                                                                      |     |
|----------------------------------------------------------------------|-----|
| <code>CALCulate&lt;n&gt;:PSEarch PEAKsearch[:IMMEDIATE]</code> ..... | 162 |
| <code>CALCulate&lt;n&gt;:PSEarch PEAKsearch:AUTO</code> .....        | 163 |
| <code>CALCulate&lt;n&gt;:PSEarch PEAKsearch:MARGIN</code> .....      | 163 |
| <code>CALCulate&lt;n&gt;:PSEarch PEAKsearch:PSHOW</code> .....       | 163 |
| <code>CALCulate&lt;n&gt;:PSEarch PEAKsearch:SUBRANGES</code> .....   | 164 |

**CALCulate<n>:PSEarch|PEAKsearch[: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.

**Suffix:**

<n> irrelevant

**Example:**

CALC:PSE  
Starts to determine the list.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, SPECM

**CALCulate<n>:PSEarch|PEAKsearch:AUTO <State>**

This command activates or deactivates the list evaluation.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

**Parameters:**

<State> ON | OFF  
\*RST: ON

**Example:**

CALC:ESP:PSE:AUTO OFF  
Deactivates the list evaluation.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

**CALCulate<n>:PSEarch|PEAKsearch:MARGin**

This command sets the margin used for the limit check/peak search.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

**Parameters:**

<Margin> -200 to 200 dB  
\*RST: 200 dB

**Example:**

CALC:ESP:PSE:MARG 100  
Sets the margin to 100 dB.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

**CALCulate<n>:PSEarch|PEAKsearch:PSHow**

This command marks all peaks with blue squares in the diagram.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

CALC:ESP:PSE:PSH ON  
 Marks all peaks with blue squares.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

**CALCulate<n>:PSEarch|PEAKsearch:SUBRanges <NumberPeaks>**

This command sets the number of peaks per range that are stored in the list. Once the selected number of peaks has been reached, the peak search is stopped in the current range and continued in the next range.

**Suffix:**

<n> irrelevant

**Parameters:**

<NumberPeaks> 1 to 50  
 \*RST: 25

**Example:**

CALC:PSE:SUBR 10  
 Sets 10 peaks per range to be stored in the list.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

**4.2.3.6 CALCulate:STATistics subsystem**

|                                         |     |
|-----------------------------------------|-----|
| CALCulate<n>:STATistics:CCDF[:STATe]    | 164 |
| CALCulate<n>:STATistics:NSAMples        | 165 |
| CALCulate<n>:STATistics:PRESet          | 165 |
| CALCulate<n>:STATistics:RESult<Trace>   | 165 |
| CALCulate<n>:STATistics:SCALe:AUTO ONCE | 166 |
| CALCulate<n>:STATistics:SCALe:X:RANGe   | 166 |
| CALCulate<n>:STATistics:SCALe:X:RLEVel  | 167 |
| CALCulate<n>:STATistics:SCALe:Y:LOWer   | 167 |
| CALCulate<n>:STATistics:SCALe:Y:UNIT    | 167 |
| CALCulate<n>:STATistics:SCALe:Y:UPPer   | 168 |

**CALCulate<n>:STATistics:CCDF[:STATe] <State>**

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF). On activating this function, the APD measurement is switched off.

**Suffix:**

<n> irrelevant

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**            `CALC:STAT:CCDF ON`  
Switches on the CCDF measurement.

**Mode:**             A, CDMA, EVDO, TDS, WCDMA, VSA

#### **CALCulate<n>:STATistics:NSAMples <NoMeasPoints>**

This command sets the number of measurement points to be acquired for the statistical measurement functions.

**Suffix:**  
<n>                    irrelevant

**Parameters:**  
<NoMeasPoints>    100 to 1E9  
\*RST:                100000

**Example:**            `CALC:STAT:NSAM 500`  
Sets the number of measurement points to be acquired to 500.

**Mode:**             A, CDMA, EVDO, TDS, WCDMA, VSA

#### **CALCulate<n>:STATistics:PRESet**

This command resets the scaling of the X and Y axes in a statistical measurement. The following values are set:

|                     |         |
|---------------------|---------|
| x-axis ref level:   | -20 dBm |
| x-axis range APD:   | 100 dB  |
| x-axis range CCDF:  | 20 dB   |
| y-axis upper limit: | 1.0     |
| y-axis lower limit: | 1E-6    |

**Suffix:**  
<n>                    irrelevant

**Example:**            `CALC:STAT:PRESet`  
Resets the scaling for statistical functions

**Mode:**             A, CDMA, EVDO, TDS, WCDMA, VSA

#### **CALCulate<n>:STATistics:RESult<Trace> <ResultType>**

This command reads out the results of statistical measurements of a recorded trace.

**Suffix:**  
<n>                    irrelevant  
<Trace>              1...6  
                          trace

**Parameters:**

<ResultType> MEAN | PEAK | CFACTor | ALL

**MEAN**

Average (=RMS) power in dBm measured during the measurement time.

**PEAK**

Peak power in dBm measured during the measurement time.

**CFACTor**

Determined CREST factor (= ratio of peak power to average power) in dB.

**ALL**

Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

The required result is selected via the following parameters:

**Example:**

```
CALC:STAT:RES2? ALL
```

Reads out the three measurement results of trace 2. Example of answer string: 5.56,19.25,13.69 i.e. mean power: 5.56 dBm, peak power 19.25 dBm, CREST factor 13.69 dB

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA

**CALCulate<n>:STATistics:SCALE:AUTO ONCE**

This command optimizes the level setting of the instrument depending on the measured peak power, in order to obtain maximum instrument sensitivity.

To obtain maximum resolution, the level range is set as a function of the measured spacing between peak power and the minimum power for the APD measurement and of the spacing between peak power and mean power for the CCDF measurement. In addition, the probability scale for the number of test points is adapted.

Subsequent commands have to be synchronized with \*WAI, \*OPC or \*OPC? to the end of the auto range process which would otherwise be aborted.

**Suffix:**

<n> irrelevant

**Example:**

```
CALC:STAT:SCAL:AUTO ONCE; *WAI
```

Adapts the level setting for statistical measurements.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA

**CALCulate<n>:STATistics:SCALE:X:RANGE <Value>**

This command defines the level range for the x-axis of the measurement diagram. The setting is identical to the level range setting defined with the [DISPlay\[:WINDow<n>\]:TRACe<t>:Y\[:SCALE\]](#) command.

**Suffix:**

<n> irrelevant

**Parameters:**

<Value> 10dB to 200dB  
 \*RST: 100dB

**Example:**

CALC:STAT:SCAL:X:RANG 20dB

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA

**CALCulate<n>:STATistics:SCALE:X:RLEVel <Value>**

This command defines the reference level for the x-axis of the measurement diagram. The setting is identical to the reference level setting using the `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALE]:RLEVel` command.

With the reference level offset <> 0 the indicated value range of the reference level is modified by the offset.

The unit depends on the setting performed with `CALCulate<n>:UNIT:POWer`.

**Suffix:**

<n> irrelevant

**Parameters:**

<Value> -120dBm to 20dBm  
 \*RST: -20dBm

**Example:**

CALC:STAT:SCAL:X:RLEV -60dBm

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA

**CALCulate<n>:STATistics:SCALE:Y:LOWer <Value>**

This command defines the lower limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

**Suffix:**

<n> selects the screen

**Parameters:**

<Value> 1E-9 to 0.1  
 \*RST: 1E-6

**Example:**

CALC:STAT:SCAL:Y:LOW 0.001

**Mode:**

A, CDMA, EVDO, TDS, VSA, WCDMA

**CALCulate<n>:STATistics:SCALE:Y:UNIT <Unit>**

This command defines the scaling type of the y-axis.

**Suffix:**

<n> selects the screen

**Parameters:**

<Unit> PCT | ABS  
 \*RST: ABS

**Example:**

CALC:STAT:SCAL:Y:UNIT PCT  
 Sets the percentage scale.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA

**CALCulate<n>:STATistics:SCALE:Y:UPPer <Value>**

This command defines the upper limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

**Suffix:**

<n> irrelevant

**Parameters:**

<Value> 1E-8 to 1.0  
 \*RST: 1.0

**Example:**

CALC:STAT:SCAL:Y:UPP 0.01

**Mode:**

A, CDMA, EVDO, TDS, WCDMA, VSA

**4.2.3.7 Other Referenced CALCulate Commands**

|                              |     |
|------------------------------|-----|
| CALCulate<n>:THReshold.....  | 168 |
| CALCulate<n>:UNIT:POWer..... | 168 |

**CALCulate<n>:THReshold <Mode>**

This command defines the threshold value for the maximum/minimum search of markers with marker search functions. The associated display line is automatically switched on.

**Suffix:**

<n> irrelevant

**Parameters:**

<Mode> MINimum to MAXimum (depending on current unit)  
 \*RST: (STATe to OFF)

**Example:**

CALC:THR -82DBM  
 Sets the threshold value to -82 dBm.

**Mode:**

A, ADEMOD, EVDO, SPECM, CDMA, TDS

**CALCulate<n>:UNIT:POWer <Unit>**

This command selects the unit for power.

The unit is defined globally for all windows.



|                    |                                                                    |
|--------------------|--------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                    |
| <n>                | irrelevant                                                         |
| <b>Parameters:</b> |                                                                    |
| <Unit>             | DBM   V   A   W   DBPW   WATT   DBUV   DBMV   VOLT   DBUA   AMPere |
|                    | *RST: dBm                                                          |
| <b>Example:</b>    | CALC:UNIT:POW DBM<br>Sets the power unit to dBm.                   |
| <b>Mode:</b>       | A, ADEMOD, BT, CDMA, EVDO, TDS, WCDMA, VSA, SPECM                  |

### 4.3 CONFigure Subsystem

The following commands configure code domain measurements.

---

#### 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.

|                    |           |
|--------------------|-----------|
| <b>Parameters:</b> |           |
| <State>            | ON   OFF  |
|                    | *RST: OFF |

|                 |                                                           |
|-----------------|-----------------------------------------------------------|
| <b>Example:</b> | CONF:CDP:CTAB ON<br>Activates the 'RECENT' channel table. |
|-----------------|-----------------------------------------------------------|

|              |                        |
|--------------|------------------------|
| <b>Mode:</b> | CDMA, EVDO, TDS, WCDMA |
|--------------|------------------------|

---

#### CONFigure:CDPower[:BTS]:CTABLE:CATalog?

This command queries the names of all the channel tables stored on the flash disk for the current operating mode.

The syntax for the return values is: <sum of file lengths of all files>, <free disk space>, <1st file name>, <1st file length>, <2nd file name>, <2nd file length>, ..., <nth file name>, <nth file length>

|                 |                                                            |
|-----------------|------------------------------------------------------------|
| <b>Example:</b> | CONF:CDP:CTAB:CAT?<br>Returns all existing channel tables. |
|-----------------|------------------------------------------------------------|

|               |            |
|---------------|------------|
| <b>Usage:</b> | Query only |
|---------------|------------|

|              |                        |
|--------------|------------------------|
| <b>Mode:</b> | CDMA, EVDO, TDS, WCDMA |
|--------------|------------------------|

---

#### CONFigure:CDPower[:BTS]:CTABLE:COMment <Comment>

This command defines a comment for the channel table selected with CONFigure:CDPower[:BTS]:CTABLE:NAME.

**Parameters:**

<Comment> comment for the channel table

**Example:**

```
CONF:CDP:CTAB:NAME 'CTAB_1'
Selects channel table 'CTAB_1'.
CONF:CDP:CTAB:COMM 'Comment for CTAB_1'
Writes a comment for 'CTAB_1'.
```

**Mode:**

CDMA, EVDO, TDS, WCDMA

**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:NAME` command. The name of the channel table may contain up to eight characters.

**Parameters:**

<TargetFileName> <string> = name of the new channel table

**Example:**

```
CONF:CDP:CTAB:NAME 'CTAB_1'
Selects channel table 'CTAB_1'.
CONF:CDP:CTAB:COPY 'CTAB_2'
Makes a copy of 'CTAB_1' with the name 'CTAB_2'.
```

**Mode:**

CDMA, EVDO, TDS, WCDMA

**CONFigure:CDPower[:BTS]:CTABLE:DATA <numeric values>**

This command sets the parameters of the channel table selected or created with the `CONFigure:CDPower[:BTS]:CTABLE:NAME` command.

**Parameters:**

<numeric values> To define a channel (one row in the channel table), you have to enter eight values in the following order:  
 <channel type>, <code class>, <code number>, <modulation type>, <midamble shift>, <status>, <reserved 1>, <reserved 2>, ...

**<channel type>**  
 The channel type is coded with numbers:  
 1 = Midamble  
 2 = DPCH  
 3 = P-CCPCH  
 4 = S-CCPCH  
 5 = FPACH  
 6 = PRACH  
 7 = PICH

**<code class>**  
 0...4

**<code number>**  
 0...[spreading factor-1]

**<modulation type>**  
 0 = invalid (for midamble)  
 1 = QPSK  
 2 = 8PSK  
 3 = 16QAM  
 4 = 64QAM

**<midamble shift>**  
 1...16

**<status>**  
 0 = inactive  
 1 = active

**<reserved 1>**  
 always 0 (reserved)

**<reserved 2>**  
 always 0 (reserved)

\*RST:        RST value

**Example:**

```
CONF:CDP:CTAB:NAME 'CTAB_1'
Selects or creates channel table 'CTAB_1'
CONF:CDP:CTAB:DATA
'2,4,1,1,1,1,0,0,2,4,2,1,1,1,0,0'
Defines two data channels with QPSK modulation.
```

**Mode:** TDS

**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:NAME` command.

**Example:** `CONF:CDP:CTAB:NAME 'CTAB_1'`  
 Selects channel table 'CTAB\_1'  
`CONF:CDP:CTAB:DEL`  
`'2,4,1,1,1,1,0,0,2,4,2,1,1,1,0,0'`  
 Deletes channel table 'CTAB\_1'.

**Mode:** CDMA, EVDO, TDS, WCDMA

#### **CONFigure:CDPower[:BTS]:CTABLE:MSHift** <numeric value>

This command sets the maximum number of midamble shifts in the channel table.

**Parameters:**

<numeric value> **2 | 4 | 6 | 8 | 10 | 12 | 14 | 16**  
 \*RST: 16

**Example:** `CONF:CDP:CTAB:NAME 'CTAB_1'`  
 Selects channel table 'CTAB\_1'  
`CONF:CDP:CTAB:MSH 4`  
 Sets the maximum number of midamble shifts to 4.

**Mode:** TDS

#### **CONFigure:CDPower[:BTS]:CTABLE:NAME** <ChannelTable>

This command selects an existing channel table or creates a new one. Use this command to edit the channel table. To use a channel table for a measurement, use the `CONFigure:CDPower[:BTS]:CTABLE:SElect` command.

**Parameters:**

<ChannelTable> <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 by that name is created.

**Mode:** CDMA, EVDO, TDS, WCDMA

#### **CONFigure:CDPower[:BTS]:CTABLE:ORDer** <CODE | MIDamble>

This command selects sorting of the channel table in code order or midamble order.

**Parameters:**

<CODE | MIDamble> **CODE**  
 Channels are sorted in code order.  
**MIDamble**  
 Channels are sorted in midamble order.  
 \*RST: CODE

**Example:** `CONF:CDP:CTAB:ORD`  
 Sorts the channels in code order.

**Mode:** TDS

**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 predefined channel tables.

**Usage:** Event

**Mode:** CDMA, EVDO, TDS

**CONFigure:CDPower[:BTS]:CTABLE:SElect <ChannelTable>**

This command selects the channel table for a measurement. In order to activate a pre-defined channel table with this command, you have to activate the RECENT channel table with the `CONFigure:CDPower[:BTS]:CTABLE[:STATE]` command first.

**Parameters:**  
<ChannelTable> <string> = name of the channel table.  
\*RST: RECENT

**Example:** `CONF:CDP:CTAB:SEL 'CTAB_1'`  
Selects the channel table 'CTAB\_1'

**Mode:** CDMA, EVDO, TDS, WCDMA

**CONFigure:CDPower[:BTS]:MEASurement <measurement>**

This command selects the measurements of the TD-SCDMA BTS and UE Measurement Application.

**Parameters:**  
<measurement> **ACLR**  
Adjacent Channel Power  
**CCDF**  
Complementary Cumulative Distribution Function  
**CDPower**  
Code Domain Power  
**ESpectrum**  
Spectrum Emission Mask  
**OBWidth**  
Occupied Bandwidth  
**POWer**  
Channel Power  
**PVTime**  
Power vs Time  
\*RST: CDPower

**Example:** `CONF:CDP:MEAS POW`  
Selects Signal Channel Power measurement.

**Mode:** TDS

---

**CONFigure:CDPower[:BTS]:PVTime:SFRames** <numeric value>

This command defines the number of subframes to be used for averaging.

**Parameters:**

<numeric value> Subframe value.  
\*RST: 100

**Example:** CONF:CDP:PVT:SFR 50  
Sets the number of subframes to 50.

**Mode:** TDS

---

**CONFigure:CDPower[:BTS]:PVTime:SPOint** <numeric value>

This command sets the switching point between uplink and downlink slots.

**Parameters:**

<numeric value> 1 to 7  
\*RST: 3

**Example:** CONF:CDP:PVT:SPO 7  
Sets the switching point to 7.

**Mode:** TDS

## 4.4 DISPlay Subsystem

This chapter describes the remote control commands of the DISPlay subsystem that are specific to the measurement application.

---

**DISPlay[:WINDow<n>]:SIZE** <Size>

This command controls the size of the specified measurement window. The result display of the screen is, by default, the same as that of the first measurement screen.

**Suffix:**

<n> 1...4  
window

**Parameters:**

<Size> **LARGE**  
Enlargens the measurement window to full size.  
**SMALI**  
Turns the measurement window back to its default size.  
\*RST: SMALI

**Example:** DISP:WIND2:SIZE LARG  
Maximizes measurement window 2.

**Mode:** CDMA, EVDO, TDS

---

### DISPlay[:WINDow<n>]:SSElect

This command controls which of the measurement windows is active. Select the measurement window via the numeric suffix.

**Suffix:**

<n> 1...4  
window

**Example:**

DISP:WIND2:SSEL  
Maximizes measurement window 2.

**Mode:** CDMA, EVDO, TDS, WCDMA

---

### DISPlay[:WINDow<n>]:STATe <State>

Activates/deactivates the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background:

**Suffix:**

<n> window

**Parameters:**

<State> ON | OFF  
\*RST: OFF

**Example:**

DISP:WIND3:STAT ON  
Turns on a third measurement screen.

**Mode:** CDMA, EVDO, TDS, WCDMA

---

### DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command defines the type of display and the evaluation of the traces in the window specified by the suffix <n>. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with [DISPlay\[:WINDow<n>\]:TRACe<t>\[:STATe\]](#).

The number of measurements for AVERage, MAXHold and MINHold is defined with the [\[SENSe:\]AVERage<n>:COUNT](#) or [\[SENSe:\]SWEp: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 3.3.2, "Trace Mode Overview"](#), on page 105.

**Example:**

```
INIT:CONT OFF
Switching to single sweep mode.
SWE:COUN 16
Sets the number of measurements to 16.
DISP:TRAC3:MODE MAXH
Switches on the calculation of the maximum peak for trace 3.
INIT;*WAI
Starts the measurement and waits for the end of the 16 sweeps.
```

**Mode:** all

**DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>**

This command switches on or off the display of the corresponding trace in the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

**Parameters:**

<State> ON | OFF  
 \*RST: ON for TRACe1, OFF for TRACe2 to 6

**Example:** DISP:TRAC3 ON

**Mode:** all

**DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>**

This command defines the display range of the y-axis (level axis) with logarithmic scaling ([DISPlay\[:WINDow<n>\]:TRACe<t>:Y:SPACing](#) on page 180) in the window specified by the suffix <n>.

For linear scaling, the display range is fixed and cannot be modified.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

**Parameters:**

<Range> 10 dB to 200 dB or value in Hz  
 \*RST: 100dB



**Example:** DISP:TRAC:Y 110dB  
**Mode:** all

**DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO <ONCE>**

This command automatically scales the y-axis in order to get the best display result for the active trace.

**Suffix:**  
 <n> 1...4  
 window

**Parameters:**  
 <ONCE> \*RST: OFF

**Example:** DISP:WIND2:TRAC:Y:AUTO  
 Adjusts the y-axis of measurement window 2.

**Mode:** CDMA, EVDO, TDS

**DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MAXimum <numeric value>**

This command defines the upper limit of the y-axis in the indicated measurement window.

**Suffix:**  
 <n> 1...4  
 window

**Parameters:**  
 <numeric value> The unit and range depend on the result display.  
 \*RST: depends on the result display

**Example:** DISP:TRAC:Y:MIN -60 DBM  
 DISP:TRAC:Y:MAX 0 DBM  
 Defines a y-axis with a minimum value of -60 dBm and a maximum value of 0 dBm.

**Mode:** CDMA, EVDO, TDS

**DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MINimum <numeric value>**

This command defines the lower limit of the y-axis in the indicated measurement window.

**Suffix:**  
 <n> 1...4  
 window

**Parameters:**  
 <numeric value> The unit and range depend on the result display.  
 \*RST: depends on the result display

**Example:**            `DISP:TRAC:Y:MIN -60 DBM`  
                       `DISP:TRAC:Y:MAX 0 DBM`  
 Defines a y-axis with a minimum value of -60 dBm and a maximum value of 0 dBm.

**Mode:**                CDMA, EVDO, TDS

#### **DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>**

This command defines the scale type of the y-axis (absolute or relative) in the window specified by the suffix <n>.

When `SYSTEM:DISPlay:UPDate` is set to OFF, this command has no immediate effect on the screen (see `SYSTEM:DISPlay:UPDate` on page 245).

**Suffix:**  
 <n>                    window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t>                    irrelevant

**Parameters:**  
 <Mode>                ABSolute | RELative  
 \*RST:                ABS

**Example:**            `DISP:TRAC:Y:MODE REL`

**Mode:**                all

#### **DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision <Value>**

This remote command determines the grid spacing on the Y axis for all diagrams, where possible.

**Suffix:**  
 <n>                    irrelevant

<t>                    irrelevant

**Parameters:**  
 <Value>                numeric value; the unit depends on the result display  
 \*RST:                depends on the result display

**Example:**            `DISP:TRAC:Y:PDIV 10`  
 Sets the grid spacing to 10 units (for example 10 dB in the Code Domain Power result display).

**Mode:**                CDMA, BT, EVDO, TDS, WCDMA

#### **DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <Value>**

This command sets the reference level.

With the reference level offset  $\langle \rangle$  0, the indicated value range of the reference level is modified by the offset.

**Suffix:**

$\langle n \rangle$  irrelevant.

$\langle t \rangle$  irrelevant

**Parameters:**

$\langle \text{Value} \rangle$  \*RST: -10dBm

**Example:** DISP:TRAC:Y:RLEV -60dBm

**Mode:** A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, VSA, WCDMA

**DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet**  $\langle \text{Value} \rangle$ 

This command sets the reference level offset.

**Suffix:**

$\langle n \rangle$  irrelevant.

$\langle t \rangle$  irrelevant

**Parameters:**

$\langle \text{Value} \rangle$  -200dB to 200dB

\*RST: 0dB

**Example:** DISP:TRAC:Y:RLEV:OFFS -10dB

**Mode:** ALL

**DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition**  $\langle \text{Position} \rangle$ 

This remote command defines the position of the reference value on the Y axis (1 – 100 %) in the window specified by the suffix  $\langle n \rangle$ .

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:**

$\langle n \rangle$  window; For applications that do not have more than 1 measurement window, the suffix  $\langle n \rangle$  is irrelevant.

$\langle t \rangle$  irrelevant

**Parameters:**

$\langle \text{Position} \rangle$  0 to 100PCT

\*RST: 100 PCT = "Spectrum" mode, AF spectrum display;  
50 PCT = Tracking Generator mode or time display

**Example:** DISP:TRAC:Y:RPOS 50PCT

**Mode:** A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD, VSA

**DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>**

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator (only with option R&S FSV-B9 or -B10), this command requires active normalization.

**Suffix:**

<n> irrelevant

<t> irrelevant

**Parameters:**

<Value> \*RST: 0 dB, coupled to reference level

**Example:**

```
DISP:TRAC:Y:RVAL -20dBm
(Analyzer)
```

```
DISP:TRAC:Y:RVAL 0
```

Sets the power value assigned to the reference position to 0 dB (tracking generator)

**Mode:** A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD

**DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>**

This command selects the scaling for the level display range in the window specified by the suffix <n>.

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

**Parameters:**

<ScalingType> LOGarithmic | LINear | LDB

**LOGarithmic**

Selects logarithmic scaling.

**LINear**

Selects linear scaling in %.

**LDB**

Selects linear scaling in dB.

\*RST: LOGarithmic

**Example:**

```
DISP:TRAC:Y:SPAC LIN
```

**Mode:** A, ADEMOD, BT, VSA

## 4.5 INSTrument subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

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|--------------------------|-----|
| INSTrument[:SElect]..... | 181 |
| INSTrument:NSElect.....  | 181 |

---

### INSTrument[:SElect] <Mode>

This command switches between the measurement modes by means of text parameters.

**Parameters:**

|        |                                                      |
|--------|------------------------------------------------------|
| <Mode> | <b>BTDS</b><br>TDS BTS mode (R&S FSV-K76 option)     |
|        | <b>MTDS</b><br>TD-SCDMA UE mode (R&S FSV-K77 option) |

---

### INSTrument:NSElect <Mode>

This command switches between the measurement modes by means of numbers.

**Parameters:**

|        |                                                    |
|--------|----------------------------------------------------|
| <Mode> | <b>17</b><br>TDS BTS mode (R&S FSV-K76 option)     |
|        | <b>18</b><br>TD-SCDMA UE mode (R&S FSV-K77 option) |

## 4.6 SENSE subsystem

This chapter describes the remote control commands of the SENSE subsystem that are specific to the measurement application.

|         |                                                     |     |
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### 4.6.1 SENSe:CDPower Commands

The SENSe:CDPower subsystem configures the code domain measurements.

---

**[SENSe:]CDPower:CODE** <CodeNo>

This command selects the code number.

**Parameters:**

<CodeNo>                    <numeric value>  
                                   Range:     1 to 16 (depends on the base spreading factor)  
                                   Increment: 1  
                                   \*RST:     1

**Example:**                    CDP:CODE 8  
                                   Selects the eighth channel.

**Mode:**                        TDS

---

**[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

---

**[SENSe:]CDPower:IQLength** <CaptureLength>

This command specifies the number of frames/slots that are captured by one sweep.

In CDMA mode, this command sets the capture length in multiples of the power control group.

**Parameters:**

<CaptureLength>    Range:     2 to 63  
                                   \*RST:     7

**Example:**                    SENS:CDP:IQLength 3

**Mode:**                        TDS

**[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 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:MMAx <ModType>**

This command defines the highest modulation to be considered in the automatic channel search. In low SNR environments it may be necessary to limit the channel search to lower modulations than 64QAM.

**Parameters:**  
<ModType>

- QPSK**  
Consider QPSK modulation only
- PSK8**  
Consider QPSK and 8PSK modulation.
- QAM16**  
Consider QPSK, 8PSK and 16QAM modulation
- QAM64**  
Consider QPSK, 8PSK, 16QAM and 64QAM modulation
- \*RST: QAM64

**Example:** `SENS:CDP:MMAx PSK8`  
assume QPSK and 8PSK modulations only for the automatic channel search

**Mode:** TDS

**[SENSe:]CDPower:MSHift <numeric value>**

This command sets the maximum number of midamble shifts.

**Parameters:**  
<numeric value>

- Range: 2 to 16
- Increment: 2
- \*RST: 16

**Example:** `CDP:MSH 10`  
Sets the maximum number of midamble shifts to 10.

**Mode:** TDS

**[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:QINVert** <State>

This command inverts the Q component of the signal.

**Parameters:**

ON | OFF                \*RST:        OFF

**Example:**

CDP:QINV ON  
Activates inversion of Q component.

**Mode:**                CDMA, EVDO, TDS, WCDMA

**[SENSe:]CDPower:SBANd** <NORMal | INVers>

This command is used to swap the left and right sideband.

**Parameters:**

<NORMal | INVers>    \*RST:        NORM

**Example:**

CDP:SBAN INV  
Switches the right and left sideband.

**Mode:**                CDMA, EVDO, TDS

**[SENSe:]CDPower:SCODe** <numeric value>

This command sets the scrambling code of the base station.

**Parameters:**

<numeric value>      Range:        0 to 127  
                          Increment:    1  
                          \*RST:        0

**Example:**

CDP:SCOD 28  
Sets scrambling code 28.

**Mode:**                TDS

**[SENSe:]CDPower:SET** <SetNo>

This command selects a specific set for further analysis. The number of sets has to be defined with the [\[SENSe:\]CDPower:SET](#) command before using this command.





**Parameters:**

&lt;State&gt; ON | OFF

**ON**

The instrument synchronizes to the midamble of the selected slot.

**OFF**

The instrument synchronizes to the P-CCPCH in slot 0.

\*RST: OFF

**Example:**

CDP:SLOT 7

Selects slot number 7.

CDP:STSL ON

Activates synchronizing to the midamble of slot 7.

**Mode:** TDS**[SENSe:]CDPower:STSLot:MODE <Mode>**

This command selects the phase reference for downlink measurements (see "[Sync To \(downlink, K77\)](#)" on page 23).

**Parameters:**

&lt;Mode&gt; CODE | MA

**CODE**

The instrument synchronizes to the code channel of the selected slot.

**MA**

The instrument synchronizes to the midamble of the selected slot.

\*RST: MA

**Example:**

CDP:STSL:MODE CODE

Activates code channel synchronizing

**Mode:** TDS**[SENSe:]CDPower:STSLot:ROTate <Mode>**

By default, the R&S FSV-K76/77 determines one phase reference for all midambles and code channels of a data slot. If this command is activated, phase rotations between the code channels are allowed. Each code channel gets its own phase reference from the associated midamble according to section AA.2 of the standard document 3GPP TS 25.221. If the associated midamble is missing, the common phase reference is used for this code channel.

**Parameters:**

&lt;Mode&gt; ON | OFF

\*RST: OFF

**Example:**

CDP:STSL:ROT ON

Allows phase rotations between code channels.

**Mode:** TDS

**[SENSe:]POWer:ACHannel:AUTO:LTIMe**

Starts the autorange routine for the reference level. This also creates the relationship between trigger and subframe start.

Note that subsequent commands have to be synchronized with \*WAI, \*OPC or \*OPC? to the end of the autorange process which would otherwise be aborted.

**Example:** POW:ACH:AUTO:LTIM;\*WAI  
Starts the autorange and timing routine.

**Usage:** Event

**Mode:** TDS

**4.6.2 SENSe:POWer Commands**

The SENSe:POWer subsystem configures the RF Power measurement.

|                                        |     |
|----------------------------------------|-----|
| [SENSe:]POWer:ACHannel:AUTO:LTIMe..... | 187 |
| [SENSe:]POWer:ACHannel:SLOT:STarT..... | 187 |
| [SENSe:]POWer:ACHannel:SLOT:STOP.....  | 187 |

**[SENSe:]POWer:ACHannel:AUTO:LTIMe**

This command automatically adjusts the reference level and the trigger to frame time to their optimum levels. This prevents overloading of the R&S FSV.

Current measurements are aborted when this command is executed and resumed after the automatic level detection is finished.

**Usage:** Event

**Mode:** TDS

**[SENSe:]POWer:ACHannel:SLOT:STarT <StopSlot>**

Sets the first slot of the measurement.

**Parameters:**

<StartSlot> The start slot may not be larger than the stop slot.

Range: 1 to 7

\*RST: 4 (BTS); 1 (MS)

**Example:** POW:ACH:SLOT:STAR 2

**Mode:** TDS

**[SENSe:]POWer:ACHannel:SLOT:STOP <StopSlot>**

Sets the last slot of the measurement.

**Parameters:**

<StopSlot> The stop slot may not be lower than the start slot.  
In MS mode, stop slots other than 1 require an external trigger.

Range: 1 to 7  
\*RST: 6 (BTS); 1 (MS)

**Example:**

POW:ACH:SLOT:STOP 5

**Mode:**

TDS

## 4.6.3 Other SENSe Commands Referenced in this Manual

### 4.6.3.1 SENSe:ADJust Subsystem

|                                                    |     |
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| [SENSe:]ADJust:ALL.....                            | 188 |
| [SENSe:]ADJust:CONFIguration:HYSTerisis:LOWer..... | 188 |
| [SENSe:]ADJust:CONFIguration:HYSTerisis:UPPer..... | 189 |
| [SENSe:]ADJust:CONFIgure:LEVel:DURation.....       | 189 |
| [SENSe:]ADJust:CONFIgure:LEVel:DURation:MODE.....  | 189 |
| [SENSe:]ADJust:FREQuency.....                      | 190 |
| [SENSe:]ADJust:LEVel.....                          | 190 |

---

#### [SENSe:]ADJust:ALL

Activates all automatic settings:

- Frequency
- Level

**Example:**

ADJ:ALL

**Mode:**

A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA

---

#### [SENSe:]ADJust:CONFIguration:HYSTerisis: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.

(See [SENSe:]ADJust:LEVel on page 190).

**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.

**Mode:**

A, ADEMOD, BT, SFM, CDMA, EVDO, PHN, TDS, WCDMA, VSA

**[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.

(See [\[SENSe:\]ADJust:LEVel](#) on page 190).

**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.

**Mode:**

A, ADEMOD, BT, SFM, CDMA, EVDO, PHN, TDS, WCDMA, VSA

**[SENSe:]ADJust:CONFIgure:LEVel:DURation <Duration>**

Defines the duration of the level measurement used to determine the optimal reference level automatically (for SENS:ADJ:LEV ON).

**Parameters:**

<Duration>            <numeric value> in seconds  
                          Range:        0.001 to 16000.0  
                          \*RST:        0.001  
                          Default unit: s

**Example:**

ADJ:CONF:LEV:DUR:5

**Mode:**

A, ADEMOD, CDMA, EVDO, TDS, VSA, WCDMA

**[SENSe:]ADJust:CONFIgure:LEVel:DURation:MODE <Mode>**

Defines whether the duration of the level measurement used to determine the optimal reference level (for SENS:ADJ:LEV) is determined automatically or if the value defined via [\[SENSe:\]ADJust:CONFIgure:LEVel:DURation](#) is used.

**Parameters:**

<Mode>                AUTO | MANual  
                          \*RST:        AUTO

**Example:**

ADJ:CONF:LEV:DUR:MODE MAN

Specifies manual definition of the measurement duration.

ADJ:CONF:LEV:DUR:5

Specifies the duration manually.

**Mode:**

A, CDMA, EVDO, TDS, VSA, WCDMA

**[SENSe:]ADJust:FREQuency**

Defines the center frequency automatically by determining the highest level in the frequency span.

**Example:** ADJ:FREQ

**Mode:** A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA

**[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](#) on page 189 and [\[SENSe:\]ADJust:CONFIguration:HYSTeresis:LOWer](#) on page 188.

**Example:** ADJ:LEV

**Mode:** A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA

**4.6.3.2 SENSe:ESpectrum Subsystem**

The `SENSe:ESpectrum` subsystem contains the remote commands to configure Spectrum Emission Mask (SEM) measurements.

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| <a href="#">[SENSe:]ESpectrum:BWID</a> .....                                                  | 191 |
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| <a href="#">[SENSe:]ESpectrum:FILTer[:RRC]:ALPha</a> .....                                    | 191 |
| <a href="#">[SENSe:]ESpectrum:HighSPeed</a> .....                                             | 192 |
| <a href="#">[SENSe:]ESpectrum:PRESet[:STANdard]</a> .....                                     | 192 |
| <a href="#">[SENSe:]ESpectrum:PRESet:REStore</a> .....                                        | 193 |
| <a href="#">[SENSe:]ESpectrum:PRESet:StORe</a> .....                                          | 193 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:BANDwidth[:RESolution]</a> .....             | 193 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:BANDwidth:VIDeo</a> .....                    | 194 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:COUNt</a> .....                              | 194 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:DELeTe</a> .....                             | 194 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:FILTer:TYPE</a> .....                        | 194 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;[:FREQuency]:StARt</a> .....                  | 195 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;[:FREQuency]:StOP</a> .....                   | 196 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:INPut:ATTenuation</a> .....                  | 196 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:INPut:ATTenuation:AUTO</a> .....             | 196 |
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| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:INStert</a> .....                            | 197 |
| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:LIMit&lt;source&gt;:ABSolute:StARt</a> ..... | 197 |
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| <a href="#">[SENSe:]ESpectrum:RANGe&lt;range&gt;:LIMit&lt;source&gt;:RELative:StOP</a> .....  | 199 |
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| [SENSe:]ESpectrum:RANGe<range>:SWEep:TIME:AUTO..... | 200 |
| [SENSe:]ESpectrum:RANGe<range>:TRANsducer.....      | 201 |
| [SENSe:]ESpectrum:RRANge.....                       | 201 |
| [SENSe:]ESpectrum:RTYPe.....                        | 201 |

---

### [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 201).

#### Parameters:

<Bandwidth>            minimum span ≤ value ≤ span of reference range  
 \*RST:                    3.84 MHz

#### Example:

```
ESP:RTYP CPOW
Sets the power reference type to channel power.
ESP:BWID 1 MHZ
Sets the Tx bandwidth to 1 MHz.
```

**Mode:**                    A, CDMA, EVDO, TDS

---

### [SENSe:]ESpectrum:FILTer[:RRC][: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 201).

#### Parameters:

<State>                    ON | OFF  
 \*RST:                    ON

#### Example:

```
ESP:RTYP CPOW
Sets the power reference type to channel power.
ESP:FILT OFF
Deactivates the use of an RRC filter.
```

**Mode:**                    A, CDMA, EVDO, TDS

---

### [SENSe:]ESpectrum:FILTer[:RRC]:ALPHa <Value>

This command sets the alpha value of the RRC filter. This setting takes only effect if channel power is selected as power reference type ( [SENSe:]ESpectrum:RTYPe command) and if the RRC filter is activated ( [SENSe:]ESpectrum:FILTer[:RRC] [:STATe] command).

#### Parameters:

<Value>                    0 to 1  
 \*RST:                    0.22

**Example:**           ESP:RTYP CPOW  
Sets the power reference type to channel power.  
ESP:FILT ON  
Activates the use of an RRC filter.  
ESP:FILT:ALPH 0.5  
Sets the alpha value of the RRC filter to 0.5.

**Mode:**             A, CDMA, EVDO, TDS

#### [SENSe:]ESpectrum:HighSPeed <State>

Activates Fast SEM mode to accelerate spurious emission mask measurements. For details see [chapter 3.3.9, "Fast Spectrum Emission Mask Measurements"](#), on page 119.

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 194
- RBW, see [\[SENSe:\]ESpectrum:RANGe<range>:BANDwidth\[:RESolution\]](#) on page 193
- VBW, see [\[SENSe:\]ESpectrum:RANGe<range>:BANDwidth:VIDeo](#) on page 194
- Sweep Time Mode, see [\[SENSe:\]ESpectrum:RANGe<range>:SWEep:TIME:AUTo](#) on page 200
- Sweep Time, see [\[SENSe:\]ESpectrum:RANGe<range>:SWEep:TIME](#) on page 200
- Reference level, see [\[SENSe:\]ESpectrum:RANGe<range>:RLEVel](#) on page 199
- RF Att Mode, see [\[SENSe:\]ESpectrum:RANGe<range>:INPut:ATTenuation:AUTo](#) on page 196
- Rf Attenuation, see [\[SENSe:\]ESpectrum:RANGe<range>:INPut:ATTenuation](#) on page 196
- Preamp, see [\[SENSe:\]ESpectrum:RANGe<range>:INPut:GAIN:STATe](#) on page 197

#### Parameters:

<State>           ON | OFF  
\*RST:            OFF

**Example:**           ESP:HSP ON

**Mode:**             A, EVDO, TDS, WCDMA

#### [SENSe:]ESpectrum:PRESet[:STANdard]

This command selects the specified XML file under `C:\r_s\instr\sem_std`. If the file is stored in a subdirectory, include the relative path.



**Example:** `ESP:PRES 'WCDMA\3GPP\DL\PowerClass_31_39.xml'`  
 Selects the `PowerClass_31_39.xml` XML file in the `C:\R_S\instr\sem_std\WCDMA\3GPP\DL` directory.  
`ESP:PRES?`  
`W-CDMA 3GPP DL (31,39) dBm`  
 The query returns information about the selected standard, the link direction and the power class. If no standard has been selected, the query returns None.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:PRESet:RESTore**

This command copies the XML files from the `C:\R_S\instr\sem_backup` folder to the `C:\R_S\instr\sem_std` folder. Files of the same name are overwritten.

**Example:** `ESP:PRES:REST`  
 Restores the originally provided XML files.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:PRESet:STORe <FileName>**

This command stores the current settings as presets 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 settings in the `PowerClass_31_39.xml` file in the `C:\R_S\instr\sem_std\WCDMA\3GPP\DL` directory.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RANGe<range>:BANDwidth[: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 192).

**Suffix:**  
 <range> 1...20  
 range

**Parameters:**  
 <Value> Refer to the data sheet.  
 \*RST: 30.0 kHz

**Example:** `ESP:RANG2:BAND:RES 5000`  
 Sets the RBW for range 2 to 5 kHz.

**Mode:** A, CDMA, EVDO, TDS

---

**[SENSe:]ESpectrum:RANGe<range>:BANDwidth:VIDeo <Value>**

This command sets the VBW value for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [\[SENSe:\]ESpectrum:HighSPeed](#) on page 192).

**Suffix:**

<range> 1...20  
range

**Parameters:**

<Value> Refer to the data sheet.  
\*RST: 10.0 MHz

**Example:** ESP:RANG1:BAND:VID 5000000  
Sets the VBW for range 1 to 5 MHz.

**Mode:** A, CDMA, EVDO, TDS

---

**[SENSe:]ESpectrum:RANGe<range>:COUNT**

This command returns the number of defined ranges.

**Suffix:**

<range> 1...20  
range

**Example:** ESP:RANG:COUNT?  
Returns the number of defined ranges.

**Mode:** A, CDMA, EVDO, TDS

---

**[SENSe:]ESpectrum:RANGe<range>:DELEte**

This command deletes the specified range. The range numbers are updated accordingly. The reference range cannot be deleted. A minimum of three ranges is mandatory.

**Suffix:**

<range> 1...20  
range

**Example:** ESP:RANG4:DEL  
Deletes range 4.

**Mode:** A, CDMA, EVDO, TDS

---

**[SENSe:]ESpectrum:RANGe<range>:FILTer:TYPE <Type>**

This command sets the filter type for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [SENSe:]ESpectrum:HighSpeed on page 192).

**Suffix:**

<range> 1...20  
range

**Parameters:**

<Type> **NORMal**  
Gaussian filters  
**CFILter**  
channel filters  
**RRC**  
RRC filters  
**PULSe**  
EMI (6dB) filters  
**P5**  
5 Pole filters  
\*RST: NORM  
The available bandwidths of the filters are specified in the data sheet.

**Example:**

```
ESP:RANG1:FILT:TYPE RRC
```

Sets the RRC filter type for range 1.

**Mode:**

A, CDMA, EVDO, TDS

[SENSe:]ESpectrum:RANGe<range>[:FREQuency]:STARt <Frequency>

This command sets the start frequency for the specified range.

In order to change the start/stop frequency of the first/last range, select the appropriate span. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last range are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Note the rules for the <Frequency> parameter specified in [chapter 3.3.5, "Ranges and Range Settings"](#), on page 109.

**Suffix:**

<range> 1...20  
range

**Parameters:**

<Frequency> numeric value  
\*RST: -250.0 MHz (range 1), -2.52 MHz (range 2), 2.52 MHz (range 3)

**Example:**

```
ESP:RANG1:STAR 100000000
```

Sets the start frequency for range 1 to 100 MHz.

**Mode:**

A, CDMA, EVDO, TDS



**Parameters:**

<State> ON | OFF  
 \*RST: ON

**Example:**

ESP:RANG2:INP:ATT:AUTO OFF  
 Deactivates the RF attenuation auto mode for range 2.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RANGe<range>:INPut:GAIN:STATe <State>**

This command switches the preamplifier on or off for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [SENSe:]ESpectrum:HighSpeed on page 192).

**Suffix:**

<range> 1...20  
 range

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

ESP:RANG3:INP:GAIN:STATe ON  
 Switches the preamplifier for range 3 on or off.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RANGe<range>:INSert <Mode>**

This command inserts a new range before or after the specified range. The range numbers are updated accordingly.

**Suffix:**

<range> 1...20  
 range

**Parameters:**

<Mode> AFTer | BEFore

**Example:**

ESP:RANG3:INS BEF  
 Inserts a new range before range 3.  
 ESP:RANG1:INS AFT  
 Inserts a new range after range 1.

**Mode:** A, CDMA, EVDO, TDS

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

This command sets an absolute limit value at the start frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

**Suffix:**  
 <range> 1...20  
 range

**Parameters:**  
 <Level> -400 to in 400 dBm  
 \*RST: 13 dBm

**Example:** ESP:RANG1:LIM:ABS:STAR 10  
 Sets an absolute limit of 10 dBm at the start frequency of the range.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP <Level>**

This command sets an absolute limit value at the stop frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

**Suffix:**  
 <range> 1...20  
 range

**Parameters:**  
 <Level> -400 to in 400 dBm  
 \*RST: 13 dBm

**Example:** ESP:RANG1:LIM:ABS:STOP 20  
 Sets an absolute limit of 20 dBm at the stop frequency of the range.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt <Limit>**

This command sets a relative limit value at the start frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

**Suffix:**  
 <range> 1...20  
 range

**Parameters:**  
 <Limit> -400 to in 400 dBc  
 \*RST: -50 dBc

**Example:** ESP:RANG3:LIM:REL:STAR -20  
 Sets a relative limit of -20 dBc at the start frequency of the range.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:RELative:STOP <Limit>**

This command sets a relative limit value at the stop frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

**Suffix:**

<range> 1...20  
range

**Parameters:**

<Limit> -400 to in 400 dBc  
\*RST: -50 dBc

**Example:**

ESP:RANG3:LIM:REL:STOP 20  
Sets a relative limit of 20 dBc at the stop frequency of the range.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RANGe<range>:LIMit<source>:STATe <State>**

This command sets the type of limit check for all ranges.

**Suffix:**

<range> irrelevant

**Parameters:**

<State> ABSolute | RELative | AND | OR

**ABSolute**

Checks only the absolute limits defined.

**RELative**

Checks only the relative limits. Relative limits are defined as relative to the measured power in the reference range.

**AND**

Combines the absolute and relative limit. The limit check fails when both limits are violated.

**OR**

Combines the absolute and relative limit. The limit check fails when one of the limits is violated.

\*RST: REL

**Example:**

ESP:RANG3:LIM:STAT AND  
Sets for all ranges the combined absolute/relative limit check.

**Mode:** A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RANGe<range>:RLEVel <Value>**

This command sets the reference level for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [\[SENSe:\]ESpectrum:HighSPeed](#) on page 192).

|                    |                                                                   |
|--------------------|-------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                   |
| <range>            | 1...20<br>range                                                   |
| <b>Parameters:</b> |                                                                   |
| <Value>            | Refer to the data sheet.<br>*RST: -20 dBm                         |
| <b>Example:</b>    | ESP:RANG2:RLEV 0<br>Sets the reference level of range 2 to 0 dBm. |
| <b>Mode:</b>       | A, CDMA, EVDO, TDS                                                |

**[SENSe:]ESpectrum:RANGe<range>:SWEep:TIME <SweepTime>**

This command sets the sweep time for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [\[SENSe:\]ESpectrum:HighSPeed](#) on page 192).

|                    |                                                                                                                        |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                                                        |
| <range>            | 1...20<br>range                                                                                                        |
| <b>Parameters:</b> |                                                                                                                        |
| <SweepTime>        | Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.<br>*RST: 0.27 s |
| <b>Example:</b>    | ESP:RANG1:SWE:TIME 1<br>Sets the sweep time for range 1 to 1 s.                                                        |
| <b>Mode:</b>       | A, CDMA, EVDO, TDS                                                                                                     |

**[SENSe:]ESpectrum:RANGe<range>:SWEep:TIME:AUTO <State>**

This command activates or deactivates the automatic sweep time setting for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [\[SENSe:\]ESpectrum:HighSPeed](#) on page 192).

|                    |                                                                                  |
|--------------------|----------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                  |
| <range>            | 1...20<br>range                                                                  |
| <b>Parameters:</b> |                                                                                  |
| <State>            | ON   OFF<br>*RST: ON                                                             |
| <b>Example:</b>    | ESP:RANG3:SWE:TIME:AUTO OFF<br>Deactivates the sweep time auto mode for range 3. |
| <b>Mode:</b>       | A, CDMA, EVDO, TDS                                                               |



**[SENSe:]ESpectrum:RANGe<range>:TRANsducer <TransducerName>**

This command sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

- The transducer overlaps or equals the span of the range.
- The x-axis is linear.
- The unit is dB.

**Suffix:**

<range>                    1...20  
                                  range

**Parameters:**

<TransducerName> 'string' = name of the transducer

**Example:**

ESP:RANG1:TRAN 'test'  
Sets the transducer called test for range 1.

**Mode:**                    A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RRANGe**

This command returns the current position (number) of the reference range.

**Example:**

ESP:RRAN?  
Returns the current position (number) of the reference range.

**Mode:**                    A, CDMA, EVDO, TDS

**[SENSe:]ESpectrum:RTYPE <Type>**

This command sets the power reference type.

**Parameters:**

<Type>                    PEAK | CPOWer

**PEAK**

Measures the highest peak within the reference range.

**CPOWer**

Measures the channel power within the reference range (integral bandwidth method).

\*RST:                    CPOWer

**Example:**

ESP:RTYP PEAK  
Sets the peak power reference type.

**Mode:**                    A, CDMA, EVDO, TDS

**4.6.3.3 SENSe:BANDwidth subsystem**

|                                                 |     |
|-------------------------------------------------|-----|
| [SENSe:]BANDwidth BWIDth[:RESolution].....      | 202 |
| [SENSe:]BANDwidth BWIDth[:RESolution]:AUTO..... | 202 |

|                                                  |     |
|--------------------------------------------------|-----|
| [SENSe:]BANDwidth BWIDth[:RESolution]:FFT.....   | 203 |
| [SENSe:]BANDwidth BWIDth[:RESolution]:RATio..... | 203 |
| [SENSe:]BANDwidth BWIDth[:RESolution]:TYPE.....  | 203 |
| [SENSe:]BANDwidth BWIDth:VIDeo.....              | 204 |
| [SENSe:]BANDwidth BWIDth:VIDeo:AUTO.....         | 204 |
| [SENSe:]BANDwidth BWIDth:VIDeo:RATio.....        | 204 |
| [SENSe:]BANDwidth BWIDth:VIDeo:TYPE.....         | 205 |

---

### [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 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106.

If the resolution bandwidth is modified, the coupling to the span is automatically switched off.

#### Parameters:

<Bandwidth> refer to data sheet  
 \*RST: (AUTO is set to ON)

#### Example:

BAND 1 MHz  
 Sets the resolution bandwidth to 1 MHz

#### Mode:

all, except ADEMOD

---

### [SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command either automatically couples the resolution bandwidth of the instrument to the span or cancels the coupling.

The automatic coupling adapts the resolution bandwidth to the currently set frequency span according to the relationship between frequency span and resolution bandwidth. The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

The ratio resolution bandwidth/span can be modified with the [\[SENSe:\]BANDwidth|BWIDth\[:RESolution\]:RATio](#) command.

#### Parameters:

<State> ON | OFF  
 \*RST: ON

#### Example:

BAND:AUTO OFF  
 Switches off the coupling of the resolution bandwidth to the span.

#### Mode:

A-F, BT, CDMA, EVDO, TDS, WCDMA

**[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>**

Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

This command is only available when using the sweep type "FFT".

**Parameters:**

<FilterMode> AUTO | NARRow

**AUTO**

The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

**NARRow**

The FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

\*RST: AUTO

**Example:**

```
BAND:TYPE FFT
Select FFT filter.
```

**Example:**

```
BAND:FFT NARR
Select narrow partial span for FFT filter.
```

**Mode:**

all, except ADEMOD

**[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>**

This command defines the ratio resolution bandwidth (Hz)/span (Hz). The ratio to be entered is reciprocal to the ratio span/RBW used in manual operation.

**Parameters:**

<Ratio> 0.0001 to 1

\*RST: 0.01

**Example:**

```
BAND:RAT 0.1
```

**Mode:**

A, BT, CDMA, EVDO, TDS, WCDMA

**[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>**

This command selects the filter type for the resolution bandwidth.

For detailed information on filters see [chapter 3.3.3, "Selecting the Appropriate Filter Type"](#), on page 106 and [chapter 3.3.4, "List of Available RRC and Channel Filters"](#), on page 107.

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

**Mode:**               all, except ADEMOD

**[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>**

This command defines the instruments video bandwidth. The available video bandwidths are specified in the data sheet.

**Parameters:**  
 <Bandwidth>           refer to data sheet  
                               \*RST:        (AUTO is set to ON)

**Example:**            BAND:VID 10 kHz

**Mode:**               A, CDMA, EVDO, TDS, WCDMA

**[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>**

This command either automatically couples the instruments video bandwidth to the resolution bandwidth or cancels the coupling.

The ratio video bandwidth/resolution bandwidth can be modified with the [\[SENSe:\]BANDwidth|BWIDth\[:RESolution\]:RATio](#) command.

**Parameters:**  
 <State>                ON | OFF  
                               \*RST:        ON

**Example:**            BAND:VID:AUTO OFF

**Mode:**               A, CDMA, EVDO, TDS, WCDMA

**[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>**

This command defines the ratio video bandwidth (Hz)/resolution bandwidth (Hz). The ratio to be entered is reciprocal to the ratio RBW/VBW used in manual operation.

**Parameters:**  
 <Ratio>                0.01 to 1000  
                               \*RST:        3

**Example:** BAND:VID:RAT 3  
Sets the coupling of video bandwidth to video bandwidth = 3\*resolution bandwidth

**Mode:** A, CDMA, EVDO, TDS, WCDMA

#### [SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>

This command selects the position of the video filter in the signal path, provided that the resolution bandwidth is  $\leq 100$  kHz.

The essential difference between the two modes is the transient response at falling signal edges: If LINear is selected, the measurement with logarithmic level scaling yields a much "flatter" falling edge than LOGarithmic. This behavior is due to the conversion of linear power into logarithmic level. If the linear power is halved, the level decreases by only 3 dB.

#### Parameters:

<Mode> LOGarithmic | LINear

##### LINear

The video filter is connected ahead of the logarithmic amplifier (default).

##### LOGarithmic

The video filter follows the logarithmic amplifier

\*RST: LIN

**Example:** BAND:VID:TYPE LIN  
Video filter ahead of the logarithmic amplifier

**Mode:** A, CDMA, EVDO, TDS, WCDMA

#### 4.6.3.4 SENSe:FREQuency subsystem

|                                                |     |
|------------------------------------------------|-----|
| [SENSe:]FREQuency:CENTer.....                  | 205 |
| [SENSe:]FREQuency:CENTer:STEP[:VALue].....     | 206 |
| [SENSe:]FREQuency:CENTer:STEP:AUTO.....        | 206 |
| [SENSe:]FREQuency:CENTer:STEP:LINK.....        | 206 |
| [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor..... | 207 |
| [SENSe:]FREQuency:OFFSet.....                  | 207 |
| [SENSe:]FREQuency:SPAN.....                    | 207 |
| [SENSe:]FREQuency:SPAN:FULL.....               | 207 |
| [SENSe:]FREQuency:START.....                   | 208 |
| [SENSe:]FREQuency:STOP.....                    | 208 |

#### [SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency of the analyzer or the measuring frequency for span = 0.

**Parameters:**

<Frequency>            Range:        0 to fmax  
                              \*RST:        fmax/2  
                              Default unit: Hz  
                               $f_{max}$  is specified in the data sheet. min span is 10 Hz

**Example:**                `FREQ:CENT 100 MHz`

**Mode:**                    all

**[SENSe:]FREQUENCY:CENTer:STEP[:VALue] <StepSize>**

This command defines the step size of the center frequency.

**Parameters:**

<StepSize>                Range:        1 to fmax  
                              \*RST:        0.1 x <span value>  
                              Default unit: Hz

**Example:**                `FREQ:CENT:STEP 120 MHz`

**Mode:**                    all

**[SENSe:]FREQUENCY:CENTer:STEP:AUTO <State>**

This command couples the step size of the center frequency to the span (ON) or sets the value of the center frequency entered via `[SENSe:]FREQUENCY:CENTer` (OFF).

**Parameters:**

<State>                    ON | OFF  
                              \*RST:        ON

**Example:**                `FREQ:CENT:STEP:AUTO ON`  
 Activates the coupling of the step size to the span.

**Mode:**                    all

**[SENSe:]FREQUENCY:CENTer:STEP:LINK <CouplingType>**

This command couples the step size of the center frequency to span (span >0) or to the resolution bandwidth (span = 0) or cancels the couplings.

**Parameters:**

<CouplingType>        OFF | SPAN | RBW  
                              **SPAN**  
                              coupling to frequency display range (for span > 0)  
                              **RBW**  
                              coupling to resolution bandwidth (for span = 0)  
                              **OFF**  
                              manual input, no coupling  
                              \*RST:        SPAN

**Example:** `FREQ:CENT:STEP:LINK SPAN`

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA

**[SENSe:]FREQUENCY:CENTer:STEP:LINK:FACTOR <Value>**

This command couples the step size of the center frequency with a factor to the span (span >0) or to the resolution bandwidth (span = 0).

**Parameters:**

<Value> 1 to 100 PCT

\*RST: 10

**Example:** `FREQ:CENT:STEP:LINK:FACT 20PCT`

**Mode:** A, ADEMOD, CDMA, EVDO, TDS, WCDMA

**[SENSe:]FREQUENCY:OFFSet <Offset>**

This command defines the frequency offset of the instrument.

**Parameters:**

<Offset> Range: -100 GHz to 100 GHz

\*RST: 0 Hz

**Example:** `FREQ:OFFS 1GHZ`

**Mode:** all

**[SENSe:]FREQUENCY:SPAN <Span>**

This command defines the frequency span.

**Parameters:**

<Span> min span to f<sub>max</sub>

\*RST: f<sub>max</sub>

f<sub>max</sub> is specified in the data sheet. min span is 10 Hz

**Example:** `FREQ:SPAN 10MHz`

**Mode:** A, CDMA, EVDO, RT, TDS, NF, WCDMA

**[SENSe:]FREQUENCY:SPAN:FULL**

This command sets the frequency span to its maximum.

**Example:** `FREQ:SPAN:FULL`

**Mode:** A, CDMA, EVDO, RT, TDS, NF, WCDMA

**[SENSe:]FREQUency:STARt <Frequency>**

This command defines the start frequency of the analyzer. This command is only available with span > 0.

**Parameters:**

<Frequency> 0 to (fmax - min span)  
 \*RST: 0  
 f<sub>max</sub> is specified in the data sheet. min span is 10 Hz

**Example:**

FREQ:STAR 20MHz

**Mode:**

A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

**[SENSe:]FREQUency:STOP <Frequency>**

This command defines the stop frequency of the analyzer. This command is only available with span > 0.

**Parameters:**

<Frequency> min span to fmax  
 \*RST: fmax  
 f<sub>max</sub> is specified in the data sheet. min span is 10 Hz

**Example:**

FREQ:STOP 2000 MHz

**Mode:**

A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

**4.6.3.5 SENSe:POWer subsystem**

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---

### [SENSe:]POWer:ACHannel:ACPairs <Value>

This command sets the number of adjacent channels (upper and lower channel in pairs). The figure 0 stands for pure channel power measurement.

#### Parameters:

<Value>                    0 to 12  
 \*RST:                    1

#### Example:

POW:ACH:ACP 3  
 Sets the number of adjacent channels to 3, i.e. the adjacent channel and alternate adjacent channels 1 and 2 are switched on.

**Mode:**                    A-F, CDMA, EVDO, TDS, WCDMA

---

### [SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>] <Bandwidth>

This command sets the channel bandwidth of the specified TX channel in the radio communication system. The bandwidths of adjacent channels are not influenced by this modification.

With [SENSe<source>:]POWer:HSPeEd set to ON, steep-edged channel filters are available. For further information on filters refer to [chapter 3.3.4, "List of Available RRC and Channel Filters"](#), on page 107.

#### 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.

**Mode:**                    A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

---

### [SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <Bandwidth>

This command defines the channel bandwidth of the adjacent channel of the radio transmission system. If the bandwidth of the adjacent channel is changed, the bandwidths of all alternate adjacent channels are automatically set to the same value.

With [SENSe<source>:]POWer:HSPeEd set to ON, steep-edged channel filters are available. For further information on filters refer to [chapter 3.3.4, "List of Available RRC and Channel Filters"](#), on page 107 .

**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.

**Mode:**

A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

**[SENSe:]POWER:ACHannel:BANDwidth|BWIDth:ALTernate<channel>**  
 <Bandwidth>

This command defines the channel bandwidth of the specified alternate adjacent channels of the radio transmission system. If the channel bandwidth of one alternate adjacent channel is changed (e.g. channel 3), the bandwidth of all subsequent alternate adjacent channels (e.g. 4–11) is automatically set to the same value.

With [SENSe<source>:]POWER:HSPeEd set to ON, steep-edged channel filters are available. For further information on filters refer to [chapter 3.3.4, "List of Available RRC and Channel Filters"](#), on page 107 .

**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

**Mode:**

A-F, CDMA, EVDO, TDS, WCDMA

**[SENSe:]POWER:ACHannel:FILTer:ALPHa:ACHannel <Value>**

This command defines the alpha value for the weighting filter for the adjacent channel.

**Parameters:**

<Value> <numeric value>  
 \*RST: 0,22

**Example:**

POW:ACH:FILT:ALPH:ACH 0,35

**Mode:**

A-F, EVDO, TDS

**[SENSe:]POWER:ACHannel:FILTer:ALPHa:ALTernate<channel> <Value>**

This command defines the alpha value for the weighting filter for the specified alternate channel.

**Suffix:**

<channel> 1...11  
 the alternate channel

**Parameters:**

<Value> <numeric value>  
 \*RST: 0,22

**Example:**

POW:ACH:FILT:ALPH:ALT3 0,35  
 Sets the alpha value for the weighting filter for the alternate channel 3 to 0,35.

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel> <Value>**

This command defines the alpha value for the weighting filter for the specified TX channel.

**Suffix:**

<channel> 1...11  
 the TX channel

**Parameters:**

<Value> <numeric value>  
 \*RST: 0,22

**Example:**

POW:ACH:FILT:ALPH:CHAN3 0,35  
 Sets the alpha value for the weighting filter for the TX channel 3 to 0,35.

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel <State>**

This command activates the weighting filter for the adjacent channel.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

POW:ACH:FILT:ACH ON

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTErnate<channel> <State>**

This command activates the weighting filter for the specified alternate channel.

**Suffix:**

<channel> 1...11  
 the alternate adjacent channel

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:** POW:ACH:FILT:ALT3 ON  
Activates the weighting filter for alternate channel 3.

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel> <State>**

This command activates the weighting filter for the specified TX channel.

**Suffix:**  
<channel> 1...18  
the TX channel

**Parameters:**  
<State> ON | OFF  
\*RST: OFF

**Example:** POW:ACH:FILT:CHA3 ON  
Activates the weighting filter for TX channel 3.

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:MODE <Mode>**

This command switches between absolute and relative adjacent channel measurement. The command is only available with span > 0 and if the number of adjacent channels is greater than 0.

For the relative measurement the reference value is set to the currently measured channel power using the command `[SENSe:]POWer:ACHannel:REference: AUTO ONCE`.

**Parameters:**  
<Mode> ABSolute | RELative  
**ABSolute**  
absolute adjacent channel measurement  
**RELative**  
relative adjacent channel measurement  
\*RST: RELative

**Example:** POW:ACH:MODE REL  
Sets the adjacent channel measurement mode to relative.

**Mode:** A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, WCDMA, TDS

**[SENSe:]POWer:ACHannel:NAME:ACHannel <Name>**

This command defines a name for the adjacent channel. The name is displayed in the result diagram and the result table.

**Parameters:**  
<Name> \*RST: Adj

**Example:** `POW:ACH:NAME:ACH 'XYZ'`  
 Defines the name of the adjacent channel as 'XYZ'.

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:NAME:ALTErnate<channel> <Name>**

This command defines a name for the specified alternate channel. The name is displayed in the result diagram and the result table.

**Suffix:**  
 <channel> 1...11  
 the alternate channel

**Parameters:**  
 <Name> \*RST: ALT<1...11>

**Example:** `POW:ACH:NAME:ALT3 'XYZ'`  
 Defines the name of the third alternate channel as 'XYZ'.

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:NAME:CHANnel<channel> <Name>**

This command defines a name for the specified TX channel. The name is displayed in the result diagram and the result table.

**Suffix:**  
 <channel> 1...12  
 the TX channel

**Parameters:**  
 <Name> \*RST: TX<1...12>

**Example:** `POW:ACH:NAME:CHAN3 'XYZ'`  
 Defines the name of the third transmission channel as 'XYZ'.

**Mode:** A-F, EVDO, TDS

**[SENSe:]POWer:ACHannel:PRESet <Setting>**

This command adjusts the frequency span, the measurement bandwidths and the detector as required for the number of channels, the channel bandwidths and the channel spacings selected in the active power measurement. If necessary, adjacent-channel power measurement is switched on prior to the adjustment.

To obtain correct results, a complete sweep with synchronization to the end of the sweep must be performed after the adjustment. Synchronization is possible only in the single sweep mode.

The result is queried with the `CALCulate<n>:MARKer<m>:FUNCTION:POWer:RESult` command.

**Parameters:**

<Setting> ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

**Example:**

```
POW:ACH:PRES ACP
```

Sets the frequency span, the measurement bandwidths and the detector as required for the ACLR measurement.

```
INIT:CONT OFF
```

Switches over to single sweep mode.

```
INIT;*WAI
```

Starts a sweep and waits for the end of the sweep.

```
CALC:MARK:FUNC:POW:RES? ACP
```

Queries the result of the adjacent-channel power measurement.

**Mode:**

A-F, CDMA, EVDO, TDS

**[SENSe:]POWer:ACHannel:PRESet:RLEVel**

This command adapts the reference level to the measured channel power and – if required – switches on previously the adjacent channel power measurement. This ensures that the signal path of the instrument is not overloaded. Since the measurement bandwidth is significantly smaller than the signal bandwidth in channel power measurements, the signal path can be overloaded although the trace is still significantly below the reference level. If the measured channel power equals the reference level, the signal path is not overloaded.

Subsequent commands have to be synchronized with \*WAI, \*OPC or \*OPC? to the end of the auto range process which would otherwise be aborted.

**Example:**

```
POW:ACH:PRES:RLEV;*WAI
```

Adapts the reference level to the measured channel power.

**Mode:**

A-F, CDMA, EVDO, TDS, WCDMA

**[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE**

This command sets the reference value to the currently measured channel power for the relative measurement.

**Example:**

```
POW:ACH:REF:AUTO ONCE
```

**Mode:**

A-F, CDMA, EVDO, TDS, WCDMA

**[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO <Channel>**

This command activates the automatic selection of a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The transmission channel with the highest power, the transmission channel with the lowest power, or the transmission channel nearest to the adjacent channels can be defined as a reference channel.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 ( [CALCulate<n>:MARKer<m>:FUNction:POWer:SElect](#) on page 134).

**Parameters:**

<Channel>            MINimum | MAXimum | LHIGhest

**MINimum**  
Transmission channel with the lowest power

**MAXimum**  
Transmission channel with the highest power

**LHIGhest**  
Lowermost transmission channel for the lower adjacent channels,  
uppermost transmission channel for the upper adjacent channels

**Example:**

```
POW:ACH:REF:TXCH:AUTO MAX
```

The transmission channel with the highest power is used as a reference channel.

**Mode:**

A-F, EVDO, TDS, WCDMA

**[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual** <ChannelNumber>

This command selects a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 ( [CALCulate<n>:MARKer<m>:FUNction:POWer:SElect](#) on page 134).

**Parameters:**

<ChannelNumber>    1 to 18

\*RST:                1

**Example:**

```
POW:ACH:REF:TXCH:MAN 3
```

Transmission channel 3 is used as a reference channel.

**Mode:**

A-F, EVDO, TDS, WCDMA

**[SENSe:]POWer:ACHannel:SPACing[:ACHannel]** <Value>

This command defines the spacing between the carrier signal and the adjacent channel (ADJ). The modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, ...): they are all multiplied by the same factor (new spacing value/old spacing value).

**Parameters:**

<Value>             100 Hz to 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.

**Mode:** A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

**[SENSe:]POWer:ACHannel:SPACing:ALTErnate<channel> <Spacing>**

This command defines the spacing between the alternate adjacent channels and the TX channel (ALT1, ALT2, ...). A modification of a higher adjacent-channel spacing causes a change by the same factor (new spacing value/old spacing value) in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.

**Suffix:**  
 <channel> 1...11  
 the alternate adjacent channel

**Parameters:**  
 <Spacing> 100 Hz to 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.

**Mode:** A-F, CDMA, EVDO, TDS, WCDMA

**[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel> <Value>**

This command defines the channel spacing for the carrier signals.

**Suffix:**  
 <channel> 1...11  
 the TX channel

**Parameters:**  
 <Value> 14 kHz to 20 GHz  
 \*RST: 20 kHz

**Example:** `POW:ACH:SPAC:CHAN 25kHz`

**Mode:** A-F, CDMA, EVDO, TDS, WCDMA

**[SENSe:]POWer:ACHannel:TXChannel:COUNT <Number>**

This command selects the number of carrier signals.



The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (see [CALCulate<n>:MARKer<m>:FUNCTION:POWer:SElect](#) on page 134).

**Parameters:**

<Number> 1 to 18  
\*RST: 1

**Example:**

POW:ACH:TXCH:COUN 3

**Mode:**

A, CDMA, EVDO, TDS, WCDMA

**[SENSe:]POWer:BANDwidth|BWIDth <Percentage>**

This command defines the percentage of the power with respect to the total power.

This value is the basis for the occupied bandwidth measurement (see [\[SENSe:\]POWer:ACHannel:PRESet](#) on page 213).

**Parameters:**

<Percentage> 10 to 99.9PCT  
\*RST: 99PCT

**Example:**

POW:BWID 95PCT

**Mode:**

A-F, CDMA, EVDO, TDS

**[SENSe:]POWer:HSPeed <State>**

This command switches on or off the high-speed channel/adjacent channel power measurement. The measurement itself is performed in zero span on the center frequencies of the individual channels. The command automatically switches to zero span and back.

Depending on the selected mobile radio standard, weighting filters with characteristic or very steep-sided channel filters are used for band limitation.

**Parameters:**

<State> ON | OFF  
\*RST: OFF

**Example:**

POW:HSP ON

**Mode:**

A-F, CDMA, EVDO, TDS, WCDMA

**[SENSe:]POWer:NCORrection <Mode>**

Activates or deactivates a noise correction measurement.

**Parameters:**

&lt;Mode&gt;

**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.

\*RST: OFF

**Example:**

POW:NCOR ON

**Mode:**

A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, TDS, WCDMA

**[SENSe:]POWer:TRACe <TraceNumber>**

This command assigns the channel/adjacent channel power measurement to the indicated trace. The corresponding trace must be active, i.e. its state must be different from blank.

**Note:** The measurement of the occupied bandwidth (OBW) is performed on the trace on which marker 1 is positioned. To evaluate another trace, marker 1 must be positioned to another trace with `CALCulate<n>:MARKer<m>:TRACe`.

**Parameters:**

<TraceNumber> 1 to 6

**Example:**

POW:TRAC 2

Assigns the measurement to trace 2.

**Mode:**

A, CDMA, EVDO, TDS, WCDMA

**4.6.3.6 SENSe:SWEep subsystem**

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---

### [SENSe:]SWEep:COUNT <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

#### Parameters:

<NumberSweeps> 0 to 32767  
 \*RST: 0 (GSM: 200, 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.
```

**Mode:** A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, GSM, NF

---

### [SENSe:]SWEep:EGATe <State>

This command switches on/off the sweep control by an external gate signal. If the external gate is selected the trigger source is automatically switched to EXTERNAL as well.

In case of measurement with external gate, the measured values are recorded as long as the gate is opened. During a sweep the gate can be opened and closed several times. The synchronization mechanisms with \*OPC, \*OPC? and \*WAI remain completely unaffected.

The sweep end is detected when the required number of measurement points (691 in "Spectrum" mode) has been recorded.

#### Parameters:

<State> ON | OFF  
 \*RST: OFF

**Example:**

```
SWE:EGAT ON
Switches on the external gate mode.
SWE:EGAT:TYPE EDGE
Switches on the edge-triggered mode.
SWE:EGAT:HOLD 100US
Sets the gate delay to 100 µs.
SWE:EGAT:LEN 500US
Sets the gate opening time to 500 µs.
INIT;*WAI
Starts a sweep and waits for its end.
```

**Mode:** A, BT, EVDO, TDS, WLAN, OFDM, OFDMA/WiBro

#### [SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

This command defines the delay time between the external gate signal and the continuation of the sweep.

**Note:** Using gate mode "level" (see [SENSe:]SWEep:EGATe:TYPE on page 222) and an IFP trigger (see TRIGger<n>[:SEQuence]:SOURce on page 241), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

**Parameters:**

```
<DelayTime>      0 s to 30 s
*RST:            0s
```

**Example:** SWE:EGAT:HOLD 100us

**Mode:** A, ADEMOD, BT, EVDO, TDS

#### [SENSe:]SWEep:EGATe:LENGth <TimeInterval>

In case of edge triggering, this command determines the time interval during which the instrument sweeps.

**Parameters:**

```
<TimeInterval>  125 ns to 30 s
*RST:            400µs
```

**Example:** SWE:EGAT:LENG 10ms

**Mode:** A, BT, EVDO, TDS

#### [SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

**Parameters:**

```
<Polarity>      POSitive | NEGative
*RST:            POSitive
```

**Example:** `SWE:EGAT:POL POS`  
**Mode:** A, ADEMOD, BT, EVDO, TDS, WCDMA

**[SENSe:]SWEep:EGATe:SOURce <Source>**

This command toggles between the available signal sources for the gate mode. If an IF power signal is used, the gate is opened as soon as a signal at > -20 dBm is detected within the IF path bandwidth (10 MHz).

**Parameters:**  
 <Source> EXTernal | IFPower | VIDEo | RFPower | PSEN  
 \*RST: IFPower

**Example:** `SWE:EGAT:SOUR IFP`  
 Switches the gate source to IF power.

**Mode:** A, ADEMOD, BT, EVDO, TDS, WCDMA, CDMA

**[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"`

**Mode:** A, BT, EVDO, TDS

**[SENSe:]SWEep:EGATe:TRACe<k>: PERiod <Value>**

This command defines the length of the period to be traced using gated triggering.

**Suffix:**  
 <k> 1...6  
 trace

**Parameters:**  
 <Value> <numeric value>  
 \*RST: 0 s

**Example:** `SWE:EGAT:TRAC1:PER 5ms`  
 Defines the period for gated triggering to 5 ms.

**Mode:** A, BT, EVDO, TDS

**[SENSe:]SWEep:EGATe:TRACe<k>:START<range>** <Value>

This command defines the starting point for the range to be traced using gated triggering.

**Suffix:**

|         |                |
|---------|----------------|
| <k>     | 1...6<br>trace |
| <range> | 1...3<br>range |

**Parameters:**

|         |                              |
|---------|------------------------------|
| <Value> | <numeric value><br>*RST: OFF |
|---------|------------------------------|

**Example:**

```
SWE:EGAT:TRAC1:STAR1 3ms
```

Sets the Starting point for range 1 on trace 1 at 3 ms.

**Mode:** A, BT, EVDO, TDS

**[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>]** <State>

This command activates or deactivates tracing for a specific range using gated triggering.

**Suffix:**

|         |                |
|---------|----------------|
| <k>     | 1...6<br>trace |
| <range> | 1...3<br>range |

**Parameters:**

|         |                       |
|---------|-----------------------|
| <State> | ON   OFF<br>*RST: OFF |
|---------|-----------------------|

**Example:**

```
SWE:EGAT:TRAC1:STAT1 ON
```

Activates tracing for range 1 of trace 1.

**Mode:** A, BT, EVDO, TDS

**[SENSe:]SWEep:EGATe:TYPE** <Type>

This command sets the type of triggering by the external gate signal.

A delay between applying the gate signal and the start of recording measured values can be defined, see [\[SENSe:\]SWEep:EGATe:HOLDoFF](#) on page 220.

**Parameters:**

&lt;Type&gt; 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 241), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

**EDGE**

The gate is edge-triggered:

After detection of the set gate signal edge, the gate remains open until the gate delay (`[SENSe:]SWEep:EGATe:HOLDoff`) has expired.

\*RST: EDGE

**Example:**`SWE:EGAT:TYPE EDGE`**Mode:**

A, ADEMOD, BT, EVDO, TDS

**[SENSe:]SWEep:EGATe:TRACe<k>: STOP<range> <Value>**

This command defines the stopping point for the range to be traced using gated triggering

**Suffix:**

<k> 1...6  
trace

<range> 1...3  
range

**Parameters:**

<Value> <numeric value>

\*RST: 1  $\mu$ s

**Example:**`SWE:EGAT:TRAC1:STOP1 5ms`

Sets the stopping point for range 1 on trace 1 at 5 ms.

**Mode:**

A, BT, EVDO, TDS

**[SENSe:]SWEep:POINts <NumberPoints>**

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

**Parameters:**

<NumberPoints>      Range:      101 to 32001  
 \*RST:                  691

**Example:**              SWE:POIN 251

**Mode:**                  A, ADEMOD, BT, CDMA, EVDO, TDS, NF, PHN, WCDMA

**[SENSe:]SWEep:TIME <Time>**

This command defines the sweep time.

The range depends on the frequency span.

**Parameters:**

<Time>                    refer to data sheet  
 \*RST:                  (AUTO is set to ON)

**Example:**              SWE:TIME 10s

**Mode:**                  ALL

**[SENSe:]SWEep:TIME:AUTO <State>**

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If [SENSe:]SWEep:TIME is used, automatic coupling is switched off.

**Parameters:**

<State>                    ON | OFF  
 \*RST:                  ON

**Example:**              SWE:TIME:AUTO ON  
 Activates automatic sweep time.

**Mode:**                  A, BT, CDMA, EVDO, RT, TDS, NF, WCDMA

**[SENSe:]SWEep:TYPE <Type>****Parameters:**

<Type>                    SWE | AUTO | FFT  
**SWE**  
 Sweep list  
**AUTO**  
 Automatic selection of the sweep type.  
**FFT**  
 FFT mode  
 \*RST:                  AUTO  
 Sets the sweep type.



**Example:**           SWE:TYPE FFT  
**Mode:**             all

#### 4.6.3.7 Other Commands in the SENSe Subsystem

---

##### [SENSe:]AVERAge<n>:COUNT <NoMeasurements>

This command defines the number of measurements which contribute to the average value in the window specified by the AVERAge<n> suffix.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the [SENSe<source>:]SWEep:COUNT command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

**Suffix:**

<n>                   window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

**Parameters:**

<NoMeasurements> 0 to 32767  
 \*RST:            0

**Example:**

```
SWE:CONT OFF
Switching to single sweep mode.
AVER:COUN 16
Sets the number of measurements to 16.
AVER:STAT ON
Switches on the calculation of average.
INIT;*WAI
Starts the measurement and waits for the end of the 16 sweeps.
```

**Mode:**             all

---

##### [SENSe:]AVERAge<n>[:STATe<Trace>] <State>

This command switches on or off the average calculation for the selected trace in the window specified by the AVERAge<n> suffix.

**Suffix:**

<n>                   window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<Trace>             1...6  
 trace

## Status Reporting System of the TD-SCDMA Measurement Applications (K76/K77)

|                    |                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Parameters:</b> |                                                                                                                                    |
| <State>            | ON   OFF                                                                                                                           |
|                    | *RST: OFF                                                                                                                          |
| <b>Example:</b>    | AVER OFF<br>Switches off the average calculation for trace 1.<br>AVER:STAT3 ON<br>Switches on the average calculation for trace 3. |
| <b>Mode:</b>       | all                                                                                                                                |

## 4.7 Status Reporting System of the TD-SCDMA Measurement Applications (K76/K77)

Detailed information on the status registers of the base system is given in section Status Reporting System. In this section, only the new and altered status registers for the "TD-SCDMA" options (K76/K77) are described.

The `STATUS:QUESTIONABLE:SYNC` register contains information on the error situation in the code domain analysis of the "TD-SCDMA" option. The bits can be queried with commands `STATUS:QUESTIONABLE:SYNC:CONDITION` and `STATUS:QUESTIONABLE:SYNC[:EVENT]`.

---

### STATUS:QUESTIONABLE:SYNC:CONDITION?

This command reads the information on the error situation in the code domain power analysis.

|                       |                                                                                                                       |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Return values:</b> |                                                                                                                       |
| <Result>              | If the result is ON, an error occurred. Details can be obtained using <code>STATUS:QUESTIONABLE:SYNC[:EVENT]</code> . |
|                       | *RST: OFF                                                                                                             |
| <b>Example:</b>       | STAT:QUES:SYNC:COND?                                                                                                  |
| <b>Usage:</b>         | Query only                                                                                                            |
| <b>Mode:</b>          | TDS                                                                                                                   |

---

### 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.

|                 |                         |
|-----------------|-------------------------|
| <b>Example:</b> | STAT:QUES:SYNC[:EVENT]? |
| <b>Usage:</b>   | Query only              |
| <b>Mode:</b>    | TDS                     |

| Bit no. | Meaning                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0       | Not used in R&S FSV-K76/-K77 applications                                                                                                                                                                                                                                                                                                                                                                                         |
| 1       | <p>K76 Frame sync failed</p> <p>This bit is set when synchronization is not possible within the application.</p> <p>The reasons for this can be:</p> <ul style="list-style-type: none"> <li>• Invalid frequency</li> <li>• Invalid level</li> <li>• Invalid scrambling code</li> <li>• Invalid max. number of MA Shifts Cell</li> <li>• Invalid values for INVERT Q or SIDEBAND INV</li> <li>• Invalid signal on input</li> </ul> |
| 2 to 14 | Not used in the R&S FSV-K76/-K77 applications                                                                                                                                                                                                                                                                                                                                                                                     |
| 15      | This bit is always 0.                                                                                                                                                                                                                                                                                                                                                                                                             |

## 4.8 TRACe Subsystem

This chapter describes the `TRACe<n>[:DATA]` command and its characteristics for the measurement application.

---

`TRACe<n>[:DATA]? LIST | TRACE1 | TRACE2 | TRACE3 | TRACE4, <block> | <numeric value>`

This command reads trace data from the R&S FSV.

The behaviour of the command is the same as in the base unit for RF measurements. For code domain measurements and the Power vs Time measurement, find a description of the behaviour of the command below.

- **Code Domain Power (absolute and relative)**

For the Code Domain Power result display, the command returns four values for each channel in the following order:

`<code class>, <code number>, <level>, <power detection>`

Refer to the description below for more details on the return values.

The query returns a maximum of 16 channels. Channels that consist of more than one code are returned as one channel.

So, for example, consider the following configuration (three active channels out of a total of 12):

- DPCH, 1.16, (CC4), -7.0 dB
- DPCH, 2.8, (CC3), -7.3 dB
- DPCH, 3.4, (CC2), -8.0 dB

In this example, the command would return the following string (active channels in **bold**):

```
4, 1, -7.0, 1, 4, 2, -55.1, 0, 3, 2, -7.3, 1, 4, 5, -56.3, 0,
4, 6, -55.8, 0, 4, 7, -57.0, 0, 2, 3, -8.0, 1, 4, 13, -55.8,
0, 4, 14, -56.3, 0, 4, 15, -55.9, 0, 4, 16, -57.3, 0
```

- **Code Domain Error Power**

For the Code Domain Error Power result display, the command returns four values for each channel in the following order:

<code class>, <code number>, <level>, <power detection>

Refer to the description below for more details on the return values.

The query returns a maximum of 16 codes. One value is returned for every code.

So, for example, consider the following configuration (three active channels out of a total of 12):

- DPCH, 1.16, (CC4), -7.0 dB
- DPCH, 2.8, (CC3), -7.3 dB
- DPCH, 3.4, (CC2), -8.0 dB

In this example, the command would return the following string (active channels in **bold**):

```
4, 1, -54.5, 1, 4, 2, -55.1, 0, 3, 2, -56.3, 1, 4, 3, -56.2,
1, 4, 5, -56.3, 0, 4, 6, -55.8, 0, 4, 7, -57.0, 0, 4, 8, -56.7,
0, 2, 3, -56.2, 1, 4, 10, -56.5, 1, 4, 11, -55.8, 1, 4, 12,
-55.9, 1, 4, 13, -55.8, 0, 4, 14, -56.3, 0, 4, 15, -55.9, 0,
4, 16, -57.3, 0
```

#### • Channel Table

For the Channel Table result display, the command returns 11 values in the following order:

<channel type>, <code class>, <code number>, <modulation type>, <absolute level in dBm>, <relative level in dB>, <midamble shift>, <mid1>, <mid1>, <reserved1>, <reserved2>

The output depends on the channel sorting order. When using code sorting order, all midambles are output first, then control channels and last the data channels. When using midamble sorting order, each midamble is output with its corresponding control and data channel.

So, for example, consider the following configuration (three active channels in common midamble allocation):

- Midamble m(3), -3.0 dBm
- DPCH, 1.16, QPSK, -7.78 dB
- DPCH, 2.8, QPSK, -7.78 dB
- DPCH, 3.4, 8PSK, -7.78 dB

In this example, the command would return the following string:

```
1, 0, 0, 0, -3.0, 0, 3, 0.005, 0.005, 0, 0 2 , 4, 1, 1, -7.78,
-4.78, 3, 0, 0, 0, 0 2 , 3, 2, 1, -7.78, -4.78, 3, 0, 0, 0,
0 2 , 2, 3, 2, -7.78, -4.78, 3, 0, 0, 0, 0 0 , 4, 2, 1, -46.9,
-43.9, 3, 0, 0, 0, 0 0 , 4, 5, 1, -46.9, -43.9, 3, 0, 0, 0,
0 0 , 4, 6, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 7, 1, -46.9,
-43.9, 3, 0, 0, 0, 0 0 , 4, 8, 1, -46.9, -43.9, 3, 0, 0, 0,
0 0 , 4, 13, 1, -46.9, -43.9, 3, 0, 0, 0, 0 0 , 4, 14, 1, -46.9,
-43.9, 3, 0, 0, 0, 0 0 , 4, 15, 1, -46.9, -43.9, 3, 0, 0, 0,
0 0 , 4, 16, 1, -46.9, -43.9, 3, 0, 0, 0, 0
```

#### • Result Summary

For the Result Summary, the command returns 25 values in the following order:

<slot>, <pdata>, <pd1>, <pd2>, <pmidamble>, <rho>, <maccuracy>, <pcdererror>, <ferror>, <cerror>, <tframe>, <iqimbalance>, <iqoffset>, <active>, <srates>, <chan-

nel>, <sfactor>, <cdprelative>, <cdpabsolute>, <evmrms>, <evmpeak>, <reserved1>, <reserved2>, <reserved3>, <reserved4>

- **Power vs Slot**

For the Power vs Slot result display, the command returns three values in the following order:

Power vs Slot Absolute: <slot number>, <level in dbm>, <validity>

Power vs Slot Relative: <slot number>, <level in db>, <validity>

The number of triplets the command returns depends on the capture length.

- **Peak Code Domain Error**

For the Peak Code Domain Error result display, the command returns two values in the following order:

Power vs Slot Absolute: <slot>, <level in dbm>, <validity>

The number of pairs the command return depends on the capture length.

- **Composite EVM**

For the Composite EVM result display, the command returns two values for every slot in the following order:

<slot 0>, <maccuracy 0>, ..., <slot n>, <maccuracy n>

The number of pairs the command return depends on the capture length.

- **Symbol EVM**

For the Symbol EVM result display, the command returns one value for each symbol:

<value in % symbol 0>, <value in % symbol 1>, ..., <value in % symbol n>

The number of symbols depends on the spreading factor:

- Spreading Factor 16: 44 symbols
- Spreading Factor 8: 88 symbols
- Spreading Factor 4: 176 symbols
- Spreading Factor 2: 352 symbols
- Spreading Factor 1: 704 symbols

- **Power vs Symbol**

For the Power vs Symbol result display, the command returns one value for each symbol:

<value in dbm symbol 0>, <value in dbm symbol 1>, ..., <value in % symbol n>

The number of symbols depends on the spreading factor:

- Spreading Factor 16: 44 symbols
- Spreading Factor 8: 88 symbols
- Spreading Factor 4: 176 symbols
- Spreading Factor 2: 352 symbols
- Spreading Factor 1: 704 symbols

- **Symbol Constellation**

For the Symbol Constellation result display, the command returns one value each for the real and imaginary parts of every symbol:

<re 0>, <im 0>, <re 1>, <im 1>, ..., <re n>, <im n>

The number of symbols depends on the spreading factor:

- Spreading Factor 16: 44 symbols
- Spreading Factor 8: 88 symbols
- Spreading Factor 4: 176 symbols
- Spreading Factor 2: 352 symbols

- Spreading Factor 1: 704 symbols
- **Composite Constellation**  
For the Composite Constellation result display, the command returns one value each for the real and imaginary parts of every data chip:  
<re 0>, <im 0>, <re 1>, <im 1>, ..., <re 703>, <im 703 >
- **Bit Stream**  
For the Bitsream result display, 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 bits depends on the modulation and the spreading factor:
  - **Spreading Factor 16**  
QPSK: 88 bits, 8PSK: 132 bits, 16QAM: 176 bits, 64QAM: 264 bits
  - **Spreading Factor 8**  
QPSK: 176 bits, 8PSK: 264 bits, 16QAM: 352 bits, 64QAM: 528 bits
  - **Spreading Factor 4**  
QPSK: 352 bits, 8PSK: 528 bits, 16QAM: 704 bits, 64QAM: 1056 bits
  - **Spreading Factor 2**  
QPSK: 704 bits, 8PSK: 1056 bits, 16QAM: 1408 bits, 64QAM: 2112 bits
  - **Spreading Factor 1**  
QPSK: 1408 bits, 8PSK: 2112 bits, 16QAM: 2816 bits, 64QAM: 4224 bits

**Suffix:**

<n>                    1...4  
                          irrelevant

**Query parameters:**

LIST                    Queries the results of the Spectrum Emission Mask.  
                          Refer to the `TRAC:DATA` command of the base unit for a more detailed description.

TRACE1 | TRACE2 |    Selects the trace to be queried.  
TRACE3 | TRACE4

**Return values:**

<active>                Shows the number of active channels.

<code class>           Shows the number of active channels.  
                          Code class of the channel. The code class specifies the spreading factor of the channel. The range is **{0...4}**.  
                          **0** = spreading factor 1  
                          **1** = spreading factor 2  
                          **2** = spreading factor 4  
                          **3** = spreading factor 8  
                          **4** = spreading factor 16  
                          For the data rates refer to the [channel characteristics](#).

<cdpabsolute>         Absolute channel power in dBm. The range is **{-∞...∞}**

<cdprelative>         Relative channel power in dB. The range is **{-∞...∞}**

<cerror>                Chip Rate Error in ppm.

|                                  |                                                                                                                                                                      |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <channel>                        | Channel number. The range is <b>{1...16}</b> . The number of channels depends on the spreading factor                                                                |
| <channel type>                   | <b>0</b> = inactive<br><b>1</b> = midamble<br><b>2</b> = DPCH<br><b>3</b> = P-CCPCH<br><b>4</b> = S-CCPCH<br><b>5</b> = FPACH<br><b>6</b> = PDSCH<br><b>7</b> = PICH |
| <code number>                    | Code number of the channel, range is <b>{1...16}</b> . The number of channels depends on the spreading factor.                                                       |
| <evmpeak>                        | Maximum value of the EVM.                                                                                                                                            |
| <evmrms>                         | Average value of the EVM.                                                                                                                                            |
| <ferror>                         | Frequency Error in Hz.                                                                                                                                               |
| <ciqimbalance> and<br><iqoffset> | IQ Imbalance and IQ Offset in %.                                                                                                                                     |
| <level>                          | Power level of the channel in dB or dBm. The range is <b>{-∞...∞}</b>                                                                                                |
| <maccuracy>                      | Composite EVM in %.                                                                                                                                                  |
| <mid1> and<br><mid2>             | Power offset between sum power of channels (belonging to midamble(k), only data field 1/2 and midamble(k) Power                                                      |
| <midamble shift>                 | Midamble Shift of the channel.                                                                                                                                       |
| <modulation type>                | Modulation type of the channel<br><b>0</b> = invalid (for midamble)<br><b>1</b> = QPSK<br><b>2</b> = 8PSK<br><b>3</b> = 16QAM<br><b>4</b> = 64QAM                    |
| <pcdererror>                     | Peak Code Domain Error in dB.                                                                                                                                        |
| <pd1> and <pd2>                  | Power of the data parts over all channels in dB. The range is <b>{-∞...∞}</b>                                                                                        |
| <pdata>                          | Mean power of both data parts (P1 and P2) over all channels in dBm. The range is <b>{-∞...∞}</b>                                                                     |
| <pmidamble>                      | Power of the midamble in dB. The range is <b>{-∞...∞}</b>                                                                                                            |
| <power detection>                | <b>0</b> - inactive channel<br><b>1</b> - active channel                                                                                                             |
| <rho>                            | Rho. The range is <b>{0...1}</b> .                                                                                                                                   |
| <sfactor>                        | Spreading Factor of the channel. The range is <b>{1...16}</b> .                                                                                                      |
| <slot>                           | Slot number. The range depends on the capture length.                                                                                                                |
| <srates>                         | Data rate is kbps.                                                                                                                                                   |

|               |                                                                                                                                                                               |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <tframe>      | Trigger to Frame in ms.<br>This value is valid only after successful synchronization to the TD-SCDMA signal. When using the Free Run trigger mode, the command returns a '9'. |
| <validity>    | <b>0</b> = inactive channel<br><b>1</b> = active channel<br><b>2</b> = alias channel. The code class of these channels is <4, i.e. a channel consists of more than one code.  |
| <b>Usage:</b> | Query only                                                                                                                                                                    |

## 4.9 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 here.

See also [chapter 4.6.3, "Other SENSE Commands Referenced in this Manual"](#), on page 188 and [chapter 4.2.3, "Other CALCulate Commands Referenced in this Manual"](#), on page 135 .

|       |                                |     |
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### 4.9.1 INPut commands

---

#### INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

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

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the 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



**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.

**Mode:** All

**INPut:COUPling** <CouplingType>

Toggles the RF input of the R&S FSV 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

**Mode:** A, ADEMOD, BTS, CDMA, EVDO, TDS, VSA, WCDMA

**INPut:DIQ:CDEVICE**

This command queries the current configuration and the status of the digital baseband input from the optional 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.<br><b>Not Started</b><br><b>Has to be Started</b><br><b>Started</b><br><b>Passed</b><br><b>Failed</b><br><b>Done</b> |
| <PRBSTestState>   | State of the PRBS test.<br><b>Not Started</b><br><b>Has to be Started</b><br><b>Started</b><br><b>Passed</b><br><b>Failed</b><br><b>Done</b>                                                          |
| <SampleRateType>  | <b>0</b><br>Maximum sampling rate is displayed<br><b>1</b><br>Current sampling rate is displayed                                                                                                      |
| <Placeholder>     | for future use; currently "0"                                                                                                                                                                         |
| <b>Example:</b>   | INP:DIQ:CDEV?<br>Result:<br>1,SMU200A,103634,Out<br>A,70000000,100000000,Passed,Not Started,0,0                                                                                                       |
| <b>Mode:</b>      | IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMODO, TDS                                                                                                                                                         |

---

#### INPut:DIQ:RANGe:AUTO <State>

If enabled, the digital input fullscale level is automatically set to the value provided by the connected device (if available).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

#### Parameters:

<State> ON | OFF  
\*RST: OFF

**Example:** INP:DIQ:RANG:AUTO ON

**Mode:** IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMODO, 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

**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 48).

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

**INPut:DIQ:RANGe[:UPPer]:UNIT** <Unit>

Defines the unit of the full scale level (see "[Level Unit](#)" on page 48). The availability of units depends on the measurement application you are using.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

**Parameters:**

<Level>                    V | dBm | dBpW | W | dBmV | dBuV | dBuA | A  
\*RST:                    Volt

**Example:**                INP:DIQ:RANG:UNIT A

**Mode:** IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

**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 48).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

**Parameters:**

<SampleRate>      Range:      1 Hz to 10 GHz  
                          \*RST:      32 MHz

**Example:**            INP:DIQ:SRAT 200 MHz

**Mode:**                A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

**INPut:DIQ:SRATe:AUTO** <State>

If enabled, the sample rate of the digital baseband IQ input signal is set automatically by the connected device, if the currently used sample rate is provided (indicated by the <SampleRateType> parameter in the result of the `INPut:DIQ:CDEvice` command).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (B17) description of the base unit.

**Parameters:**

<State>                ON | OFF  
                          \*RST:      OFF

**Example:**            INP:DIQ:SRAT:AUTO ON

**Mode:**                IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

**INPut:EATT** <Attenuation>

Requires option R&S FSV-B25.

Switches the electronic attenuator on (if not already active) and allows the attenuation of the electronic attenuator to be set.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

The attenuation can be varied in 1 dB steps from 0 to 25 dB. Other entries are rounded to the next lower integer value.

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

**Parameters:**

<Attenuation> 0...25  
 \*RST: 0 dB (OFF)

**Example:**

INP1:EATT 10 dB

**Mode:**

all

**INPut:EATT:AUTO <State>**

Switches the automatic behaviour of the electronic attenuator on or off. If activated, electronic attenuation is used to reduce the operation of the mechanical attenuation whenever possible.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

**Parameters:**

<State> ON | OFF  
 \*RST: ON

**Example:**

INP1:EATT:AUTO OFF

**Mode:**

all

**INPut:EATT:STATe <State>**

Switches the electronic attenuator on or off.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

INP:EATT:STAT ON

Switches the electronic attenuator into the signal path.

**Mode:**

all

**INPut:GAIN:STATe <State>**

This command switches the preamplifier on or off (only for option RF Preamplifier, R&S FSV-B22/B24).

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using R&S Digital I/Q Interface (R&S FSV-B17).

**Parameters:**

<State> ON | OFF  
 \*RST: OFF

**Example:**

INP:GAIN:STAT ON  
 Switches on 20 dB preamplification.

**Mode:**

A, ADEMODO, BT, CDMA, EVDO, NF, PHN, WCDMA, GSM, VSA, TDS

**INPut:IMPedance <Value>**

This command sets the nominal input impedance of the instrument. The set impedance is taken into account in all level indications of results.

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

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

**Parameters:**

<Value> 50 | 75  
 \*RST: 50  $\Omega$

**Example:**

INP:IMP 75

**Mode:**

all

**INPut:SElect <Source>**

This command selects the signal source for measurements.

**Parameters:**

<Source> RF | DIQ  
**RF**  
 Radio Frequency ("RF INPUT" connector)  
**DIQ**  
 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, ADEMODO, GSM, OFDM, OFDMA/WiBro, WLAN

## 4.9.2 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.

**Mode:** A-F, ADEMOD, CDMA, EVDO, GSM, VSA, OFDM, OFDMA/  
WiBro, TDS, WCDMA, WLAN

**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.
```

**Mode:** ALL

**TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>**

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

**Suffix:**

<n> irrelevant

**Parameters:**

<Delay> Range: zero span: -sweeptime (see data sheet) to 30 s; span:  
0 to 30 s  
\*RST: 0 s

**Example:**

```
TRIG:HOLD 500us
```

**Mode:** All

**TRIGger<n>[:SEQuence]:LEVel[:EXternal] <TriggerLevel>**

This command sets the level of the external trigger source in Volt.

**Suffix:**

<n> irrelevant

**Parameters:**

<TriggerLevel> Range: 0.5 V to 3.5 V  
\*RST: 1.4 V

**Example:**

```
TRIG:LEV 2V
```

**Mode:** All

**TRIGger<n>[:SEQuence]:SLOPe <Type>**

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.



|                    |                     |
|--------------------|---------------------|
| <b>Suffix:</b>     |                     |
| <n>                | irrelevant          |
| <b>Parameters:</b> |                     |
| <Type>             | POSitive   NEGative |
|                    | *RST: POSitive      |
| <b>Example:</b>    | TRIG:SLOP NEG       |
| <b>Mode:</b>       | all                 |

---

#### TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source for the start of a sweep.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

|                    |                                                                                     |
|--------------------|-------------------------------------------------------------------------------------|
| <b>Suffix:</b>     |                                                                                     |
| <n>                | irrelevant                                                                          |
| <b>Parameters:</b> |                                                                                     |
| <Source>           | <b>IMMediate</b><br>Free Run                                                        |
|                    | <b>EXtern</b><br>External trigger                                                   |
|                    | <b>IFPower</b><br>Second intermediate frequency                                     |
|                    | <b>RFPower</b><br>First intermediate frequency                                      |
|                    | <b>TIME</b><br>Time interval                                                        |
|                    | <b>PSEN</b><br>External power sensor (requires R&S FSV-K9 option)                   |
|                    | *RST: IMMediate                                                                     |
| <b>Example:</b>    | TRIG:SOUR EXT<br>Selects the external trigger input as source of the trigger signal |
| <b>Mode:</b>       | ALL                                                                                 |

### 4.9.3 Other Referenced Commands

---

#### ABORt

This command aborts a current measurement and resets the trigger system.

|                 |                 |
|-----------------|-----------------|
| <b>Example:</b> | ABOR; INIT: IMM |
| <b>Mode:</b>    | all             |

**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

**Mode:**

all

**FORMat:DEXPort:DSEParator <Separator>**

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

**Parameters:**

<Separator> POINT | COMMA

\*RST: (factory setting is POINT; \*RST does not affect setting)

**Example:**

FORM:DEXP:DSEP POIN

Sets the decimal point as separator.

**Mode:**

all

**INITiate<n>:CONMeas**

This command 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.
```

**Mode:** A, ADEMOD, CDMA, EVDO, VSA, WCDMA, TDS

**INITiate<n>:CONTInuous <State>**

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

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

**INITiate<n>:ESPectrum**

This command starts a Spectrum Emission Mask measurement.

**Suffix:**

<n> irrelevant

**Example:**

```
INIT:ESP
Starts a Spectrum Emission Mask measurement.
```

**Mode:** A, CDMA, EVDO, TDS, WCDMA

**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.

**Mode:** A, ADEMOD, CDMA, EVDO, NF, TDS, WCDMA

**MMEMory:STORe<n>:TRACe <Trace>, <FileName>**

This command stores the selected trace in the specified window in a file with ASCII format. The file format is described in [chapter 3.3.6, "ASCII File Export Format"](#), on page 110

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 242).

**Suffix:**

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

**Parameters:**

<Trace> 1 to 6  
selected measurement trace

<FileName> DOS file name  
The file name includes indication of the path and the drive name. Indication of the path complies with DOS conventions.

**Example:** `M MEM:STOR:TRAC 3, 'TEST.ASC'`  
Stores trace 3 in the file TEST.ASC.

**Mode:** all

**OUTPut:IF[:SOURce] <Source>**

This command switches the source of the IF output between the demodulated signal and the IF signal.

**Parameters:**

<Source> IF | VIDeo  
**IF**  
intermediate frequency output  
**VIDeo**  
video output, 200 mV  
**\*RST:** IF

**Example:** `OUTP:IF VID`  
Selects the video signal for the IF output connector.

**Mode:** A

**OUTPut:TRIGger <PortLevel>**

Sets the Trigger Out port in the Additional Interfaces (option B5 only) to low or high. Thus, you can trigger an additional device via the external trigger port, for example.

**Parameters:**

<PortLevel> LOW | HIGH  
**\*RST:** LOW

**Example:** `OUTP:TRIG HIGH`

**Mode:** A

**SYSTem:DISPlay:UPDate <State>**

In remote control mode, this command switches on or off the instrument display. If switched on, only the diagrams, traces and display fields are displayed and updated.

The best performance is obtained if the display output is switched off during remote control.

**Parameters:**

<State> ON | OFF

\*RST: OFF

**Example:**

SYST:DISP:UPD ON

**Mode:**

all

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