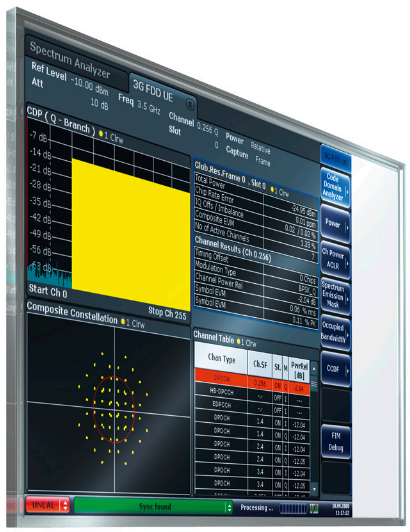
R&S® FSV-K73
Firmware Option 3GPP FDD UE Measurement
Operating Manual



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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

This manual describes the following options:

- R&S FSV-K73 (1310.8555.02)

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

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

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

Mühldorfstr. 15, 81671 München, Germany
Phone: +49 89 41 29 - 0
Fax: +49 89 41 29 12 164
Email: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com

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

Contents

1 Preface

1.1 Documentation Overview

The user documentation for the R&S FSVR is divided as follows:

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

Quick Start Guide

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

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

Operating Manuals

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

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

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

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

- R&S FSVR base unit; in addition:
  - R&S FSV-K7S Stereo FM Measurements
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis Operating Manual
  R&S FSV-K70 Vector Signal Analysis Getting Started (First measurements)
- R&S FSV-K72 3GPP FDD BTS Analysis
- R&S FSV-K73 3GPP FDD UE Analysis
- R&S FSV-K76/77 3GPP TD-SCDMA BTS/UE Measurement
- R&S FSV-K82/83 CDMA2000 BTS/MS Analysis
- R&S FSV-K84/85 1xEV-DO BTS/MS Analysis
- R&S FSV-K91 WLAN IEEE 802.11
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application
- R&S FSV-K101/K105 EUTRA / LTE Uplink Measurement Application

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

Service Manual

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

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

Online Help

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

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

1.2 Conventions Used in the Documentation

1.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

1.2.2 Conventions for Procedure Descriptions

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

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

1.2.3 Notes on Screenshots

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

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

1.3 How to Use the Help System

Calling context-sensitive and general help

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

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

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

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

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

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

Contents of the help dialog box

The help dialog box contains four tabs:

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

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

Navigating in the table of contents

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

- To change to the next tab, press the tab on the touchscreen.

Navigating in the help topics

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

Searching for a topic

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

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

Changing the zoom

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

Closing the help window

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

2 Introduction

This section contains all information required for operation of an R&S FSVR equipped with Application Firmware R&S FSV–K73. It covers operation via menus and the remote control commands for the 3GPP FDD UE user equipment test.

This part of the documentation consists of the following chapters:

- chapter 3, "Measurement Examples (R&S FSV–K73)", on page 11
  Explains some basic 3GPP°FDD user equipment tests.
- chapter 4, "Setup for User Equipment Tests", on page 20
  Describes the measurement setup for user equipment tests.
- chapter 5, "3GPP FDD UE Test Models", on page 22
  Gives an overview over the test models with different channel configurations.
- chapter 6, "Instrument Functions 3GPP User Equipment Measurements", on page 24
  Describes the instrument functions of 3GPP user equipment measurements
- chapter 7, "Configuration of 3GPP FDD UE Measurements", on page 38
  Contains a detailed description of the possible user equipment test measurements as a reference for manual operation. This chapter also presents a list of remote control commands associated with each function.
- chapter 8, "Remote Control Commands (R&S FSV–K73)", on page 108
  Describes all remote control commands defined for the code domain measurement. An alphabetic list of all remote control commands are provided at the end of this document.
- chapter 9, "Error Messages", on page 227
  Contains device-specific error messages for R&S FSV–K73.
- chapter 10, "Glossary", on page 228
  Contains an explanation of terms related to measured quantities of the code domain measurement.

This part of the documentation includes only functions of the firmware application R&S FSV-K73. For all other descriptions, please refer to the description of the base unit at the beginning of the documentation.

3 Measurement Examples (R&S FSV–K73)

This chapter gives an overview of the "Basic Settings in Code Domain Measurement Mode" and explains some basic 3GPP°FDD user equipment tests. It describes how operating and measurement errors can be avoided using correct presetting. The measurements are performed with an R&S FSVR equipped with option R&S FSV–K73.

Key settings are shown as examples to avoid measurement errors. Following the correct setting, the effect of an incorrect setting is shown.

The following measurements are performed:

- chapter 3.1, "Measurement 1: Measurement of the Signal Channel Power", on page 12
- chapter 3.2, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 13
- chapter 3.3, "Measurement 3: Measurement of the Relative Code Domain Power", on page 14
- chapter 3.4, "Measurement 4: Triggered Measurement of Relative Code Domain Power", on page 16
- chapter 3.5, "Measurement 5: Measurement of the Composite EVM", on page 17
- chapter 3.6, "Measurement 6: Measurement of Peak Code Domain Error", on page 18

The measurements are performed using the following units and accessories:

- The R&S FSVR with Application Firmware R&S FSV–K73: 3GPP FDD UE user equipment test
- The Vector Signal Generator R&S SMU with option R&S SMU-B45: digital standard 3GPP (options R&S SMU-B20 and R&S SMU-B11 required)
- 1 coaxial cable, 50Ω, approx. 1 m, N connector
- 1 coaxial cable, 50Ω, approx. 1 m, BNC connector

Basic Settings in Code Domain Measurement Mode

In the default mode after a PRESET, the R&S FSVR is in the analyzer mode. The following default settings of the code domain measurement are activated provided that the code domain analyzer mode is selected.

Parameter	Setting
Digital standard	W-CDMA 3GPP REV
Sweep	CONTINUOUS
CDP mode	CODE CHAN AUTOSEARCH
Trigger settings	FREE RUN
Trigger offset	0
Scrambling code	0

Parameter	Setting
Threshold value	-60 dB
Symbol rate	15 ksps
Code number	0
Slot number	0
Display	Screen A: Code Power Relative Screen B: result Summary

3.1 Measurement 1: Measurement of the Signal Channel Power

The measurement of the spectrum gives an overview of the 3GPP FDD UE signal and the spurious emissions close to the carrier.

1. Test setup
   Connect the RF output of the R&S SMU to the RF input of the R&S FSVR (coaxial cable with N connectors).
2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   DIGITAL STD
   a) WCDMA/3GPP
   b) SET DEFAULT
   c) LINK DIRECTION: UP/REVERSE
   d) TEST MODELS (NOT STANDARDIZED)...
   e) C+D960K
   f) STATE: ON
3. Settings on the R&S FSVR
   [**PRESET**]
   [**CENTER**: 2.1175 GHz]
   [**AMPT**: 0 dBm]
   [MODE: 3GPP FDD UE]
   [**MEAS**: POWER]

3.2 Measurement 2: Measurement of the Spectrum Emission Mask

The 3GPP specification defines a measurement, which monitors the compliance with a spectral mask in a range of at least ±12.5 MHz about the 3GPP FDD UE carrier. To assess the power emissions in the specified range, the signal power is measured in the range near the carrier by means of a 30kHz filter, in the ranges far off the carrier by means of a 1MHz filter. The resulting trace is compared to a limit line defined in the 3GPP specification.

1. Test setup
   Connect the RF output of the R&S SMU to the RF input of the R&S FSVR (coaxial cable with N connectors).
2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   DIGITAL STD
   a) WCDMA/3GPP
   b) SET DEFAULT
   c) LINK DIRECTION: UP/REVERSE
   d) TEST MODELS (NOT STANDARDIZED)...
   e) C+D960K
   f) STATE: ON
3. Settings on the R&S FSVR
   [**PRESET**]
   [**CENTER**: 2.1175 GHz]
   [**AMPT**: 0 dBm]
   [MODE: 3GPP FDD UE]
   [**MEAS**: Spectrum Emission Mask]
4. Measurement on the R&S FSVR

The following is displayed:

- Spectrum of the 3GPP FDD UE signal
- Limit line defined in the standard
- Information on limit line violations (passed/failed)

3.3 Measurement 3: Measurement of the Relative Code Domain Power

A code domain power measurement on one of the channel configurations is shown in the following. Basic parameters of CDP analysis are changed to demonstrate the effects of non-signal-adapted values.

1. Test setup
   Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference output (REF) on the rear panel of R&S SMU (coaxial cable with BNC connectors).
2. Settings on the R&S SMU
   See chapter 3.2, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 13
3. Settings on the R&S FSVR
   See chapter 3.2, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 13; in addition:
   SETUP: REFERENCE EXT
4. Measurement on the R&S FSVR
   Frequency error: The displayed frequency error should be < 10 Hz

Setting: Synchronization of the Reference Frequencies

Synchronization of the reference oscillators both of the DUT and the analyzer strongly reduces the measured frequency error.

1. Test setup
   Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference output (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).
2. Settings on the R&S SMU
   See chapter 3.2, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 13
3. Settings on the R&S FSVR
   See chapter 3.2, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 13; in addition:
   SETUP: REFERENCE EXT
4. Measurement on the R&S FSVR
   The displayed frequency error should be < 10 Hz

Note
The reference frequencies of the analyzer and of the DUT should be synchronized.

Setting: Behaviour with Deviating Center Frequency Setting

In the following, the behaviour of the DUT and the analyzer with an incorrect center frequency setting is shown.

1. Test setup
   Tune the center frequency of the signal generator in 0.5 kHz steps and watch the analyzer screen:
2. Measurement on the R&S FSVR
   a) A CDP measurement on the analyzer is still possible with a frequency error of up to approx. 1 kHz. Up to 1 kHz, a frequency error causes no apparent difference in measurement accuracy of the code domain power measurement.
   b) Above a frequency error of 1 kHz, the probability of an impaired synchronization increases. With continuous measurements, at times all channels are displayed in blue with almost the same level.
   c) Above a frequency error of approx. 2 kHz, a CDP measurement cannot be performed. The R&S FSVR displays all possible codes in blue with a similar level.
3. Settings on the R&S SMU
   FREQ: 2.1175 GHz
   a) Set the signal generator center frequency to 2.1175 GHz again:

   FREQ: 2.1175 GHz

Note
The analyzer center frequency should not differ from the DUT frequency by more than 2 kHz.

Setting: Behaviour with Incorrect Scrambling Code

A valid CDP measurement can be carried out only if the scrambling code set on the analyzer is identical to that of the transmitted signal.

1. Test setup
   SELECT BS/MS
   BS 1: ON
   SCRAMBLING CODE: 0001
   (The scrambling code is set to 0000 on the analyzer.)
2. Settings on the R&S SMU
   The CDP display shows all possible codes with approximately the same level.
3. Settings on the R&S FSVR
   Set scrambling code to new value.
   [MEAS CONFIG]
   [Sync/Scrambling Settings]
   [Scrambling Code 01]
4. Measurement on the R&S FSVR

The CDP display shows the test model again.

Note

The scrambling code setting of the analyzer must be identical to that of the measured signal.

3.4 Measurement 4: Triggered Measurement of Relative Code Domain Power

If the code domain power measurement is performed without external triggering, a section of approximately 20 ms of the test signal is recorded at an arbitrary moment to detect the start of a 3GPP FDD UE frame in this section. Depending on the position of the frame start, the required computing time can be quite long. Applying an external (frame) trigger can reduce the computing time.

1. Test setup
   a) Connect the RF output of the R&S SMU to the input of the R&S FSVR.
   b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the R&S FSVR to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).
   c) Connect the external trigger input on the rear panel of the R&S FSVR (EXT TRIG GATE) to the external trigger output on the rear panel of the R&S SMU (TRIGOUT1 of PAR DATA).
2. Settings on the R&S SMU
   See chapter 3.3, "Measurement 3: Measurement of the Relative Code Domain Power", on page 14
3. Settings on the R&S FSVR
   See chapter 3.3, "Measurement 3: Measurement of the Relative Code Domain Power", on page 14
   In addition:
   [**TRIG** EXTERN]
4. Measurement on the R&S FSVR

The following is displayed:

- Screen A: Code domain power of signal (channel configuration with 3 data channels on Q branch)
- Screen B: Numeric results of CDP measurement
- Trigger to Frame: Offset between trigger event and start of 3GPP FDD UE frame

The repetition rate of the measurement increases considerably compared to the repetition rate of a measurement without an external trigger.

Setting: Trigger Offset

A delay of the trigger event referenced to the start of the 3GPP FDD UE frame can be compensated by modifying the trigger offset.

1. Settings on the R&S FSVR:
   [**TRIG**] -> [**TRIGGER OFFSET**] -> 100 µs
2. Measurement on the R&S FSVR:
   The Trigger to Frame parameter in the numeric results table (screen B) changes:
   Trigger to Frame -> -100 µs

Note

A trigger offset compensates analog delays of the trigger event.

3.5 Measurement 5: Measurement of the Composite EVM

The 3GPP specification defines the composite EVM measurement as the average square deviation of the total signal:

An ideal reference signal is generated from the demodulated data. The test signal and the reference signal are compared with each other. The square deviation yields the composite EVM.

1. Test setup
   a) Connect the RF output of the R&S SMU to the input of the R&S FSVR.
   b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the R&S FSVR to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).
   c) Connect the external trigger input on the rear panel of the R&S FSVR (EXT TRIG GATE) to the external trigger output on the rear panel of the R&S SMU (TRIGOUT1 of PAR DATA).
2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   a) DIGITAL STD
   b) LINK DIRECTION: UP/REVERSE
   c) TEST MODELS (NOT STANDARDIZED)...
   d) C+D960K
   e) SELECT BS/MS
   f) MS 1 ON
   g) OVERALL SYMBOL RATE... 6*960
   h) STATE: ON

3. Settings on the R&S FSVR
   [PRESET]
   [CENTER: 2.1175 GHz]
   [REF: 10 dBm]
   [3GPP FDD UE]
   [TRIG EXTERN]
   [RESULTS COMPOSITE EVM]
4. Measurement on the R&S FSVR

The following is displayed:

- Screen A: Code domain power of signal, branch Q
- Screen B: Composite EVM (EVM for total signal)

3.6 Measurement 6: Measurement of Peak Code Domain Error

The peak code domain error measurement is defined in the 3GPP specification for FDD signals.

An ideal reference signal is generated from the demodulated data. The test signal and the reference signal are compared with each other. The difference of the two signals is projected onto the classes of the different spreading factors. The peak code domain error measurement is obtained by summing up the symbols of each difference signal slot and searching for the maximum error code.

1. Test setup
   a) Connect the RF output of the R&S SMU to the input of the R&S FSVR.
   b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the R&S FSVR to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).
   c) Connect the external trigger input on the rear panel of the R&S FSVR (EXT TRIG GATE) to the external trigger output on the rear panel of the R&S SMU (TRIGOUT1 of PAR DATA).
2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   DIGITAL STD
   WCDMA 3GPP
   LINK DIRECTION: UP/REVERSE
   TEST MODELS (NOT STANDARDIZED)...
   C+D960K
   SELECT BS/MS
   MS 1 ON

OVERALL SYMBOL RATE...: 6*960
STATE: ON

3. Settings on the R&S FSVR
[PRESET]
[CENTER: 2.1175 GHz]
[REF: 0 dBm]
[3GPP FDD UE]
[TRIG: EXTERN]
[RESULTS: PEAK CODE DOMAIN ERR]
4. Measurement on the R&S FSVR

The following is displayed:

- Screen A: Code domain power of signal, branch Q
- Screen B: Peak code domain error (projection of error onto the class with spreading factor 256)

4 Setup for User Equipment Tests

NOTICE

Risk of instrument damage

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

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

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

This section describes how to set up the analyzer for 3GPP FDD UE user equipment tests. As a prerequisite for starting the test, the instrument must be correctly set up and connected to the AC power supply as described in chapter 1 of the operating manual for the analyzer. Furthermore, application firmware module R&S FSV–K73 must be properly installed following the instructions provided in the operating manual for the analyzer.

Standard Test Setup

- Connect antenna output (or TX output) of UE to RF input of the analyzer via a power attenuator of suitable attenuation.
  The following values are recommended for the external attenuator to ensure that the RF input of the analyzer is protected and the sensitivity of the analyzer is not reduced too much.

Max. power	Recommended ext. attenuation
^{3}55 to 60 dBm	35 to 40 dB
^{3}50 to 55 dBm	30 to 35 dB
^{3}45 to 50 dBm	25 to 30 dB
^{3}40 to 45 dBm	20 to 25 dB
^{3}35 to 40 dBm	15 to 20 dB
^{3}30 to 35 dBm	10 to 15 dB
^{3}25 to 30 dBm	5 to 10 dB
^{3}20 to 25 dBm	0 to 5 dB
<20 dBm	0 dB

- For signal measurements at the output of two-port networks, connect the reference frequency of the signal source to the rear reference input of the analyzer (EXT REF IN/OUT).
- To ensure that the error limits specified by the 3GPP standard are met, the analyzer should use an external reference frequency for frequency measurements on user equipment. For instance, a rubidium frequency standard may be used as a reference source.
- If the user equipment is provided with a trigger output, connect this output to the rear trigger input of the analyzer (EXT TRIG GATE).

Presetting

- Enter external attenuation (REF LVL OFFSET)
- Enter reference level
- Enter center frequency
- Set the trigger
- Select standard and measurement

5 3GPP FDD UE Test Models

The possible channel configurations for the mobile station signal are limited by 3GPP. Only two different configurations for data channels DPDCH are permissible according to the specification. In addition to these two channel configurations, the HS-DPCCH channel can be transmitted to operate the mobile station in HSDPA mode. Thus, the R&S FSV–K73 checks for these channel configurations only during the automatic channel search. Therefore, channels whose parameters do not correspond to one of these configurations are not automatically detected as active channels.

The two possible channel configurations are summarized below:

Table 5-1: Channel configuration 1: DPCCH and 1 DPDCH

Channel type	Number of channels	Symbol rate	Spreading code(s)	Mapping to component
DPCCH	1	15 ksps	0	Q
DPDCH	1	15 ksps – 960 ksps	[spreading-factor/4]	I

Table 5-2: Channel configuration 2: DPCCH and up to 6 DPDCH

Channel type	Number of channels	Symbol rate	Spreading code(s)	Mapping to component
DPCCH	1	15 ksps	0	Q
DPDCH	1	960 ksps	1	I
DPDCH	1	960 ksps	1	Q
DPDCH	1	960 ksps	3	I
DPDCH	1	960 ksps	3	Q
DPDCH	1	960 ksps	2	I
DPDCH	1	960 ksps	2	Q

Table 5-3: Channel configuration 3: DPCCH, up to 6 DPDCH and 1 HS-DPCCH The channel configuration is as above in table 4-2. On HS-DPCCH is added to each channel table.

Number of DPDCH	Symbol rate all DPDCH	Symbol rate HS-DPCCH	Spreading code HS-DPCCH	Mapping to component (HS-DPCCH)
1	15 – 960 ksps	15 ksps	64	Q
2	1920 ksps	15 ksps	1	I
3	2880 ksps	15 ksps	32	Q
4	3840 ksps	15 ksps	1	I
5	4800 ksps	15 ksps	32	Q
6	5760 ksps	15 ksps	1	I

Table 5-4: Channelization code of HS-DPCCH

Nmax-dpdch (as defined in subclause 4.2.1)	Channelization code C_{ch}
1	$C_{ch,256,64}$
2,4,6	$C_{ch,256,1}$
3,5	$C_{ch,256,32}$

6 Instrument Functions 3GPP User Equipment Measurements

The R&S FSVR equipped with the 3GPP User equipment measurement option R&S FSV–K73 performs code domain power measurements on downlink signals according to the 3GPP standard (Third Generation Partnership Project, FDD mode). Signals that meet the conditions for channel configuration of 3GPP standard test models 1 to 5 can be measured, including HSDPA and HSUPA signals (test model 5). In addition to the code domain power measurements specified by the 3GPP standard, the 3GPP user equipment measurements option offers measurements with predefined settings in the frequency domain, e.g. power measurements.

To open the 3GPP UE menu

- If the 3GPP FDD UE mode is not the active measurement mode, press the MODE key and select the "3GPP FDD UE" softkey
- If the 3GPP FDD UE mode is already active, press the MENU key.

The 3GPP UE menu is displayed.

6.1 Menu and Softkey Description for CDA Measurements

This chapter describes the menus and softkeys for CDA measurements. The "Span", "Bandwidth", and "Marker Function" menus are disabled for measurements in the CDA mode. For all other measurements, the settings are described together with the measurement. The softkeys are described in chapter 7.2.6, "Softkeys and Menus for RF Measurements (K73)", on page 85.

All other menus are provided as described for the base unit. For details refer to the corresponding menu descriptions.

To display help to a softkey, press the HELP key and then the softkey for which you want to display help. To close the help window, press the ESC key. For further information refer to chapter 1.3, "How to Use the Help System", on page 8.

6.2 Measurements and Result Diagrams

The 3GPP user equipment measurement option provides Code Domain Measurements and RF measurements listed below:

Code Domain Measurements

The "Code Domain Measurement" option provides the following test measurement types and result diagrams which are available via the "Display Config" softkey or the "Display Config" button in the "Settings Overview" (see "Display Config" on page 53).

- Code Domain Power (see "Code Domain Power" on page 55)
- Code Domain Channel Table (see "Composite EVM (RMS)" on page 56)
- Code Domain Result Summary (see "Result Summary" on page 59)
- Trace Statistics(Avg, Min, Max) in Code Domain Analyzer Mode (see "Result Summary" on page 59)
- Composite EVM (see "Composite EVM (RMS)" on page 56)
- Peak Code Domain Error (see "Peak Code Domain Error" on page 56)
- Power vs Slot (see "Power vs Slot" on page 58)
- Composite Const (see "Composite Constellation" on page 58)
- Code Domain Error (see "Code Domain Error Power" on page 61)
- Power vs Symbol (see "Power vs Symbol" on page 63)
- Symbol Const (see "Symbol Constellation" on page 63)
- Symbol EVM (see "Symbol EVM" on page 63)
- Symbol Magnitude Error (see "Symbol Magnitude Error" on page 59)
- Symbol Phase Error (see "Symbol Phase Error" on page 59)
- Bitstream (see "Bitstream" on page 63)
- Freq Err vs Slot (see "Freq Err vs Slot" on page 64)
- Phase Discontinuity (see "Phase Discontinuity vs Slot" on page 64)

The code domain power measurements are performed as specified by the 3GPP standards. A signal section of approx. 20 ms is recorded for analysis and then searched through to find the start of a 3GPP FDD UE frame. If a frame start is found in the signal, the code domain power analysis is performed for a complete frame starting from slot 0. The different result diagrams are calculated from the recorded IQ data set. Therefore it is not necessary to start a new measurement in order to change the result diagram. Common settings for these measurements are performed via the settings menu (HOME key). For details refer to the "Settings Overview" on page 43 dialog box.

RF measurements

The RF Measurement option provides the following test measurement types and result displays:

- Output Power (see chapter 7.2.1, "Output Power Measurements", on page 82)
- Adjacent Channel Power (ACLR) (see chapter 7.2.3, "Adjacent Channel Power (ACLR)", on page 83)
- Spectrum Emission Mask (see chapter 7.2.2, "Spectrum Emission Mask", on page 82)
- Occupied Bandwidth (see chapter 7.2.4, "Occupied Bandwidth", on page 84)
- CCDF (see chapter 7.2.5, "CCDF", on page 84)

All these measurements are accessed via the MEAS key (measurement menu). Some parameters are set automatically according to the 3GPP standard. A list of these parameters is given with each measurement type. A set of parameters is passed on from the 3GPP user equipment measurements option to the base unit and vice versa in order to provide a quick swap (see the following table).

Transferred parameters
center frequency
reference level
attenuation
reference level offset
trigger source

6.3 Working with the Frequency Mask Trigger

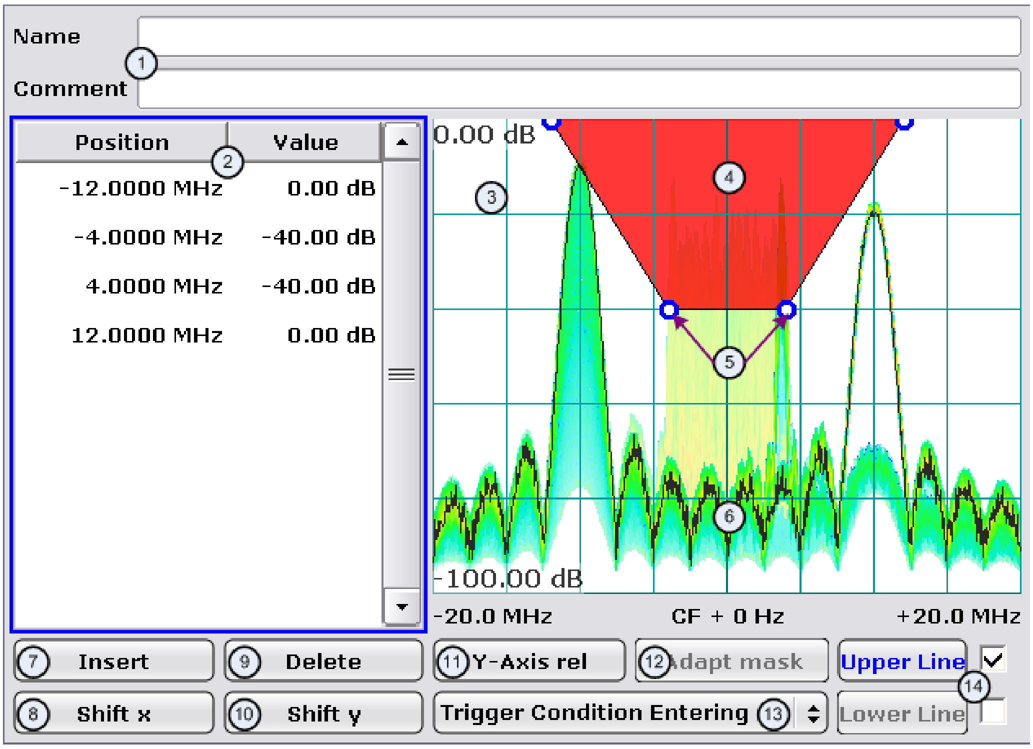
The Frequency Mask Trigger (FMT) is a trigger designed to trigger measurements if the signal violates certain conditions with respect to a frequency mask that you can define prior to the measurement.

Availability of the frequency mask trigger

Note that the frequency mask trigger is available for code domain analysis only.

To create and edit a frequency mask, you can access the corresponding dialog box via the "Frequency Mask" softkey in the trigger menu.

Opening the dialog box also opens a softkey submenu that contains various functionality to work with frequency masks.



1 = Name and description of the frequency mask
2 = Mask point table: table containing all mask points
3 = Preview pane
4 = Frequency mask preview: the area the frequency mask currently covers is red
5 = Frequency mask data points: define the shape of the frequency mask
6 = Preview of the current measurement trace; type and shape depend on currently selected measurement
7 = Insert button: insert a new data points
8 = Shift X button: shifts the complete frequency mask horizontally
9 = Delete button: deletes an existing data points
10 = Shift Y button: shifts the complete frequency mask vertically
11 = Y-Axis Rel/Abs button: switches between relative (dB) and absolute (dBm) amplitude values
12 = Adapt Mask button: creates a frequency mask automatically
13 = Trigger Condition menu: sets the trigger condition
14 = Activate Line buttons: select the upper and lower frequency mask; check marks next to the buttons activate and deactivate a line

6.3.1 Creating a Frequency Mask

Upon opening the "Edit Frequency Mask" dialog box, the R&S FSVR already provides a basic structure of an upper frequency mask in the live preview window.

It is also possible to create a new mask by pressing the "New Mask" softkey. The "New Mask" softkey resets the current shape of the mask to its default state.

Labelling a frequency mask
Assign a name to the frequency mask in the "Name" field. Activate the input in the "Name" field either by touching it or via the "Edit Name" softkey. This is also the save name of the frequency mask.

In addition to naming the mask, you can also comment on the frequency mask you are working on in the "Comment" field. Again, activate the input either by touching it or with the "Edit Comment" softkey.

Remote command:
`CALCulate<n>:MASK:COMMent` on page 154
`CALCulate<n>:MASK:NAME` on page 156

Defining the frequency mask span
Define the span of the frequency mask.

The span defines the range that the frequency mask covers on the frequency axis.

Remote command:
`CALCulate<n>:MASK:SPAN` on page 156

Working with upper and lower lines
A frequency mask may have an upper and a lower threshold, with the signal in between. The checkboxes next to the "Upper Line" and "Lower Line" buttons activate or deactivate the corresponding line. Note that it is not possible to deactivate both lines.

You can select the line you want to edit with the "Upper Line" / "Lower Line" buttons or by touching the corresponding area in the preview to apply any changes. The buttons turn blue if a line is selected and the R&S FSVR shows the data points in the area covered by the mask in the preview pane.

Remote command:
`CALCulate<n>:MASK:LOWer[:STATe]` on page 155
`CALCulate<n>:MASK:UPPer[:STATe]` on page 157

Setting the trigger condition
To make the trigger work, you need to set a trigger condition with the "Trigger Condition" button. The R&S FSVR supports four conditions.

"Entering" Activates the trigger as soon as the signal enters the frequency mask.
To arm the trigger, the signal initially has to be outside the frequency mask.

"Leaving" Activates the trigger as soon as the signal leaves the frequency mask.
To arm the trigger, the signal initially has to be inside the frequency mask.

Remote command:
`TRIGger<n>[:SEQuence]:MASK:CONDition` on page 221

6.3.2 Editing Mask Points

You can adjust the frequency mask any way you want by adding, removing and repositioning frequency mask data points.

Data points define the shape of the frequency mask. In the preview pane, the R&S FSVR visualizes data points as blue circles. In addition, all data point positions are listed in the data point table. The number of data points is limited to 801.

Data points are defined by two values. The first value defines the position of the data point on the horizontal (frequency) axis. Frequency information is relative to the center frequency.

Note that in realtime mode, the span depends on the realtime bandwidth. That also means that the distance of a data point to the center frequency can never exceed 20 MHz as the maximum realtime bandwidth is 40 MHz.

The second value defines the position of the data point on the vertical (level) axis. By default, level information is relative to the reference level. You can, however, turn the level axis to absolute scaling with the "Y-Axis Abs/Rel" button. This also changes the unit of the vertical axis (dB for relative data points, dBm for absolute data points).

Adding data points
To add a new data point, press the "Insert" button or the "Insert Value Above" softkey. The R&S FSVR always adds the data point to the left (or in case of the table, above) of the currently selected data point. The currently selected data point is highlighted gray in the table. If no data point was selected previously, the buttons add a new point next to the very first one.

Deleting data points
The "Delete" button or the "Delete Value" softkey remove a data point from the mask. The R&S FSVR deletes the currently selected data point. If no data point is selected, it deletes the first one. The "Delete" button is inactive in that case.

Positioning data points
There are two ways to move a single data point.

In the preview pane, you can drag around the data points on the touchscreen or with a mouse and position it roughly in the place you want it to be. A more exact method is to edit the data point table itself end enter the frequencies and levels as you need.

Remote command:
`CALCulate<n>:MASK:LOWer[:DATA]` on page 155
`CALCulate<n>:MASK:UPPer[:DATA]` on page 158

Shifting mask points as a whole
With the "Shift X" and "Shift Y" buttons you are able to move all mask points of a frequency mask as one. The "Shift X" button moves the mask point set horizontally, while the "Shift Y" button moves them vertically. This is an easy method to move mask points if the relative position of mask points to each other is alright already without adjusting each one by itself.

Remote command:
`CALCulate<n>:MASK:LOWer:SHIFt:X` on page 155
`CALCulate<n>:MASK:LOWer:SHIFt:Y` on page 155
`CALCulate<n>:MASK:UPPer:SHIFt:X` on page 157
`CALCulate<n>:MASK:UPPer:SHIFt:Y` on page 157

Automatic alignment of the frequency mask
Instead of defining the position of every data point by hand, the R&S FSVR is able to shape the frequency mask according to the shape of the current signal. On pressing the "Auto Set Mask" button, the R&S FSVR forms the frequency mask around the current spectrum.

Note the the automatic alignment of the frequency mask works only for the upper frequency mask.

Remote command:
`CALCulate<n>:MASK:UPPer[:DATA]` on page 158

6.3.3 Managing Frequency Masks

To be able to reuse or edit a frequency mask that you have defined later, you can save and restore particular frequency mask configurations.

The R&S FSVR stores files that contain such configurations on its internal hard disk.

Save Mask
The "Save" softkey opens a dialog box to save the current frequency mask configuration in a file.

If you do not name the file in the dialog box, the R&S FSVR names the file like the name of the frequency mask itself.

Load Mask

The "Load" softkey opens a dialog box to restore a frequency mask.

The dialog box contains all frequency masks already on the hard disk of the R&S FSVR. Select the mask you need and confirm the selection with the "Load" button.

Remote command:
Path selection:
CALCulate<n>:MASK:CDIRectory on page 154
Load mask:
CALCulate<n>:MASK:NAME on page 156

Delete Mask

The Delete softkey opens a dialog box to delete a previously saved frequency mask.

The "Delete" button deletes the file. Note that you have to confirm the deletion process.

Remote command:
CALCulate<n>:MASK:DELete on page 154

6.4 Further Information

6.4.1 Short List of Abbreviations

Term or abbreviation	Description
UE	user equipment
CPICH	common pilot channel
DPCH	dedicated physical channel, data channel
FDD	frequency division duplexing
PCCPCH	primary common control physical channel

Term or abbreviation	Description
PICH	paging indication channel
SCH	synchronization channel, divided into P-SCH (primary synchronization channel) and S-SCH (secondary synchronization channel)

6.4.2 Channels of the Code Domain Channel Table and Their Usage

The channel assignment table contains the following (data) channels:

Channel	Description
DPCCH	The Dedicated Physical Control Channel is used to synchronize the signal. It carries pilot symbols and is expected in the Q branch at code class 8 with code number 0. The channel is displayed in the upper part of the table.
DPDCH	The Dedicated Physical Data Channel is used to carry UPLINK data from the UE to the BS. The code allocation depends on the total required symbol rate. The following table represents the possible configurations of DPCH spreading factors and code allocation.
HSDPCCH	The High Speed Dedicated Physical Control Channel (for HS-DCH) is used to carry control information (CQI/ACK/NACK) for downlink high speed data channels (HS-DCH). It is used in HSDPA signal setup. The data rate is fixed to 15ksps. The code allocation depends on the number of active DPCH and is described in the table below. This control channel is displayed in the upper part of the channel table. The HS-DPCCH can be switched on or off after the duration of 1/5 frame or 3 slots or 2ms. Power control is applicable too.
EDPCCH	The Enhanced Dedicated Physical Control Channel is used to carry control information for uplink high speed data channels (EDPDCH). It is used in HSUPA signal setup. The data rate is fixed to 15ksps. This control channel is displayed in the upper part of the channel table.
EDPDCH	The Enhanced Dedicated Physical Data Channel is used to carry UPLINK data for high speed channels (EDPDCH). It is used in HSUPA signal setup. The data rate and code allocation depends on the number of DPDCH and HS-DPCCH (refer to table below). This data channel is displayed in the lower part of the channel table.

The following parameters of these channels are determined by the CDP measurement:

Channel Type	Type of channel (active channels only)
Symbol Rate	Symbol rate at which the channel is transmitted
Channel Number	Number of channel spreading code (0 to [spreading factor-1])
Use TFCI	
Timing Offset	
Pilot Bits	Number of pilot bits of the channel (only valid for the control channel DPCCH)
CDP Relative	

Status	
Confilct	

6.4.3 Detector Overview

The measurement detector for the individual display modes can be selected directly by the user or set automatically by the R&S FSVR. The detector activated for the specific trace is indicated in the corresponding trace display field by an abbreviation.

The detectors of the R&S FSVR are implemented as pure digital devices. They collect signal power data within each measured point during a sweep. The default number of sweep points is 691. The following detectors are available:

Table 6-1: 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

The result obtained from the selected detector within a measurement point is displayed as the power value at this measurement point.

All detectors work in parallel in the background, which means that the measurement speed is independent of the detector combination used for different traces.

Number of measured values

During a frequency sweep, the R&S FSVR increments the first local oscillator in steps that are smaller than approximately 1/10 of the bandwidth. This ensures that the oscillator step speed is conform to the hardware settling times and does not affect the precision of the measured power.

The number of measured values taken during a sweep is independent of the number of oscillator steps. It is always selected as a multiple or a fraction of 691 (= default number of trace points displayed on the screen). Choosing less then 691 measured values (e.g. 125 or 251) will lead to an interpolated measurement curve, choosing more than 691 points (e.g. 1001, 2001 …) will result in several measured values being overlaid at the same frequency position.

RMS detector and VBW

If the RMS detector is selected, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves.

6.4.4 Trace Mode Overview

The traces can be activated individually for a measurement or frozen after completion of a measurement. Traces that are not activate are hidden. Each time the trace mode is changed, the selected trace memory is cleared.

The R&S FSVR offers 6 different trace modes:

Clear Write

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

All available detectors can be selected.

Remote command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 207

Max Hold

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

The detector is automatically set to "Positive Peak".

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

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE MAXH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 207

Min Hold

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

The detector is automatically set to "Negative Peak".

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

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE MINH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 207

Average

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

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 6.4.3, "Detector Overview", on page 32).

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE AVER`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 207

View

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

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the displayed trace no longer matches the current instrument setting is indicated by the icon on the tab label.

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

Remote command:
`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 207

Blank

Hides the selected trace.

Remote command:
`DISP:TRAC OFF`, see `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]` on page 208

6.4.5 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

The video filters are responsible for smoothing the displayed trace. Using video bandwidths that are small compared to the resolution bandwidth, only the signal average is displayed and noise peaks and pulsed signals are repressed. If pulsed signals are to be measured, it is advisable to use a video bandwidth that is large compared to the resolution bandwidth (VBW * 10 x RBW) for the amplitudes of pulses to be measured correctly.

The following filter types are available:

- Normal (3dB) (Gaussian) filters

The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.

- CISPR (6 dB) filters
- MIL Std (6 dB) filters
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel filters
  For details see chapter 6.4.6, "List of Available RRC and Channel Filters", on page 35 .
  Channel filters do not support FFT mode.
- RRC filters
  For details see chapter 6.4.6, "List of Available RRC and Channel Filters", on page 35 .
  RRC filters do not support FFT mode.
- 5-Pole filters
  The available bandwidths are specified in the data sheet.
  5-Pole filters do not support FFT mode.

6.4.6 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table). The indicated filter bandwidth is the 3 dB bandwidth. For RRC filters, the fixed roll-off factor (a) is also indicated.

Table 6-2: 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	

Filter Bandwidth	Filter Type	Application
6 kHz, a=0.2	RRC	APCO
8.5 kHz	CFILter	ETS300 113 (12.5 kHz channels)
9 kHz	CFILter	AM Radio
10 kHz	CFILter	
12.5 kHz	CFILter	CDMAone
14 kHz	CFILter	ETS300 113 (20 kHz channels)
15 kHz	CFILter	
16 kHz	CFILter	ETS300 113 (25 kHz channels)
18 kHz, a=0.35	RRC	TETRA
20 kHz	CFILter	
21 kHz	CFILter	PDC
24.3 kHz, a=0.35	RRC	IS 136
25 kHz	CFILter	
30 kHz	CFILter	CDPD, CDMAone
50 kHz	CFILter	
100 kHz	CFILter	
150 kHz	CFILter	FM Radio
192 kHz	CFILter	PHS
200 kHz	CFILter	
300 kHz	CFILter	
500 kHz	CFILter	J.83 (8-VSB DVB, USA)
1 MHz	CFILter	CDMAone
1.228 MHz	CFILter	CDMAone
1.28 MHz, a=0.22	RRC	
1.5 MHz	CFILter	DAB
2 MHz	CFILter	
3 MHz	CFILter	
3.75 MHz	CFILter	
3.84 MHz, a=0.22	RRC	W-CDMA 3GPP
4.096 MHz, a=0.22	RRC	W-CDMA NTT DOCoMo

Filter Bandwidth	Filter Type	Application
5 MHz	CFILter	
20 MHz	CFILter	
28 MHz	CFILter	
40 MHz	CFILter	

6.4.7 ASCII File Export Format

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.

File contents: header and data section	Description
Type;FSVR;	
Version;1.45;	
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display
Demodulator;Offset QPSK;	Demodulation type
ResultMode;Trace;	Result mode
x unit;sym;	Unit of the x axis
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

7 Configuration of 3GPP FDD UE Measurements

The R&S FSV-K73 option appears in the "Select Mode" menu (MODE key) as "3GPP FDD UE". This softkey can be used to start the R&S FSV–K73 options.

The most important parameters for the 3GPP FDD UE user equipment tests are summarized in the root menu of the R&S FSV–K73 option and explained below using the softkey functions. The root menu is available by pressing the "3GPP FDD UE" softkey in the "Select Mode" menu, the MEAS key or the HOME key.

The Code Domain Analyzer softkey activates the code domain analyzer measurement mode and opens the submenus for setting the measurement.

The "Power", "Ch Power ACLR", "Spectrum Emission Mask", "Occupied Bandwidth", "CCDF" and "RF Combi" softkeys activate tests in the analyzer mode. Pressing the associated softkey performs the settings required by 3GPP specifications. A subsequent modification of settings is possible.

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.

chapter 7.1, "Code Domain Analyzer Measurements (K73)", on page 39	Activates the code domain measurement mode and opens another submenu for selecting and configuring the parameters. All other menus of the R&S FSVR are adapted to the functions of the code domain measurement mode.
chapter 7.2.1, "Output Power Measurements", on page 82	Activates the channel power measurement with defined settings in the analyzer mode.
chapter 7.2.3, "Adjacent Channel Power (ACLR)", on page 83	Activates the adjacent-channel power measurement with defined settings in the analyzer mode.
chapter 7.2.2, "Spectrum Emission Mask", on page 82	Compares the signal power in different carrier offset ranges with the maximum values specified by 3GPP.
chapter 7.2.4, "Occupied Bandwidth", on page 84	Activates the measurement of the occupied bandwidth (analyzer mode).
chapter 7.2.5, "CCDF", on page 84	Evaluates the signal with regard to its statistical characteristics (distribution function of the signal amplitudes).

7.1 Code Domain Analyzer Measurements (K73)

The Code Domain Analyzer softkey activates the code domain analyzer measurement mode and opens the submenu to set the measurement.

Refer to chapter 7.1, "Code Domain Analyzer Measurements (K73)", on page 39 for an introduction to the code domain analyzer settings.

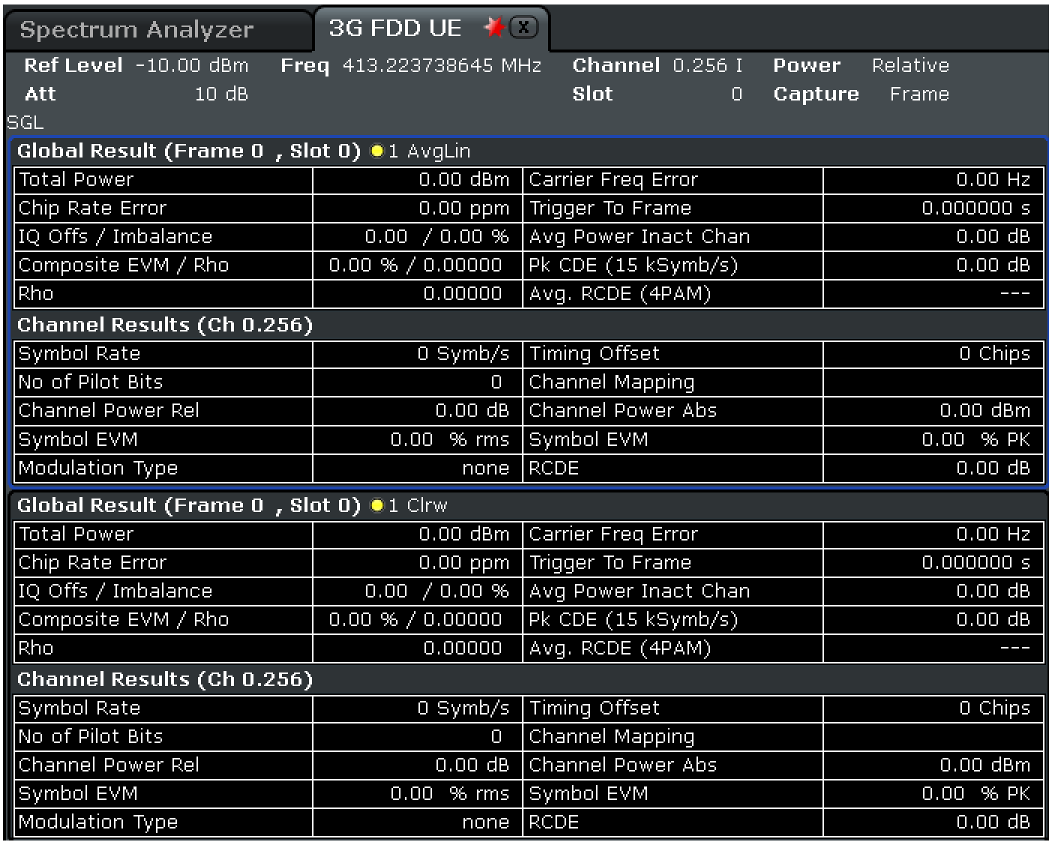
For a brief introduction to the display concept of the code domain analyzer measurements refer to chapter 7.1.1, "Display Concept", on page 39.

7.1.1 Display Concept

Measurement results

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

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



The available measurement types and result diagrams are described in chapter 7.1.3, "Measurement Modes in Code Domain Analyzer", on page 55 .

For more information on the display configuration, see the description of the "Display Config" on page 53 softkey.

Measurement settings

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

Label	Description
Ref level	Reference level defined in "Ref Level" on page 44
Att	Attenuation
Freq	Center frequency defined in "Center" on page 44
Channel	Channel with spreading factor and mapping
Slot	Slot
Power	"Code Power Display" defined in "Demod Settings" on page 51
Capture	Analysis Mode (Slot, Frame) defined in "IQ Capture Settings" on page 45

Overview of all measurement settings

You can easily display an overview of all measurement settings using the "Settings Overview" on page 43 softkey.

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

Screen focus

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

7.1.1.1 Defining the display configuration

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

   Tip: SCPI command: `DISPlay[:WINDow<n>]:STATe` on page 207
4. Select the required result diagram to be displayed in the selected screen.

   Tip: SCPI command: `CALCulate<n>:FEED` on page 113
5. Press "Close".

To select a predefined display configuration

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

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

   The previously stored and default configurations are listed. The current configuration is displayed at the top of the dialog box.
2. Select the required set of screen configurations.
3. Press "Apply".

To store the current display configuration

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

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

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

To remove a predefined display configuration

You can remove one of the stored display configurations.

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

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

To restore the default display configurations

You can restore the default set of predefined display configurations.

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

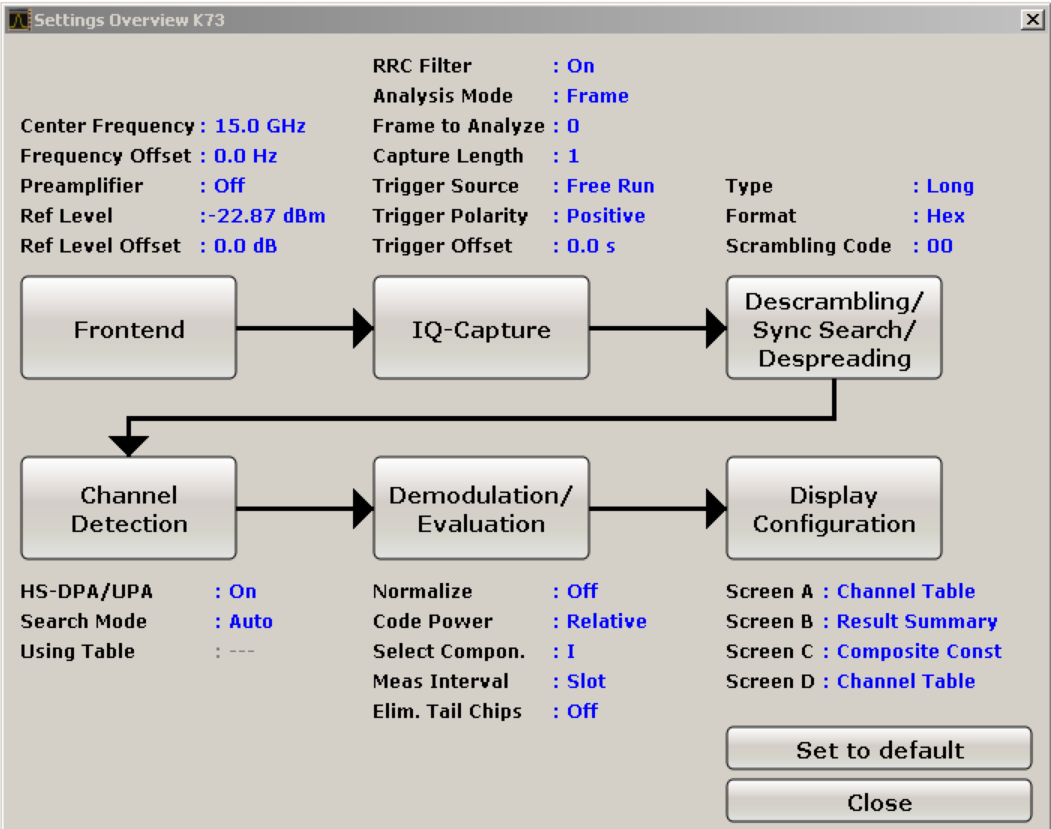
7.1.2 Softkeys of the Code Domain Analyzer Menu (R&S FSV–K73)

The Code Domain Analyzer softkey opens the "Code Domain Analyzer" submenu.

Settings Overview

The "Settings Overview" softkey opens the "Settings Overview" dialog box that visualizes the data flow of the Code Domain Analyzer and summarizes the current settings. In addition, the current settings can be changed via the "Settings Overview" dialog box.

To change the settings, either use the rotary knob or the curser keys to change the focus to another button, and press the ENTER key to open the corresponding dialog box. To open the dialog boxes displayed in the "Settings Overview" dialog box, you can also press the particular softkey in the "Code Domain Analyzer" submenu.

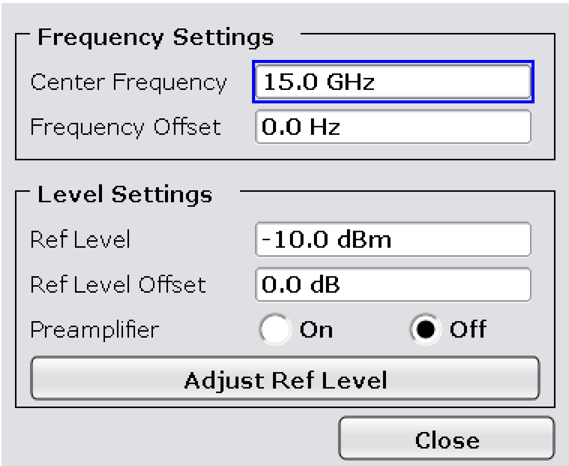


Setting	Refer to
Frontend	"Frontend Settings" on page 44
IQ-Capture	"IQ Capture Settings" on page 45

Setting	Refer to
Descrambling/Sync Search/Despreading	"Sync/Scrambling Settings" on page 48
Channel Detection	"Channel Detection Settings" on page 48
Demodulation/Evaluation	"Demod Settings" on page 51
Display Configuration	chapter 7.1.1, "Display Concept", on page 39

Frontend Settings

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



Center ← Frontend Settings

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

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

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

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

Remote command:
[SENSe:]FREQuency:CENTer on page 190

Frequency Offset ← Frontend Settings

Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset.

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

Remote command:
[SENSe:]FREQuency:OFFSet on page 191

Ref Level ← Frontend Settings

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

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

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 209

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

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet on page 210

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

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

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

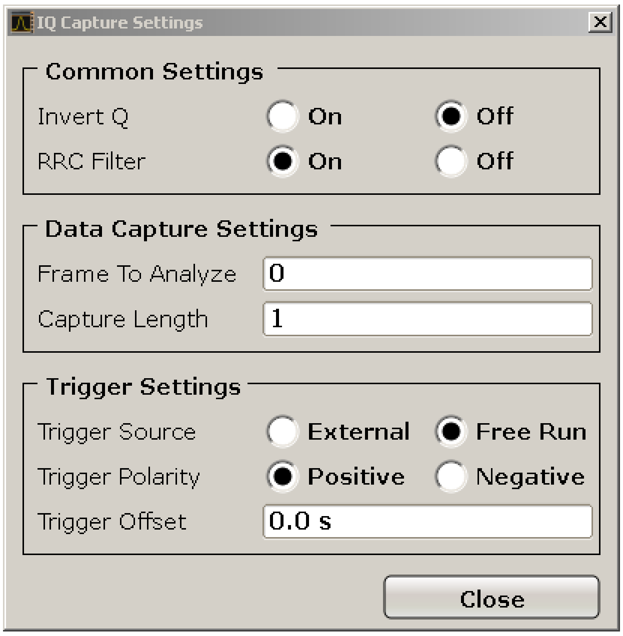
This function is not available for input from the R&S Digital I/Q Interface (option R&S FSV-B17).

Remote command:
INPut:GAIN:STATe on page 218

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

Remote command:
[SENSe:]ADJust:LEVel on page 185

IQ Capture Settings
Opens the "IQ Capture Settings" dialog box.



Invert Q ← IQ Capture Settings

Inverts the sign of the signal's Q-component. The default setting is OFF.

Remote command:
`[SENSe:]CDPower:QINVert` on page 177

RRC Filter ← IQ Capture Settings

Selects if a root raised cosine (RRC) receiver filter is used or not. This feature is useful if the RRC filter is implemented in the device under test (DUT).

"ON"	If an unfiltered WCDMA signal is received (normal case), the RRC filter should be used to get a correct signal demodulation. (Default settings)
"OFF"	If a filtered WCDMA signal is received, the RRC filter should not be used to get a correct signal demodulation. This is the case if the DUT filters the signal.

Remote command:
`[SENSe:]CDPower:FILTer[:STATe]` on page 172

Analysis Mode ← IQ Capture Settings

Select a result length of one slot or one complete frame.

Remote command:
`[SENSe:]CDPower:BASE` on page 171

Frame To Analyze ← IQ Capture Settings

Enter the Frame to analyze and to be displayed.

Remote command:
`[SENSe:]CDPower:FRAMe[:LVALue]` on page 172

Capture Length ← IQ Capture Settings
Enter the capture length (amount of frames to record).

Remote command:
[SENSe:]CDPower:IQLength on page 173

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.

Remote command:
TRIG:SOUR EXT, see TRIGger<n>[:SEQuence]:SOURce on page 221

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

Remote command:
TRIG:SOUR IMM, see TRIGger<n>[:SEQuence]:SOURce on page 221

Trg/Gate Polarity ← IQ Capture Settings
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.

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.

Remote command:
TRIGger<n>[:SEQuence]:SLOPe on page 221

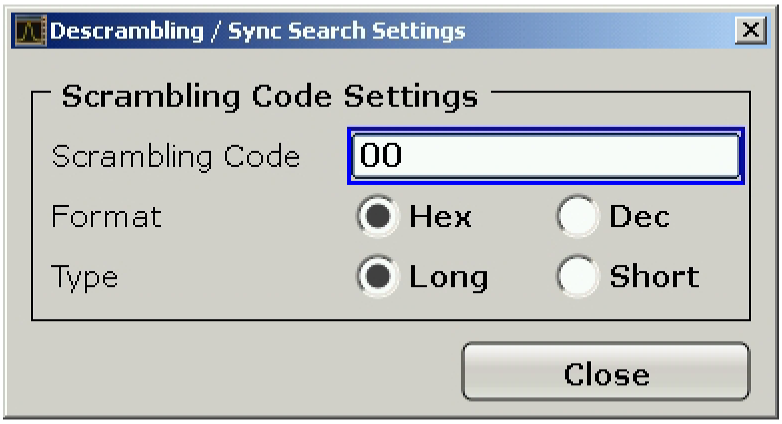
Trigger Offset ← IQ Capture Settings
Opens an edit dialog box to enter the time offset between the trigger signal and the start of the sweep.

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

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

Remote command:
TRIGger<n>[:SEQuence]:HOLDoff[:TIME] on page 220

Sync/Scrambling Settings
Opens the "Descrambling/Sync Search Settings" dialog box.



Scrambling Code ← Sync/Scrambling Settings
Define the scrambling code in the specified format.

The entered scrambling code has to be identical to that of the signal. Otherwise a CDP measurement of the signal is not possible.

Remote command:
[SENSe:]CDPower:LCODe[:VALue] on page 175

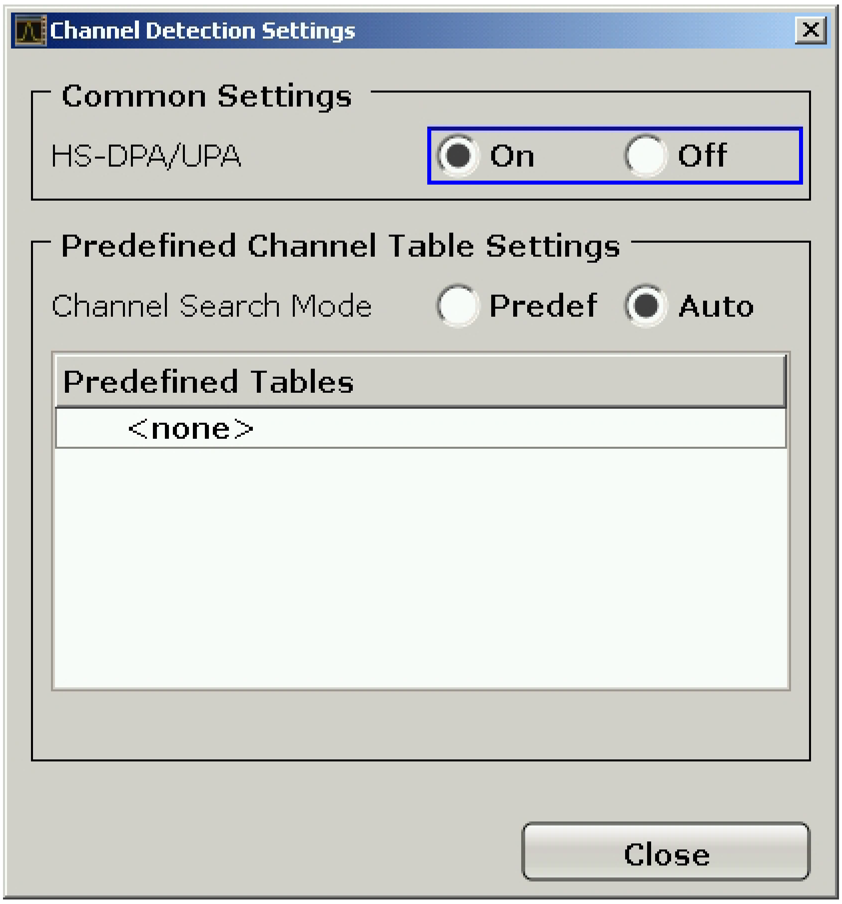
Format ← Sync/Scrambling Settings
Switches the display format of the scrambling codes between hexadecimal and decimal.

Remote command:
SENS:CDP:LCOD:DVAL <numeric value> (see [SENSe:]CDPower:LCODe[:VALue] on page 175)

Type ← Sync/Scrambling Settings
Select whether the entered scrambling code is to be handled as long or short scrambling code.

Remote command:
[SENSe:]CDPower:LCODe:TYPE on page 174

Channel Detection Settings
Opens the "Channel Detection Settings" dialog box.



HS-DPA/UPA ← Channel Detection Settings
If this option is selected, it enables the application to detect HSUPA/DPA-channels and shows them in the channel table.

Remote command:
`[SENSe:]CDPower:HSDPamode` on page 172

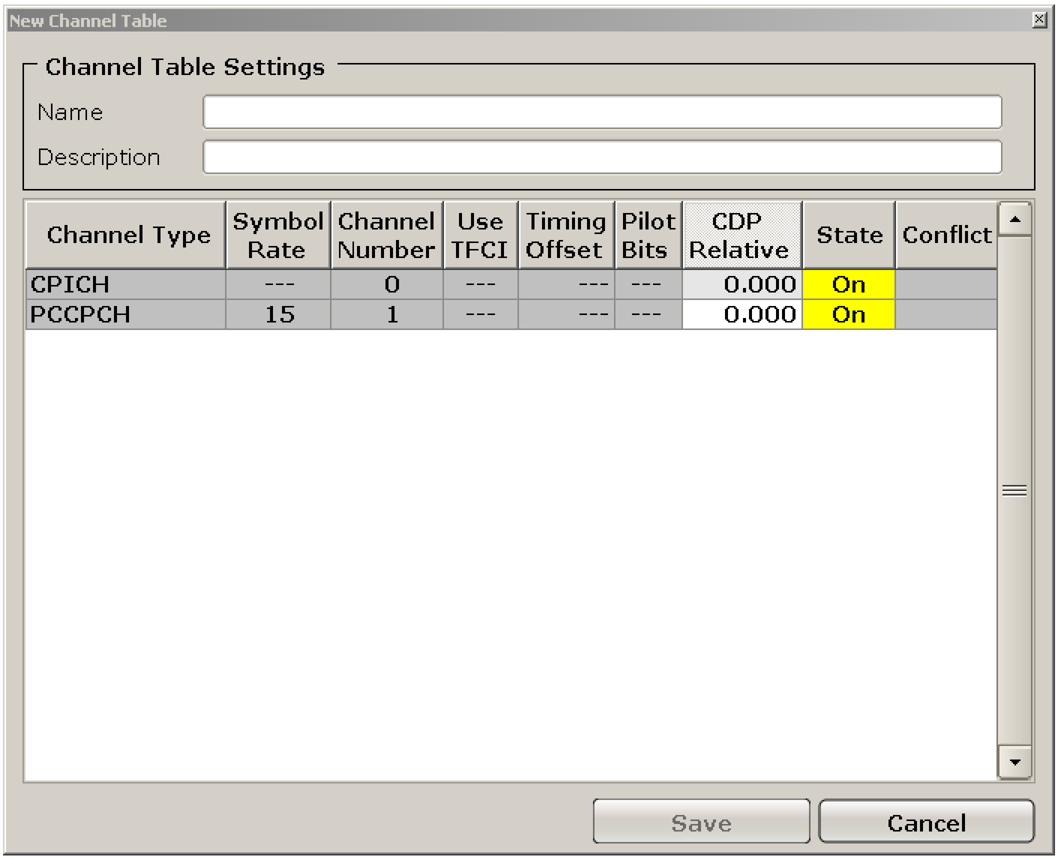
Channel Search Mode ← Channel Detection Settings
Select the channel search mode. Either select "Predef" to use predefined tables or "Auto" for automatic detection of the channels.

Remote command:
`CONFigure:WCDPower:MS:CTABle[:STATe]` on page 165
`CONFigure:WCDPower:MS:CTABle:SELect` on page 166

Predefined Tables ← Channel Detection Settings
The list shows all available channel tables and marks the current active table or the table to edit.

Remote command:
`CONFigure:WCDPower:MS:CTABle:CATalog?` on page 168

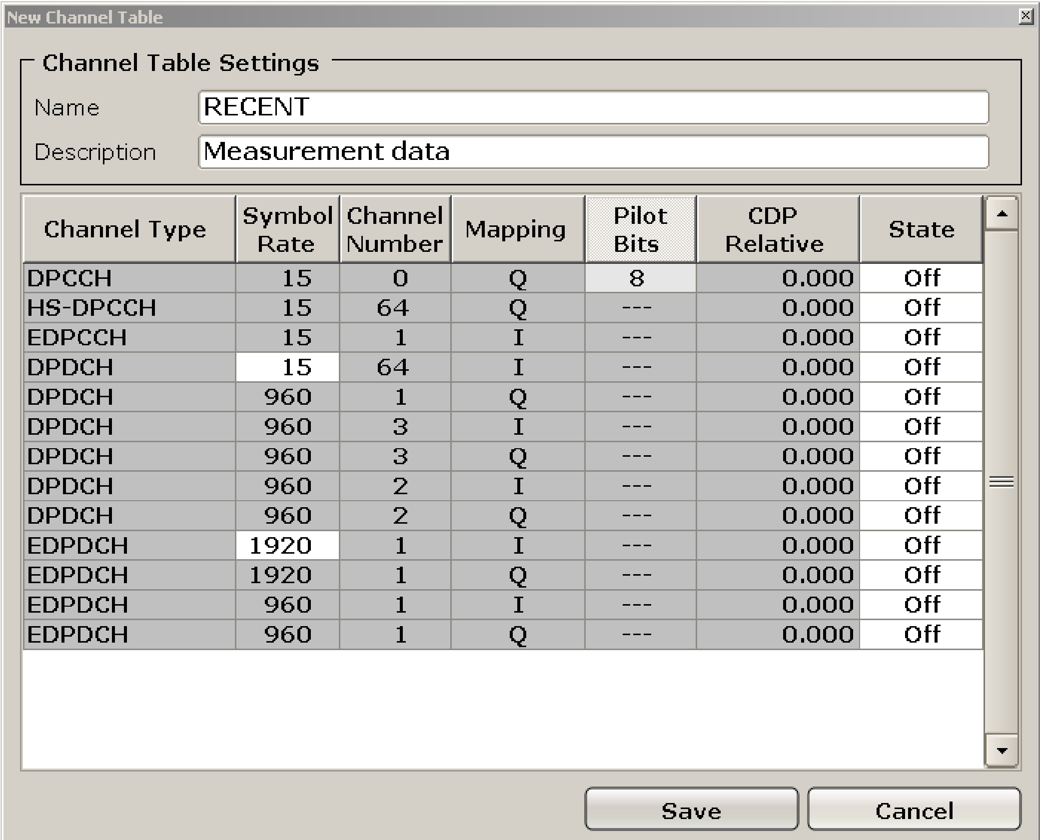
New ← Channel Detection Settings
Opens the "New Channel Table" dialog box to define new channel table settings.



Enter "Name" and "Description" for the new channel table and define the settings in the table below.

Channel Type	Type of channel (active channels only)
Symbol Rate	Symbol rate at which the channel is transmitted
Channel Number	Number of channel spreading code (0 to [spreading factor-1])
Mapping	Component onto which the channel is mapped (I or Q). The entry is not editable, since the standard specifies the channel assignment for each channel.
Pilot Bits	Number of pilot bits of the channel (only valid for the control channel DPCCH)
CDP Relative	Channel relative (referred to the total power of the signal)
Status	Status display. Codes that are not assigned are marked as inactive channels.

Meas ← New ← Channel Detection Settings
Creates a new channel table with the settings from the current measurement data.



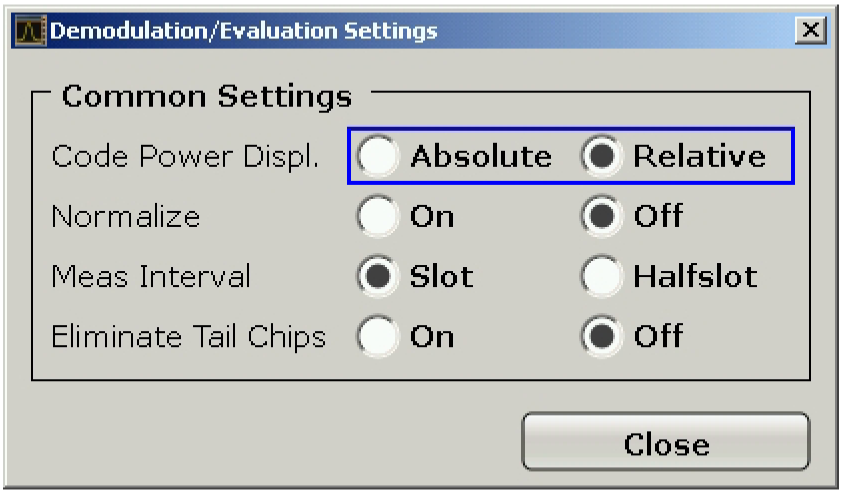
Channel Type	Symbol Rate	Channel Number	Mapping	Pilot Bits	CDP Relative	State
DPCCH	15	0	Q	8	0.000	Off
HS-DPCCH	15	64	Q	---	0.000	Off
EDPCCH	15	1	I	---	0.000	Off
DPDCH	15	64	I	---	0.000	Off
DPDCH	960	1	Q	---	0.000	Off
DPDCH	960	3	I	---	0.000	Off
DPDCH	960	3	Q	---	0.000	Off
DPDCH	960	2	I	---	0.000	Off
DPDCH	960	2	Q	---	0.000	Off
EDPDCH	1920	1	I	---	0.000	Off
EDPDCH	1920	1	Q	---	0.000	Off
EDPDCH	960	1	I	---	0.000	Off
EDPDCH	960	1	Q	---	0.000	Off

Copy ← Channel Detection Settings
Opens the "Copy Channel Table" dialog box to copy the currently displayed channel table. Enter a name for the new table, edit the settings as described for a new table (see "New" on page 49) and select "Save".

Edit ← Channel Detection Settings
Opens the "Edit Channel Table" dialog box to edit the currently displayed channel table. Edit the settings as described for a new table (see "New" on page 49) and select "Save".

Delete ← Channel Detection Settings
Deletes the currently displayed channel table after a message is confirmed.

Demod Settings
Opens the "Demodulation Settings" dialog box.



Code Power Displ ← Demod Settings

Switches between showing the absolute power or the power relative to the chosen reference.

This parameter only affects the display mode "Code Domain Power"

Remote command:
`[SENSe:]CDPower:PDIsplay` on page 176

Normalize ← Demod Settings

Changes the elimination of the DC-offset. If the radio button On is selected, the DC-offset is eliminated. Otherwise the DC-Offset is not eliminated.

Remote command:
`[SENSe:]CDPower:NORMalize` on page 176

Meas Interval ← Demod Settings

Switches between the analysis of an half slot or a full slot.

Both measurement intervals are influenced by the settings of Eliminate Tail Chips: If "Eliminate Tail Chips" is set to On, 96 chips at both ends of the measurement interval are not taken into account for analysis.

"Slot"	The length of each analysis interval is 2560 chips, corresponding to one time slot of the 3GPP signal. The time reference for the start of slot 0 is the start of a 3GPP radio frame.
"Halfslot"	The length of each analysis interval is reduced to 1280 chips, corresponding to half of one time slot of the 3GPP signal.

Remote command:
`[SENSe:]CDPower:HSLot` on page 173

Eliminate Tail Chips ← Demod Settings

Selects the length of the measurement interval for calculation of error vector magnitude (EVM). In accordance with 3GPP specification Release 5, the EVM measurement interval is one slot (4096 chips) minus 25 _s at each end of the burst (3904 chips) if power changes are expected. If no power changes are expected, the evaluation length is one slot (4096 chips).

"On" Changes of power are expected. Therefore an EVM measurement interval of one slot minus 25 _s (3904 chips) is considered.

"Off" Changes of power are not expected. Therefore an EVM measure-
ment
interval of one slot (4096 chips) is considered. (Default settings)

Remote command:
[SENSe:]CDPower:ETCHips on page 171

Display Config
Opens the "Display Configuration" dialog box in which you can define how the measurement results are displayed.

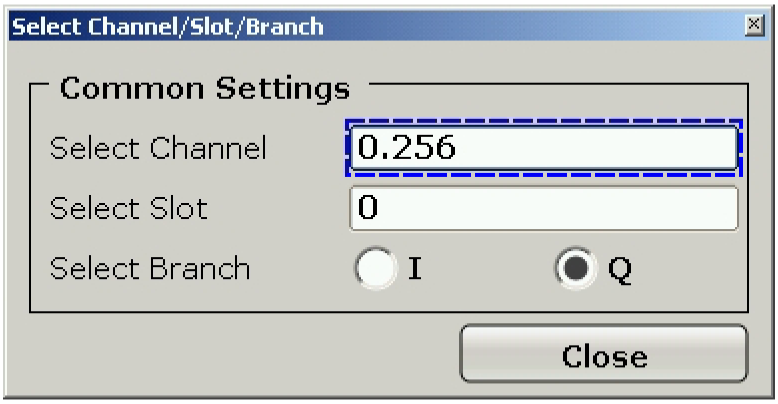
The code domain analyzer can show up to four result diagrams in four different screens (windows) at one time. For each screen, you can define which type of result diagram is to be displayed, or deactivate the screen temporarily.

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

The display modes and measurements specified by the 3GPP standard and available in Code Domain Analyzer mode are described in chapter 7.1.3, "Measurement Modes in Code Domain Analyzer", on page 55 .

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

Select Channel
Opens a dialog box to select a channel and a slot.



Select Channel ← Select Channel
Selects a channel for the calculation of the result diagrams "CDP PWR RELATIVE/ ABSOLUTE", "POWER VS SLOT", "SYMBOL CONST" and "SYMBOL EVM" (see also chapter 6.2, "Measurements and Result Diagrams", on page 24).

There are two ways to enter the channel numbers:

- Enter a channel number and spreading factor, separated by a decimal point.
  If the channel number and the spreading factor are entered simultaneously, the entered channel is selected and marked in red if an active channel is involved. For

the display, the channel number entered is converted on the basis of spreading factor 512. For unused channels, the code resulting from the conversion is marked.
Example: Enter *5.128*
Channel 5 is marked at spreading factor 128 (30 ksps) if the channel is active, otherwise code 20 at spreading factor 512.

- Enter a channel number without a decimal point.
In this case, the instrument interprets the entered code as based on spreading factor 512. If the code entered corresponds to a used channel, the entire associated channel is marked. If the code corresponds to an unused channel, only the code entered is marked.
Example: Enter *20*
Code 20 is marked at spreading factor 512 if there is no active channel on this code. If for instance channel 5 is active at spreading factor 128, the entire channel 5 is marked.
If the entered code corresponds to an active channel, the entire associated channel is marked. If it corresponds to a gap between the channels, only the entered code is marked.
If the code number is modified using the rotary knob, the red marking changes its position in the diagram only if the code number no longer belongs to the marked channel. The step width of the changed rotary knob position refers to a spreading factor of 512.

Remote command:
[SENSe:]CDPower:CODE on page 171

Select Slot ← Select Channel
Selects the slot for evaluation. This affects the following result diagrams (see also chapter 6.2, "Measurements and Result Diagrams", on page 24):

- Code Domain Power
- Peak Code Domain Error
- Result Summary
- Composite Constellation
- Code Domain Error Power
- Channel Table
- Power vs Symbol
- Symbol Const
- Symbol EVM
- Bitstream

Remote command:
[SENSe:]CDPower:SLOT on page 177

Select Branch
Switches between the evaluation of the I and the Q branch.

Remote command:
CALCulate<n>:CDPower:Mapping on page 112

7.1.3 Measurement Modes in Code Domain Analyzer

The display modes in this chapter are all based on the recording of the IQ-Data. With the same dataset of the recorded signal, we can calculate the following display modes. Therefore it is not necessary to restart the measurement to switch the display mode.

The following display modes and measurements specified by the 3GPP standard are available:

Code Domain Power

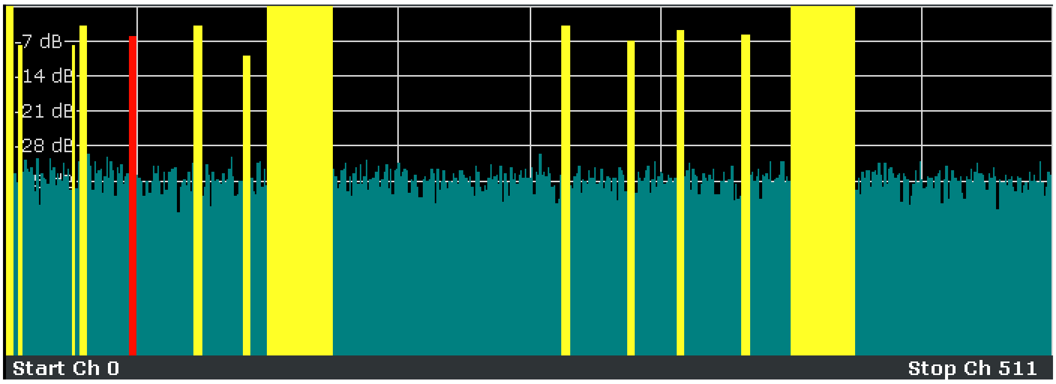


Fig. 7-1: Code Domain Power Display for R&S FSV–K73

The "Code Domain Power" display mode shows the power of the different code channels in the the adjusted slot. Due to the circumstance that the power is regulated from slot to slot, the result power may differ between different slots. Detected channels are painted yellow. The channel which is adjusted via Select Channel is marked red. The codes where no channel could be detected are painted cyan.

If some of the DPCH-channels contain incorrect pilot symbols, these channels are marked with the color green, and an "INCORRECT PILOT" message is displayed in the status bar.

If HS-DPA/UPA is set to "ON" in the "Channel Detection Settings"/"Common Settings" dialog box, channels without pilot symbols, e.g. channels of type "HS-PDSCH", are recognized as active.

Remote command:
`CALC:FEED "XPOW:CDP"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Composite EVM (RMS)
The "Composite EVM" measurement displays the error between the entire measurement signal and the ideal reference signal in present. The error is averaged over all channels for different slots. A bar diagram with EVM values versus slots is used. The Composite EVM measurement covers the entire signal during the entire observation time.

Remote command:
`CALC:FEED "XTIM:CDP:ERR:MACC"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Peak Code Domain Error
"Peak Code Domain Error" display mode determines the maximum of the code domain error values for a given slot and for all codes. This display is a bar diagram over slots. The unit is dB. The Peak Code Domain Error measurement covers the entire signal and the entire observation time.

Remote command:
`CALC:FEED "XTIM:CDP:ERR:PCD"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

EVM vs Chip
For the Meas Interval "Slot" (see "Demod Settings" on page 51), the Error Vector Magnitude (EVM) is displayed for all chips of the slected slot.

For the Meas Interval "Halfslot" (see "Demod Settings" on page 51), the EVM is displayed for the chips of one half slot. The selected slot/halfslot can be varied. Possible entries are 0 to 14 for "Slot" and 0 to 29 for "Halfslot".

The EVM is calculated as the root of the squared difference between the received and reference signal. The reference signal is estimated out of the channel configurations of all active channels. The EVM is given in percent referred to the square root of the mean power of the reference signal.

$$EVM_k = \sqrt{\frac{|s_k - x_k|^2}{\frac{1}{N}\sum_{n=0}^{N-1}|x_n|^2}} \cdot 100\% \quad | \quad N = 2560 \quad | \quad k \in [0 \ldots (N-1)]$$

where:

EVM_k	vector error of the chip EVM of chip number k
s_k	complex chip value of received signal
x_k	complex chip value of reference signal
k	index number of the evaluated chip
N	number of chips at each CPICH slot
n	index number for mean power calculation of reference signal

Remote command:
`CALC:FEED "XTIM:CDP:CHIP:EVM"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Mag Error vs Chip
For the Meas Interval "Slot" (see "Demod Settings" on page 51), the magnitude error is displayed for all chips of the selected slot. For the Meas Interval "Halfslot" (see "Demod Settings" on page 51), the magnitude error is displayed for the chips of one half slot. The selected slot/halfslot can be varied. Possible entries are 0 to 14 for "Slot" and 0 to 29 for "Halfslot".

The magnitude error is calculated as the difference between the magnitudes of the received and reference signal. The reference signal is estimated out of the channel configurations of all active channels. The magnitude error is given in percent referred to the square root of the mean power of the reference signal.

$$MAG_k = \frac{|s_k| - |x_k|}{\sqrt{\frac{1}{N}\sum_{n=0}^{N-1}|x_n|^2}} \cdot 100\% \quad | \quad N = 2560 \quad | \quad k \in [0 \ldots (N-1)]$$

where:

MAG_k	magnitude error of chip number k
s_k	complex chip value of received signal
x_k	complex chip value of reference signal
k	index number of the evaluated chip
N	number of chips at each CPICH slot
n	index number for mean power calculation of reference signal

Remote command:
`CALC:FEED "XTIM:CDP:CHIP:MAGN"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Phase Error vs Chip
For the Meas Interval "Slot" (see "Demod Settings" on page 51), the phase error is displayed for all chips of the selected slot. For the Meas Interval "Halfslot" (see "Demod Settings" on page 51), the phase error is displayed for the chips of one half slot. The selected slot/halfslot can be varied. Possible entries are 0 to 14 for "Slot" and 0 to 29 for "Halfslot".

The phase error is calculated as the difference between the phases of the received and reference signal. The reference signal is estimated out of the channel configurations of all active channels. The magnitude error is given in grad ranging from -180° to 180°.

$$PHI_k = \varphi(s_k) - \varphi(x_k) \quad | \quad N = 2560 \quad | \quad k \in [0 \ldots (N-1)]$$

where:

PHI_k	phase error of chip number k
s_k	complex chip value of received signal
x_k	complex chip value of reference signal
k	index number of the evaluated chip
N	number of chips at each CPICH slot
φ(x)	phase calculation of a complex value

Remote command:
`CALC:FEED "XTIM:CDP:CHIP:PHAS"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Composite Constellation
The "Composite Const" measurement analyzes the entire signal for one single slot. For large numbers of channels to analyze the results will superimpose. In that case the benefit of this measurement is limited (senseless).

In "Composite Const" measurement the constellation points of the 1536 Chips for the specified slot are displayed. This data is determined inside the DSP even before the channel search. I.e. it is not possible to assign constellation points to channels. The constellation points are displayed normalized with respect to the total power.

Remote command:
`CALC:FEED "XTIM:CDP:COMP:CONS"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Power vs Slot
The "Power vs Slot" display mode indicates the power of the selected code channel depending on the slot number. The power of the selected channel (marked red in the CDP diagram) is displayed versus all slots of a frame of the 3GPP FDD UE signal. The softkey is only valid if one frame of the 3GPP signal is analyzed.

Beginning at the start of the 3GPP FDD UE frame, 15 or 30 successive slots are displayed, depending on the value of the "SLOT RES" softkey. The power is shown in absolute scaling.

It is not only possible to select a code channel in the CDP diagram, but also to mark a slot in the power-versus-slot diagram. Marking is done by entering the slot number. The selected slot is marked in red. For more detailed displays, the marked slot of the channel is used (see "SLOT #" entry in the information area above the diagram).

Modifying a slot number has the following effects:

- The CDP diagram in the upper half of the display is updated referred to the entered slot number.
- All results that depend on the selected slot are recalculated for selected channel. The relevant graphics are updated.

Remote command:
`CALC:FEED "XTIM:CDP:PVSL"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

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

The symbol magnitude error is the difference of the magnitude of the received symbol and that of the reference symbol, related to the magnitude of the reference symbol.

Remote command:
`CALC:FEED "XTIM:CDP:SYMB:EVM:MAGN"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

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

Remote command:
`CALC:FEED "XTIM:CDP:SYMB:EVM:PHAS"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Result Summary
The "Result Summary" display mode selects the numerical display of all results.

Three different tables are available, depending if the corresponding window is a full screen, a split screen or a quarter screen window. The full screen display mode shows the same results as the split screen window, but with a bigger font. In the quarter screen window, only the most important results are displayed on the screen.

The frame number and the slot number are always displayed in the "Global Results" header. It indicates the slot for which the measurement is performed. The entry is only valid if one frame of the 3GPP signal is analyzed. The analysis is performed either on a complete slot or a half slot.

Table 7-1: Global Results

Total Power:	Displays the total signal power (average power of total evaluated 3GPP FDD UE slot).
Chip Rate Error:	Displays the chip rate error in the frame to analyze in ppm. As a result of a high chip rate error symbol errors arise and the CDP measurement is possibly not synchronized to the 3GPP FDD UE signal. The result is valid even if the synchronization of the analyzer and signal failed.
IQ Offs/Imbalance:	DC offset and IQ imbalance of the signal in the selected slot in %
Composite EVM/Rho:	Composite EVM: The difference between the test signal and the ideal reference signal in the selected slot (see "Composite EVM (RMS)" on page 56). Rho: Quality paramter RHO for each slot.
No of Active Chan:	Indicates the number of active channels detected in the signal in the selected slot. Both the detected data channels and the control channels are considered active channels.
Carrier Freq Error:	Displays the frequency error in the selected slot referred to the center frequency of the analyzer. The absolute frequency error is the sum of the analyzer and DUT frequency error. Differences of more than 1 kHz between transmitter and receiver frequency impair the synchronization of the CDP measurement. For this reason, the transmitter and receiver should be synchronized (see chapter Getting Started).
Trigger to Frame:	This result displays the timing offset from the beginning of the recorded signal section to the start of the analyzed 3GPP FDD UE frame. In the case of triggered data collection, this timing offset is identical with the timing offset of frame trigger (+ trigger offset) – frame start. In the case of failure of the synchronization of the analyzer and 3GPP FDD UE signal, the value of Trigger to Frame is not significant.
Avg Power Intact Chan	The power in the code domain of all inactive channels is averaged to give the user an overview on the difference between active and inactive channels.
Pk CDE (30 ksps)	The Pk CDE measurement specifies a projection of the difference between the test signal and the ideal reference signal onto the selected spreading factor in the selected slot. The spreading factor onto which projection is made is shown beneath the measurement result.
Avg. RCDE (4 PAM)	Average Relative Code Domain Error over all channels detected with 4 PAM in the selected frame.

Table 7-2: Channel Results

Symbol Rate:	Symbol rate at which the channel is transmitted.
No of Pilot Bits:	Indicates the number of pilot bits detected in the control channel.
Symbol EVM:	Peak or average of the results of the error vector magnitude measurement. The measurement provides information on the EVM of the channel (marked red) in the CDP diagram in the slot (marked red) of the power-versus slot diagram at the symbol level.
Chan Power Abs:	Channel power, absolute
Timing Offset:	Offset between the start of the first slot in the channel and the start of the analyzed 3GPP FDD UE frame.
Channel Slot No:	The channel slot number is obtained by combining the value of the selected CPICH and the channel's timing offset.

Modulation Type:	Indicates the modulation type of the selected channel. Valid entries are BPSK I for channels on branch I, BPSK Q for channels on branch Q and NONE for inactive channels.
Chan Power Rel:	Channel relative (referred to the total power of the signal)
Symbol EVM:	Peak or average of the results of the error vector magnitude measurement. The measurement provides information on the EVM of the channel (marked red) in the CDP diagram in the slot (marked red) of the power-versus slot diagram at the symbol level.
RCDE	Relative Code Domain Error for the complete frame of the selected channel.

Remote command:
`CALC:FEED "XTIM:CDP:ERR:SUMM"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113
Query of results:
`CALCulate<n>:MARKer<m>:FUNCtion:WCDPower:MS:RESult?` on page 131

Code Domain Error Power

"Code Domain Error Power" is the difference in power between the measured and his ideal signal. The unit is dB. There are no other units for the y-axis.

Remote command:
`CALC:FEED "XTIM:CDP:ERR:PCD"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Channel Table

The "Code Domain Channel Table" display mode shows the channel assignment table. The channel assignment table can contain a maximum of 512 entries, corresponding to the 256 codes that can be assigned within the class of spreading factor 256, both I and Q components.

The upper part of the table indicates the DPCCH channel that has to be present in every signal to be analyzed. Furthermore there are additional control channels used in HSDPA and HSUPA signals. These channels (HSDPCCH and EDPCCH) are also displayed in the upper part of the table.

The lower part of the table indicates the data channels (DPDCH and E-DPDCH) that are contained in the signal. As specified in 3GPP, the channel table can contain up to 6 DPDCHs or up to 4 E-DPDCHs. The channels are in descending order according to symbol rates and within a symbol rate in ascending order according to the channel numbers. Therefore, the unassigned codes are always to be found at the end of the table.

Physical channels used in 3GPP UPLINK signals according to Release 99 specification:

DPCCH	The Dedicated Physical Control Channel is used to synchronize the signal. It carries pilot symbols and is expected in the Q branch at code class 8 with code number 0. The channel is displayed in the upper part of the table.
DPDCH	The Dedicated Physical Data Channel is used to carry UPLINK data from the UE to the BS. The code allocation depends on the total required symbol rate. The following table represents the possible configurations of DPCH spreading factors and code allocation.

HSDPCCH	The High Speed Dedicated Physical Control Channel (for HS-DCH) is used to carry control information (CQI/ACK/NACK) for downlink high speed data channels (HS-DCH). It is used in HSDPA signal setup. The data rate is fixed to 15ksps. The code allocation depends on the number of active DPCH and is described in the table below. This control channel is displayed in the upper part of the channel table. The HS-DPCCH can be switched on or of at for a duration of 1/5 frame = 3 slots = 2ms. Power control is applicable too.
EDPCCH	The Enhanced Dedicated Physical Control Channel is used to carry control information for uplink high speed data channels (EDPDCH). It is used in HSUPA signal setup. The data rate is fixed to 15ksps. This control channel is displayed in the upper part of the channel table.
EDPDCH	The Enhanced Dedicated Physical Data Channel is used to carry UPLINK data for high speed channels (EDPDCH). It is used in HSUPA signal setup. The data rate and code allocation depends on the number of DPDCH and HS-DPCCH (refer to table below). This data channel is displayed in the lower part of the channel table.

The following parameters of these channels are determined by the CDP measurement:

Chan Type	Type of channel (active channels only).
Ch. SF	Number of channel spreading code (0 to [spreading factor])
Sym Rate [ksps]	Symbol rate at which the channel is transmitted (15 ksps to 960 ksps)
Stat	Status display. Codes that are not assigned are marked as inactive channels.
TFCI	Indication whether the data channel uses TFCI symbols.
PilotL [Bits]	Number of pilot bits of the channel (only valid for the control channel DPCCH).
Pwr Abs [dBm]/Pwr Rel [dBm]	Indication of the absolute and relative channel power (referred to the CPICH or the total power of the signal).
T Offs [Chips]	Timing offset. Offset between the start of the first slot of the channel and the start of the analyzed 3GPP FDD UE frame.

In CODE CHAN "AUTO SEARCH" mode, a data channel is designated as active if its power has a minimum value compared to the total power of the signal and if a minimum signal/noise ratio is maintained within the channel.

In CODE CHAN "PREDEFINED" mode, each data channel that is included in the user defined channel table is considered to be active.

In the R&S FSV–K73 the display configuration can be set to show quarter screens. In such a case the channel table is reduced to: Channel, Code SF, State and Power Abs

Remote command:
`CALC:FEED "XTIM:CDP:ERR:CTAB"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Power vs Symbol
The "Power vs. Symbol" measurement shows the power over the symbol number for the selected channel and the selected slot. The power is not averaged here. The trace is drawn using a histogram line algorithm, i.e. only vertical and horizontal lines, no diagonal, linear Interpolation (polygon interpolation). Surfaces are NOT filled. This measurement displays Power versus Symbol for one single channel and for one single slot.

Remote command:
`CALC:FEED "XTIM:CDP:PVSY"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Symbol Constellation
The "Symbol Const" measurement shows QPSK or BPSK modulated signals of the selected channel and the selected slot. QPSK constellation points are located on the diagonals (not x and y-axis) of the constellation diagram. BPSK constellation points are always on the x-axis. If possible the display should use more than just 1 pixel per value, as in the minimum case only 12 symbols are available. This improves the visibility.

Remote command:
`CALC:FEED "XTIM:CDP:SYMB:CONS"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Symbol EVM
The "Symbol EVM" display mode shows the error between the measured signal and the ideal reference signal in percent for the selected channel and the selected slot. A trace over all symbols of a slot is drawn. The number of symbols is in the range from 12 (min) to 384 (max). It depends on the symbol rate of the channel.

Remote command:
`CALC:FEED "XTIM:CDP:SYMB:EVM"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Bitstream
The "Bitstream" measurement displays the demodulated bits of a selected channel for a given slot. Depending on the symbol rate the number of symbols within a slot can vary from 12 (min) to 384 (max). For QPSK modulation a symbol consists of 2 Bits (I and Q). For BPSK modulation a symbol consists of 1 Bit (only I used).

Remote command:
`CALC:FEED "XTIM:CDP:BSTR"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Freq Err vs Slot
To reduce the overall span of "Frequency Err vs Slot", the difference between the frequency error of the corresponding slot to the frequency error of the first (zero) slot is calculated for each value to be displayed. This helps eliminate a static frequency offset of the whole signal to achieve a better display of a real time-depending frequency curve.

Remote command:
`CALC:FEED "XTIM:CDP:FVSL"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

Phase Discontinuity vs Slot
The "Phase Discontinuity vs Slot" is calculated according to 3GPP specifications. The phase calculated for each slot is interpolated to both ends of the slot using the frequency shift of that slot. The difference between the phase interpolated for the beginning of one slot and the end of the preceding slot is displayed as the phase discontinuity of that slot.

Remote command:
`CALC:FEED "XTIM:CDP:PSVS"`, see chapter 8.2.2, "CALCulate:FEED subsystem", on page 113

7.1.4 Softkeys of the Frequency Menu – FREQ key (R&S FSV–K73)

The FREQ key opens a submenu to change the measurement frequency.

Some softkey functions are not available in CDP mode. Refer to the description of the FREQ key in the base unit for information on the other softkeys available for RF measurements.

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

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

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

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

Remote command:
`[SENSe:]FREQuency:CENTer` on page 190

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

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

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

Remote command:
`[SENSe:]FREQuency:CENTer:STEP` on page 190

Frequency Offset
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset.

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

Remote command:
`[SENSe:]FREQuency:OFFSet` on page 191

7.1.5 Softkeys of the Amplitude Menu – AMPT key (R&S FSV–K73)

The AMPT key opens a submenu to set the level.

Some softkey functions are not available in CDP mode. Refer to the description of the AMPT key in the base unit for information on the other softkeys available for RF measurements.

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

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

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 209

Scaling
Opens a submenu to define the amplitude scaling type.

Ref Value ← Scaling
The "Ref Value" softkey opens an edit dialog box to adjust the reference value.

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue on page 210

Y per Div ← Scaling
The "Y PER DIV" softkey opens an edit dialog box to change the range per division in the result diagram. The range is the length for one section of the y axis.

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision on page 209

Ref Value Position ← Scaling
The "Ref Value Position" softkey opens an edit dialog box to adjust the position the reference value of the y-axis (0 – 100 %). 100 % is at the top of the screen, 0 % is at the bottom of the screen.

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition on page 210

Preamp On/Off
Switches the preamplifier on and off.

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

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

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

Remote command:
INPut:GAIN:STATe on page 218

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

The mechanical attenuation can be set in 10 dB steps.

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

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

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

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

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

Remote command:
INPut:ATTenuation on page 212

RF Atten Auto/Mech Att Auto

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

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

Remote command:
`INPut:ATTenuation:AUTO` on page 212

El Atten On/Off

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

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

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

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

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

Remote command:
`INPut:EATT:AUTO` on page 217

El Atten Mode (Auto/Man)

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

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

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

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

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

Remote command:
`INPut:EATT:AUTO` on page 217
`INPut:EATT` on page 216

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

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 210

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

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

Remote command:
`INPut:COUPling` on page 213

7.1.6 Softkeys of the Sweep Menu – SWEEP key (R&S FSV–K73)

The menu of the SWEEP key contains options to switch between single measurement and continuous measurement and to control individual measurements.

Some softkey functions are not available in CDP mode. Refer to the description of the SWEEP key in the base unit for information on the other softkeys available for RF measurements.

In Code Domain Analyzer mode, the following functions are available in the submenu:

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 69).

Remote command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 223

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

Remote command:
INIT:CONT OFF, see INITiate<n>:CONTinuous on page 223

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

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

Remote command:
INITiate<n>:CONMeas on page 223

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

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

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

Remote command:
[SENSe:]SWEep:COUNt on page 193

7.1.7 Softkeys of the Trigger Menu – TRIG key (R&S FSV–K73)

The TRIG key opens the following submenu.

The following softkey functions are available for CDA 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.

Remote command:
TRIG:SOUR IMM, see TRIGger<n>[:SEQuence]:SOURce on page 221

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.

Remote command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 221

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

For more information see chapter 6.3, "Working with the Frequency Mask Trigger", on page 26.

Remote command:
see chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152

Trigger Polarity
Sets the polarity of the trigger source.

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

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

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

Remote command:
`TRIGger<n>[:SEQuence]:SLOPe` on page 221
`[SENSe:]SWEep:EGATe:POLarity` on page 193

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

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

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

Remote command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 220

7.1.8 Softkeys of the Trace Menu – TRACE key (R&S FSV–K73)

The TRACE key is used to configure the data acquisition for measurement and the analysis of the measurement data.

The following chapter describes all softkeys available in the "Trace" menu in "3GPP FDD UE" Mode for Code Domain Analysis measurements.

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

Clear Write

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

All available detectors can be selected.

Remote command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 207

Max Hold

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

The detector is automatically set to "Positive Peak".

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

This mode is not available for statistics measurements.

Remote command:
`DISP:TRAC:MODE MAXH`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 207

Min Hold

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

The detector is automatically set to "Negative Peak".

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

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE MINH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 207

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

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 6.4.3, "Detector Overview", on page 32).

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE AVER, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 207

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

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the displayed trace no longer matches the current instrument setting is indicated by the icon on the tab label.

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

Remote command:
DISP:TRAC:MODE VIEW, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 207

7.1.9 Softkeys of the Marker Menu – MKR key (R&S FSV–K73)

The MKR key opens a submenu for the marker settings.

Markers are not available for the following result diagrams:

- Result Summary
- Channel Table

In all other result diagrams up to four markers can be activated.

The following softkeys are available for CDA measurements.

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

Marker 1/2/3/4

Selects the corresponding marker and activates it.

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

Remote command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 125
`CALCulate<n>:MARKer<m>:X` on page 126
`CALCulate<n>:MARKer<m>:Y` on page 128
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 139
`CALCulate<n>:DELTamarker<m>:X` on page 140
`CALCulate<n>:DELTamarker<m>:X:RELative?` on page 141
`CALCulate<n>:DELTamarker<m>:Y` on page 141

Marker Norm/Delta

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

Remote command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 125
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 139

Marker Zoom

Activates or deactivates the zoom for the current active marker. With the zoom function, more details of the measurement signal can be seen. This softkey can only be selected if at least one of the markers is activated.

Remote command:

`CALCulate<n>:MARKer<m>:FUNCtion:ZOOM` on page 133

All Marker Off

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

Remote command:

`CALCulate<n>:MARKer<m>:AOFF` on page 122

7.1.10 Softkeys of the Marker To Menu – MKR-> key (R&S FSV–K73)

The MKR-> key opens a submenu for marker functions. The menu is not available for the all result displays.

The following softkeys are available for CDA measurements.

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

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

`CALCulate<n>:MARKer<m>[:STATe]` on page 125

`CALCulate<n>:MARKer<m>:X` on page 126

`CALCulate<n>:MARKer<m>:Y` on page 128

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

Remote command:
`CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 123

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

Remote command:
`CALCulate<n>:MARKer<m>:MAXimum:NEXT` on page 122
`CALCulate<n>:DELTamarker<m>:MAXimum:NEXT` on page 137

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

Three settings are available:

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

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

Remote command:
CALC:MARK:MAX:LEFT (<): CALCulate<n>:MARKer<m>:MAXimum:LEFT on page 122
CALCulate<n>:DELTamarker<m>:MAXimum:LEFT on page 137
CALC:MARK:MAX:RIGH (>): CALCulate<n>:MARKer<m>:MAXimum:RIGHt on page 123
CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt on page 138
CALC:DELT:MAX:NEXT (abs): CALCulate<n>:MARKer<m>:MAXimum:NEXT on page 122
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT on page 137

CPICH
The "CPICH" softkey sets the marker to the CPICH channel. The softkey is only available for R&S FSV-K72.

CALCulate<n>:MARKer<m>:FUNCtion:CPICh on page 129

CALCulate<n>:MARKer<m>:Y on page 128

PCCPCH
Sets the marker to the PCCPCH channel.

Remote command:
CALCulate<n>:MARKer<m>:FUNCtion:PCCPch on page 129
CALCulate<n>:MARKer<m>:Y on page 128

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

Remote command:
CALCulate<n>:MARKer<m>:MINimum[:PEAK] on page 124

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

Remote command:
CALCulate<n>:MARKer<m>:MINimum:NEXT on page 124
CALCulate<n>:DELTamarker<m>:MINimum:NEXT on page 138

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

Three settings are available:

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

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

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

Remote command:
`CALC:MARK:MIN:LEFT` (>): `CALCulate<n>:MARKer<m>:MINimum:LEFT` on page 123
`CALCulate<n>:DELTamarker<m>:MINimum:LEFT` on page 138
`CALC:MARK:MIN:RIGH` (>): `CALCulate<n>:MARKer<m>:MINimum:RIGHt` on page 125
`CALCulate<n>:DELTamarker<m>:MINimum:RIGHt` on page 139
`CALC:MARK:MIN:NEXT` (abs): `CALCulate<n>:MARKer<m>:MINimum:NEXT` on page 124
`CALCulate<n>:DELTamarker<m>:MINimum:NEXT` on page 138

7.1.11 Softkeys of the Auto Set Menu – AUTO SET Key (R&S FSV–K73)

The AUTOSET key opens a menu to configure automatic settings.

This chapter describes the softkeys available for CDA measurements.

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

Auto All

Performs all automatic settings.

- "Auto Level" on page 76
- "Auto Scrambling Code" on page 77

Remote command:
`[SENSe:]ADJust:ALL` on page 184

Auto Level

Defines the optimal reference level for the current measurement automatically.

The measurement time for automatic leveling can be defined using the Settings softkey.

Remote command:
`[SENSe:]ADJust:LEVel` on page 185

Auto Scrambling Code

This softkey starts a calculation on the recorded signal with all scrambling codes. The scrambling code that leads to the highest signal power is chosen as the new scrambling code.

Remote command:
`[SENSe:]CDPower:LCODe:SEARch:[IMMediate]?` on page 174

Settings

Opens a submenu to define settings for automatic leveling.

Possible settings are:

- "Meas Time Manual" on page 77
- "Meas Time Auto" on page 77

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 76). The default value is 1 ms.

Remote command:
`[SENSe:]ADJust:CONFigure:LEVel:DURation` on page 185

Meas Time Auto ← Settings

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

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

Upper Level Hysteresis ← Settings

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

Remote command:
`[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer` on page 184

Lower Level Hysteresis ← Settings

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

Remote command:
`[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer` on page 184

7.1.12 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 7.2.6.6, "Softkeys of the Input/Output Menu for RF Measurements", on page 106.

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

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

Remote command:
`INPut:COUPling` on page 213

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

Remote command:
`DIAGnostic<n>:SERVice:NSOurce` on page 223

Signal Source
Opens a dialog box to select the signal source.

For "Digital Baseband (I/Q)", the source can also be configured here.

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

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

Remote command:
`INPut:SELect` on page 218

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

The device name is unknown.

Remote command:
`INPut:DIQ:CDEVice` on page 213

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

Remote command:
`INPut:DIQ:SRATe` on page 216

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

The level can be defined either in dBm or Volt.

Remote command:
`INPut:DIQ:RANGe[:UPPer]` on page 215

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

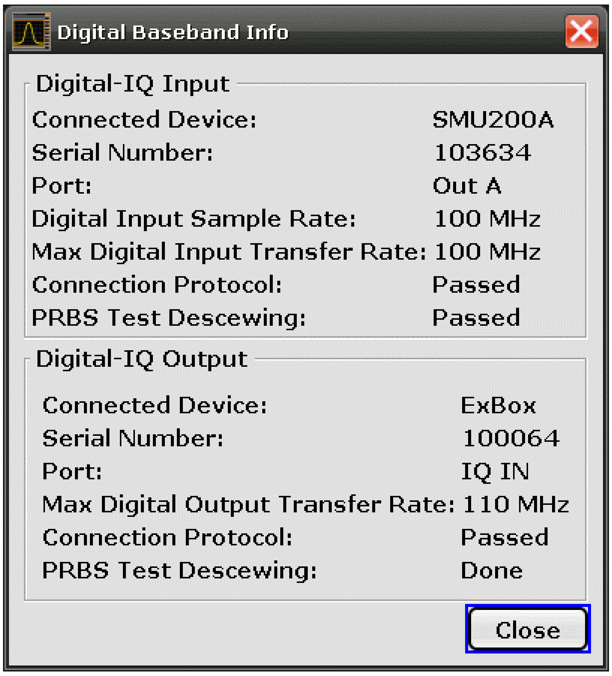
Remote command:
`INPut:DIQ:RANGe[:UPPer]:UNIT` on page 215

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

Remote command:
`INPut:DIQ:RANGe:COUPling` on page 214

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

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



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

Remote command:
`INPut:DIQ:CDEVice` on page 213

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

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

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

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

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

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

TX Settings ← EXIQ
Opens the "EX-IQ-BOX Settings" dialog box to configure the R&S FSVR for digital output to a connected device ("Transmitter" Type).

RX Settings ← EXIQ
Opens the "EX-IQ-BOX Settings" dialog box to configure the R&S FSVR for digital input from a connected device ("Receiver" Type).

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

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

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

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

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

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

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

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

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

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

7.2 RF Measurements

7.2.1 Output Power Measurements

The R&S FSVR measures the unweighted RF signal power in a bandwidth of:

$$f_{BW} = 5\,MHz \geq (1+\alpha)\cdot 3.84\,MHz \quad | \quad \alpha = 0.22$$

The power is measured in zero span mode (time domain) using a digital channel filter of 5 MHz in bandwidth. According to the 3GPP standard, the measurement bandwidth (5 MHz) is slightly larger than the minimum required bandwidth of 4.7 MHz. The bandwidth is displayed numerically below the screen.

Remote: `CONFigure:WCDPower:MS:MEASurement` on page 164

7.2.2 Spectrum Emission Mask

The measurement Spectrum Emission Mask is the determination of the power of the 3GPP FDD UE signal in defined offsets from the carrier and compares the power values with a spectral mask specified by 3GPP.

This measurement ist identical to the Spectrum Emission Mask measurement of the base unit.

By entering the measurement, the configuration to measure the 3GPP standard will be loaded.

The following user-specific settings are not modified on the first access following presetting:

- Reference Level, Reference Level Offset

- Center Frequency, Frequency Offset
- Input Attenuation, Mixer Level
- All trigger settings

SCPI command: `CONFigure:WCDPower:MS:MEASurement` on page 164

7.2.3 Adjacent Channel Power (ACLR)

Selecting of Adjacent Channel Power (ACLR) activates the adjacent channel power measurement in the default setting according to 3GPP specifications (adjacent channel leakage ratio). The R&S FSVR measures the channel power and the relative power of the adjacent channels and of the alternate channels. The results are displayed below the screen.

The following user-specific settings are not modified on the first access following presetting:

- Reference Level, Reference Level Offset
- Center Frequency, Frequency Offset
- Input Attenuation, Mixer Level
- All trigger settings

Pressing the Adjacent Channel Power softkey activates the analyzer mode with defined settings:

CHAN PWR/ACP	CP/ACP ON	
CP/ACP STANDARD	W-CDMA 3GPP FWD	
CP/ACP CONFIG	NO. OF ADJ CHAN	2

To restore adapted measurement parameters, the following level parameters are saved on exiting and are set again on re-entering this measurement:

Level Parameters

- RBW, VBW
- Sweep time
- SPAN
- NO OF ADJ. CHANNELS
- FAST ACP MODUS

For further details about the ACP measurements refer to "Settings of CP/ACLR Test Parameters" of the base unit.

`CONFigure:WCDPower:MS:MEASurement` on page 164

Query of results:

`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` on page 129

7.2.4 Occupied Bandwidth

The Occupied Bandwidth softkey activates the measurement of the bandwidth that the signal occupies.

The occupied bandwidth is defined as the bandwidth in which – in default settings -99 % of the total signal power is to be found. The percentage of the signal power to be included in the bandwidth measurement can be changed.

The occupied bandwidth and the frequency markers are output in the marker info field at the top right edge of the screen as OBW.

The following user-specific settings are not modified on the first access following pre-setting:

- Reference Level, Reference Level Offset
- Center Frequency, Frequency Offset
- Input Attenuation, Mixer Level
- All trigger settings

Pressing the Occupied Bandwidth softkey activates the analyzer mode with defined settings:

OCCUPIED BANDWIDTH		
TRACE1	DETECTOR	SAMPLE

To restore adapted measurement parameters, the following level parameters are saved on exiting and are set again on re-entering this measurement:

Level Parameters

- RBW, VBW
- Sweep time
- SPAN

For further details about the Occupied Bandwidth measurements refer to the description in the base unit.

Remote: `CONFigure:WCDPower:MS:MEASurement` on page 164

Query of results:

Remote: `CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` on page 129

7.2.5 CCDF

The CCDF softkey starts a measurement of the distribution function of the signal amplitudes (complementary cumulative distribution function). The CCDF and the Crest factor are displayed. For the purposes of this measurement, a signal section of user-definable length is recorded continuously in the zero span, and the distribution of the signal amplitudes is evaluated.

The following user-specific settings are not modified on the first access following pre-setting:

- Reference Level, Reference Level Offset
- Center Frequency, Frequency Offset
- Input Attenuation, Mixer Level
- All trigger settings

Pressing the CCDF softkey activates the analyzer mode with defined settings:

CCDF		
TRACE1	DETECTOR	SAMPLE
BW	RES BW MANUAL	10 MHz
	VIDEO BW MANUAL	5 MHz

To restore adapted measurement parameters, the following level parameters are saved on exiting and are set again on re-entering this measurement:

Level Parameters

- RBW
- NO OF SAMPLES

For further details about the CCDF measurements refer to the description in the base unit.

`CONFigure:WCDPower:MS:MEASurement` on page 164

or

`CALCulate<n>:STATistics:CCDF[:STATe]` on page 160

Query of results:

`CALCulate<n>:MARKer<m>:X` on page 126

`CALCulate<n>:STATistics:RESult<Trace>` on page 161

7.2.6 Softkeys and Menus for RF Measurements (K73)

The following chapter describes the softkeys and menus available for RF measurements in 3GPP FDD UE base station tests.

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

7.2.6.1 Softkeys of the Frequency Menu

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

Center

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

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

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

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

Remote command:
`[SENSe:]FREQuency:CENTer` on page 190

CF Stepsize

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

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

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

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

This softkey is available for RF measurements.

0.1*Span (span > 0) ← CF Stepsize

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

Remote command:
`FREQ:CENT:STEP:LINK SPAN`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 190
`FREQ:CENT:STEP:LINK:FACT 10PCT`, see `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor` on page 191

0.1*RBW (span > 0) ← CF Stepsize
Sets the step size for the center frequency to 10 % of the resolution bandwidth.

This is the default setting.

Remote command:
FREQ:CENT:STEP:LINK RBW, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 190
FREQ:CENT:STEP:LINK:FACT 10PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 191

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

Remote command:
FREQ:CENT:STEP:LINK SPAN, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 190
FREQ:CENT:STEP:LINK:FACT 50PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 191

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

Remote command:
FREQ:CENT:STEP:LINK RBW, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 190
FREQ:CENT:STEP:LINK:FACT 50PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK:FACTor on page 191

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

Remote command:
FREQ:CENT:STEP:LINK SPAN, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 190
FREQ:CENT:STEP:LINK:FACT 20PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 190

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

Remote command:
FREQ:CENT:STEP:LINK RBW, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 190
FREQ:CENT:STEP:LINK:FACT 20PCT, see [SENSe:]FREQuency:CENTer:STEP:LINK on page 190

=Center ← CF Stepsize
Sets the step size to the value of the center frequency and removes the coupling of the step size to span or resolution bandwidth.

This function is especially useful for measurements of the signal harmonics. In this case, each stroke of the arrow key selects the center frequency of another harmonic.

=Marker ← CF Stepsize
Sets the step size to the value of the current marker and removes the coupling of the step size to span or resolution bandwidth.

This function is especially useful for measurements of the signal harmonics. In this case, each stroke of the arrow key selects the center frequency of another harmonic.

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

Remote command:
`[SENSe:]FREQuency:CENTer:STEP` on page 190

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

$f_{min} \leq f_{start} \leq f_{max} - span_{min}$

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

Remote command:
`[SENSe:]FREQuency:STARt` on page 192

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

$f_{min} + span_{min} \leq f_{stop} \leq f_{max}$

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

Remote command:
`[SENSe:]FREQuency:STOP` on page 192

Frequency Offset
Opens an edit dialog box to enter a frequency offset that shifts the displayed frequency range by the specified offset.

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

Remote command:
`[SENSe:]FREQuency:OFFSet` on page 191

7.2.6.2 Softkeys of the Span Menu for RF Measurements

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

Span Manual

Opens an edit dialog box to enter the frequency span. The center frequency remains the same when you change the span.

The following range is allowed:

span = 0: 0 Hz

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

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

Remote command:
[SENSe:]FREQuency:SPAN on page 192

Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

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

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

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

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

Remote command:
SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 194
[SENSe:]SWEep:TIME on page 193

Full Span

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

Remote command:
[SENSe:]FREQuency:SPAN:FULL on page 192

Last Span
Sets the span to the previous value. With this function e.g. a fast change between overview measurement and detailed measurement is possible.

Remote command:
-

7.2.6.3 Softkeys of the Amplitude Menu

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

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

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

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 209

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

This softkey and its submenu are available for RF measurements.

Range Log 100 dB ← Range
Sets the level display range to 100 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211
Display range:
`DISP:WIND:TRAC:Y 100DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 208

Range Log 50 dB ← Range
Sets the level display range to 50 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211
Display range:
`DISP:WIND:TRAC:Y 50DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 208

Range Log 10 dB ← Range
Sets the level display range to 10 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211
Display range:
`DISP:WIND:TRAC:Y 10DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 208

Range Log 5 dB ← Range
Sets the level display range to 5 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211
Display range:
`DISP:WIND:TRAC:Y 5DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 208

Range Log 1 dB ← Range
Sets the level display range to 1 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211
Display range:
`DISP:WIND:TRAC:Y 1DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 208

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

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211
Display range:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 208

Range Linear % ← Range
Selects linear scaling for the level axis in %.

The grid is divided into decadal sections.

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

Remote command:
`DISP:TRAC:Y:SPAC LIN`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211

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

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

Remote command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211

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

The default setting is dBm.

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

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

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

Remote command:
CALCulate<n>:UNIT:POWer on page 164

Preamp On/Off
Switches the preamplifier on and off.

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

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

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

Remote command:
INPut:GAIN:STATe on page 218

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

The mechanical attenuation can be set in 10 dB steps.

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

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

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

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

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

Remote command:
INPut:ATTenuation on page 212

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

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

Remote command:
`INPut:ATTenuation:AUTO` on page 212

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

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

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

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

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

Remote command:
`INPut:EATT:AUTO` on page 217

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

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

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

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

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

Remote command:
`INPut:EATT:AUTO` on page 217
`INPut:EATT` on page 216

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

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 210

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

Only available for RF measurements.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition` on page 210

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

Only available for RF measurements.

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

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 209

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

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

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

Remote command:
[SENSe:]POWer:NCORrection on page 183

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

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

Remote command:
INPut:COUPling on page 213

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

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

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

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

Remote command:
INPut:IMPedance on page 218

YIG Filter (On Off)
Activates or deactivates the YIG filter by means of relays or by bypassing the filter.

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

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

INPut:FILTer:YIG[:STATe] on page 217

7.2.6.4 Softkeys of the Bandwidth Menu

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

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

Bandwidth settings are only available for RF measurements.

Res BW Manual

Opens an edit dialog box to enter a value for the resolution bandwidth. The available resolution bandwidths are specified in the data sheet.

For details on the correlation between resolution bandwidth and filter type refer to chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 34.

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 all RF measurements except for Power measurements.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 187
`[SENSe:]BANDwidth|BWIDth[:RESolution]` on page 186

Res BW Auto

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

This setting is recommended if you need the ideal resolution bandwidth in relation to a particular span.

This softkey is available for measuring the Adjacent Channel Power, the Occupied Bandwidth and the CCDF.

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO on page 187

Video BW Manual

Opens an edit dialog box to enter the video bandwidth. The available video bandwidths are specified in the data sheet.

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

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

Note: RMS detector and VBW.
If an RMS detector is used, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves.
For details on detectors see chapter 6.4.3, "Detector Overview", on page 32.

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

Remote command:
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 189
[SENSe:]BANDwidth|BWIDth:VIDeo on page 189

Video BW Auto

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

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

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

Remote command:
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 189

Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

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

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

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

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

Remote command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 194
`[SENSe:]SWEep:TIME` on page 193

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

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

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

Remote command:
`[SENSe:]SWEep:TIME:AUTO` on page 194

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 99
- "FFT" on page 100 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 34)
- "Auto" on page 100

Sweep ← Sweep Type
Sets the Sweep Type to standard analog frequency sweep.

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

Remote command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 194

FFT ← Sweep Type
Sets the Sweep Type to FFT mode.

The FFT sweep mode samples on a defined frequency value and transforms it to the spectrum by fast Fourier transformation (FFT).

FFT is not available when using 5-Pole filters, Channel filters or RRC filters. In this case, sweep mode is used.

Remote command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 194

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

Remote command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 194

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

Auto ← FFT Filter Mode ← Sweep Type
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 187

Narrow ← FFT Filter Mode ← Sweep Type
For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 187

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

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

RBW/VBW Sine [1/1] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth"

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

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

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 1`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 189

RBW/VBW Pulse [.1] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = 10 × resolution bandwidth or"

"video bandwidth = 10 MHz (= max. VBW)."

This coupling ratio is recommended whenever the amplitudes of pulsed signals are to be measured correctly. The IF filter is exclusively responsible for pulse shaping. No additional evaluation is performed by the video filter.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 10`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 189

RBW/VBW Noise [10] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth/10"

At this coupling ratio, noise and pulsed signals are suppressed in the video domain. For noise signals, the average value is displayed.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 0.1`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 189

RBW/VBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

The resolution bandwidth/video bandwidth ratio can be set in the range 0.001 to 1000.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
`BAND:VID:RAT 10`, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio on page 189

Span/RBW Auto [100] ← Coupling Ratio
Sets the following coupling ratio:

"resolution bandwidth = span/100"

This coupling ratio is the default setting of the R&S FSVR.

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

Remote command:
`BAND:VID:RAT 0.001`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 189

Span/RBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

The span/resolution bandwidth ratio can be set in the range 1 to 10000.

Remote command:
`BAND:RAT 0.1`, see `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` on page 188

Default Coupling ← Coupling Ratio
Sets all coupled functions to the default state ("AUTO").

In addition, the ratio "RBW/VBW" is set to "SINE [1/1]" and the ratio "SPAN/RBW" to *100.*

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 187
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 189
`[SENSe:]SWEep:TIME:AUTO` on page 194

Filter Type
Opens a submenu to select the filter type.

This softkey and its submenu are available for measuring the the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF. Instead of opening a submenu, this softkey opens the "Sweep List" dialog box to select the filter type when measuring the Spectrum Emission Mask.

The submenu contains the following softkeys:

- Normal (3 dB)
- CISPR (6 dB)
- MIL Std (6 dB)
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel
- RRC
- 5-Pole (not available for sweep type "FFT")

For detailed information on filters see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 34 and chapter 6.4.6, "List of Available RRC and Channel Filters", on page 35.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE` on page 188

7.2.6.5 Softkeys of the Sweep Menu

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

Continuous Sweep

Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting.

The trace averaging is determined by the sweep count value (see the "Sweep Count" softkey, "Sweep Count" on page 69).

Remote command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 223

Single Sweep

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

Remote command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 223

Continue Single Sweep

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

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

Remote command:
`INITiate<n>:CONMeas` on page 223

Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

Sweep time	
absolute max. sweep time value:	16000 s
absolute min. sweep time value:	zero span: 1 µs
	span > 0: depends on device model (refer to data sheet)

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

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

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

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

Remote command:
`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 194
`[SENSe:]SWEep:TIME` on page 193

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

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

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

Remote command:
`[SENSe:]SWEep:TIME:AUTO` on page 194

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 99
- "FFT" on page 100 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 34)
- "Auto" on page 100

Sweep ← Sweep Type
Sets the Sweep Type to standard analog frequency sweep.

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

Remote command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 194

FFT ← Sweep Type
Sets the Sweep Type to FFT mode.

The FFT sweep mode samples on a defined frequency value and transforms it to the spectrum by fast Fourier transformation (FFT).

FFT is not available when using 5-Pole filters, Channel filters or RRC filters. In this case, sweep mode is used.

Remote command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 194

Auto ← Sweep Type
Automatically sets the fastest available Sweep Type for the current measurement. Auto mode is set by default.

Remote command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 194

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

Auto ← FFT Filter Mode ← Sweep Type
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 187

Narrow ← FFT Filter Mode ← Sweep Type
For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

Remote command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 187

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

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

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

Remote command:
`[SENSe:]SWEep:COUNt` on page 193

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.

Remote command:
`[SENSe:]SWEep:POINts` on page 193

7.2.6.6 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 7.1.12, "Softkeys of the Input/Output Menu for CDA Measurements", on page 77.

Input (AC/DC)

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

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

Remote command:
`INPut:COUPling` on page 213

Noise Source

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

Remote command:
`DIAGnostic<n>:SERVice:NSOurce` on page 223

Video Output

Turns output on the IF / Video output available with option R&S FSV-B5 on and off.

When you turn on the output, you can select to output either the intermediate frequency or the video signal.

Note: Video output does not return valid values in IQ or FFT mode.

Remote command:
`OUTP:IF VID` , see `OUTPut:IF[:SOURce]` on page 225

Power Sensor

For precise power measurement a power sensor can be connected to the instrument via the front panel (USB connector) or the rear panel (power sensor, option R&S FSV-B5). The Power Sensor Support firmware option (R&S FSV-K9) provides the power measurement functions for this test setup.

This softkey is only available if the R&S FSVR option Power Sensor (R&S FSV-K9) is installed.

For details see the chapter "Instrument Functions Power Sensor (K9)" in the base unit description.

This softkey is available for RF measurements.

Trigger Out

Sets the Trigger Out port in the Additional Interfaces (option R&S FSV-B5 only) to low or high. Thus, you can trigger an additional device via the external trigger port, for example.

Remote command:
`OUTPut:TRIGger` on page 226

8 Remote Control Commands (R&S FSV–K73)

In this section all remote control commands specific to the user equipment test option R&S FSV–K73 are described in detail. For details on conventions used in this chapter refer to chapter 8.1, "Notation", on page 109.

For further information on analyzer or basic settings commands, refer to the corresponding subsystem in the base unit description.

In particular, the following subsystems are identical to the base unit; refer to the base unit description:

- CALCulate:DELTamarker
- CALCulate:MARKer (except for the specific commands described in chapter 8.2, "CALCulate subsystem (R&S FSV–K73)", on page 111)
- DISPlay subsystem
- FORMat subsystem
- INITiate subsystem
- INPut subsystem
- MMEM subsystem
- OUTput subsystem
- SENSe subsystem (except for the specific commands described in chapter 8.5, "SENSe subsystem (R&S FSV-K73)", on page 170)
- TRIGger subsystem

8.1 Notation

In the following sections, all commands implemented in the instrument are first listed and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

Individual Description

The individual description contains the complete notation of the command. An example for each command, the *RST value and the SCPI information are included as well.

The options and operating modes for which a command can be used are indicated by the following abbreviations:

Abbreviation	Description
A	spectrum analysis
A-F	spectrum analysis – span > 0 only (frequency mode)
A-T	spectrum analysis – zero span only (time mode)
ADEMOD	analog demodulation (option R&S FSV-K7)
BT	Bluetooth (option R&S FSV-K8)
CDMA	CDMA 2000 base station measurements (option R&S FSV-K82)
EVDO	1xEV-DO base station analysis (option R&S FSV-K84)
GSM	GSM/Edge measurements (option R&S FSV-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSV-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSV-K93)
NF	Noise Figure measurements (R&S FSV-K30)
PHN	Phase Noise measurements (R&S FSV-K40)
PSM	Power Sensor measurements (option R&S FSV-K9)

RT	Realtime mode
SFM	Stereo FM measurements (optionR&S FSV-K7S)
SPECM	Spectogram mode (option R&S FSV-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSV-K76/K77)
VSA	Vector Signal Analysis (option R&S FSV-K70)
WCDMA	3GPP Base Station measurements (option R&S FSV-K72), 3GPP UE measurements (option R&S FSV-K73)
WLAN	WLAN TX measurements (option R&S FSV-K91)

The spectrum analysis mode is implemented in the basic unit. For the other modes, the corresponding options are required.

Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description. The instrument itself does not distinguish between upper and lower case letters.

Special Characters

|	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.

Example:

```
SENSe:FREQuency:CW|:FIXed
```

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

```
SENSe:FREQuency:CW 1E3
```

```
SENSe:FREQuency:FIXed 1E3
```

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example: Selection of the parameters for the command

```
[SENSe<1…4>:]AVERage<1…4>:TYPE VIDeo | LINear
```

[]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards. Parameters in square brackets can be incorporated optionally in the command or omitted as well.

{}	Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.

Description of Parameters

Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<…>) and is briefly explained in the following.

For details see the chapter "SCPI Command Structure" in the base unit description.

<Boolean>

This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword OFF or by the numeric value 0, the "on" state is indicated by ON or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value> <num>

These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data). The following keywords given below are permitted:

- `MAXimum`: This keyword sets the parameter to the largest possible value.
- `MINimum`: This keyword sets the parameter to the smallest possible value.
- `DEFault`: This keyword is used to reset the parameter to its default value.
- `UP`: This keyword increments the parameter value.
- `DOWN`: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

`SENSe:FREQuency:CENTer? MAXimum`

Returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

8.2 CALCulate subsystem (R&S FSV–K73)

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.

8.2.1 CALCulate<n>CDPower subsystem

CALCulate<n>:CDPower:Mapping <SignalBranch>

This command adjusts the mapping for the result displays Code Domain Power and Code Domain Error Power.

Suffix:

<n> 1...4
window

Parameters:

<SignalBranch> I | Q | AUTO

I
The I branch of the signal will be used for evaluation

Q
The Q branch of the signal will be used for evaluation

AUTO
The branch selected by the dialog "Selected Channel" will be used for evaluation.

*RST: AUTO

Example: `CALC:CDP:MAPPING AUTO`

Mode: CDMA, WCDMA

Manual operation: See "Select Branch" on page 54

8.2.2 CALCulate:FEED subsystem

The CALCulate:FEED subsystem selects the result display for the different screens in the code domain analyzer. This corresponds to the result display selection in manual operation.

CALCulate<n>:FEED <Evaluation>

This command selects the evaluation mode for the different screens.

For a description of the evaluation modes see chapter 6.2, "Measurements and Result Diagrams", on page 24.

Suffix:
<n> window

Parameters:

<Evaluation>

'XPOW:CDP' | 'XPOW:CDP:ABSolute' | 'XPOW:CDP:RATio' | 'XPOW:CDP:OVERview | 'XPOWer:CDEP' | 'XTIMe:CDPower:CHIP:EVM' | 'XTIMe:CDPower:CHIP:MAGNitude' | 'XTIMe:CDPower:CHIP:PHASe' | 'XTIM:CDP:ERR:SUMM' | 'XTIM:CDP:ERR:CTABle' | 'XTIM:CDP:ERR:PCDomain' | 'XTIM:CDP:MACCuracy' | 'XTIM:CDP:PVSYmbol' | 'XTIM:CDP:COMP:CONStellation' | 'XTIM:CDP:FVSLot' | 'XTIM:CDP:PVSLot' | 'XTIM:CDP:PVSLot:ABSolute' | 'XTIM:CDP:PVSLot:RATio' | 'XTIM:CDP:BSTReam' | 'XTIM:CDP:SYMB:CONStellation' | 'XTIM:CDP:SYMB:EVM' | 'XTIMe:CDPower:SYMBol:EVM:PHASe' | 'XTIMe:CDPower:SYMBol:EVM:MAGNitude' | XTIM:CDP:PSVS

'XPOW:CDEPower'
Result display of code domain error power as bar graph

'XPOW:CDP'
Result display of code domain power as bar graph [absolute scaling]

'XPOW:CDP:ABSolute'
Result display of code domain power as bar graph [absolute scaling]

'XTIM:CDP:BSTReam'
Result display of bit stream

'XTIMe:CDP:CHIP:EVM'
Result display error vector magnitude (EVM) versus chip

'XTIMe:CDP:CHIP:MAGNitude'
Result display magnitude error versus chip

'XTIMe:CDPower:CHIP:PHASe'
Result display phase error versus chip

'XTIM:CDP:COMP:CONStellation'
Result display of composite constellation

'XTIM:CDP:ERR:CTABle'
Result display of channel assignment table

'XTIM:CDP:ERR:PCDomain'
Result display of peak code domain error

'XTIM:CDP:ERR:SUMMary'
Result display in tabular form

'XTIM:CDP:FVSLot'
Result display of frequency error versus slot

'XTIM:CDP:MACCuracy'
Result display of composite EVM (error vector magnitude referenced to the overall signal)

'XPOW:CDP:OVERview'

Result display of code domain power ratio as bar graph [relative scaling]

'XTIM:CDP:PSVS'
Result display of phase discontinuity versus slot

'XTIM:CDP:PVSLot'
Result display of power versus slot

'XTIM:CDP:PVSLot:ABSolute'
Result display of power versus slot [absolute scaling]

'XTIM:CDP:PVSLot:RATio'
Result display of power versus slot [absolute scaling]

'XTIM:CDP:PVSYmbol'
Result display of power versus symbol

‘XPOW:CDP:RATio'
Result display of code domain power as bar graph [relative scaling]

'XTIM:CDP:SYMB:CONStellation'
Result display of symbol constellation

'XTIM:CDP:SYMB:EVM'
Result display of symbol error vector magnitude

'XTIMe:CDPower:SYMBol:EVM:MAGNitude'
Result display of the symbol magnitude error

'XTIMe:CDPower:SYMBol:EVM:PHASe'
Result display of the symbol phase error

*RST: depends on the active screen

Example: `CALC3:FEED 'XTIM:CDP:ERR:SUMM'`
Activates the result summary in screen C.

Mode: WCDMA

8.2.3 CALCulate<n>LIMit:ACPower Subsystem

The CALCulate<n>LIMit:ACPower subsystem defines limit checking for adjacent channel power measurements.

CALCulate<n>:LIMit1:ACPower[:STATe] <State>

This command switches on and off the limit check for adjacent channel power measurements in the selected measurement window. The commands `CALCulate<n>LIMit:ACPower:ACHannel:STATe` or `CALCulate<n>LIMit:ACPower:ALTernate: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>	n irrelevant

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CALC:LIM:ACP ON`
Mode:	WCDMA

CALCulate<n>:LIMit1:ACPower:ACHannel[:RELative]

This command defines the relative limit of the upper/lower adjacent channel for adjacent channel power measurements in the selected measurement window. 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 `CALCulate<n>LIMit:ACPower:ACHannel:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent channel power as defined in mobile radio standards.

Suffix:

<n>	n irrelevant

Parameters:

	*RST: 0 dB The first numeric value is the limit for the upper (lower) adjacent channel. The second value is ignored but must be indicated for reasons of compatibility with the FSE family.
Example:	`CALC:LIM:ACP:ACH 30DB, 30DB` 'Sets the relative limit value in for the power in the lower and upper adjacent channel to 30 dB below the channel power.
Mode:	WCDMA

CALCulate<n>:LIMit1:ACPower:ACHannel[:RELative]:STATe <State>

This command activates the limit check for the relative limit value of the adjacent channel when adjacent channel power measurement is performed. Before the command, the limit check must be activated using `CALC:LIM:ACP:STAT ON`.

The result can be queried with `CALC:LIM:ACP:ACH:RES?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are available.

Suffix:

<n> n
irrelevant

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:LIM:ACP:ACH:REL:STAT ON`
'Switches on the check of the relative limit values for adjacent channels.

Mode: WCDMA

CALCulate<n>:LIMit1:ACPower:ACHannel:ABSolute

This command defines the absolute limit value for the lower/upper adjacent channel during adjacent-channel power measurement (Adjacent Channel Power) in the selected measurement window.

It should be noted that the absolute limit value has no effect on the limit check as soon as it is below the relative limit value defined with `CALC:LIM:ACP:ACH:REL`. This mechanism allows automatic checking of the absolute basic values of adjacent channel power as defined in mobile radio standards.

Suffix:

<n> n
irrelevant

Parameters:

*RST: -200DBM
The first value is the limit for the lower and the upper adjacent channel. The second limit value is ignored but must be indicated for reasons of compatibility with the FSE family.

Example: `CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
'Sets the absolute limit value in for the power in the lower and upper adjacent channel to 35 dBm.

Mode: WCDMA

CALCulate<n>:LIMit1:ACPower:ACHannel:ABSolute:STATe <State>

This command activates the limit check for the adjacent channel when adjacent-channel power measurement (Adjacent Channel Power) is performed. Before the command, the limit check for the channel/adjacent-channel measurement must be globally switched on using `CALC:LIM:ACP ON`.

The result can be queried with `CALC:LIM:ACP:ACH:RES?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are available.

Suffix:

<n> 1...4
irrelevant

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:LIM:ACP:ACH:ABS:STAT ON`
'Switches on the check of absolute limit values for the adjacent channels.

Mode: WCDMA

CALCulate<n>:LIMit1:ACPower:ACHannel:RESult?

This command queries the result of the limit check for the upper/lower adjacent channel in the selected measurement window 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> 1...4
irrelevant

Parameters:

The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Example: `CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

Usage: Query only

Mode: WCDMA

CALCulate<n>:LIMit1:ACPower:ALTernate<ch>[:RELative]

This command defines the limit for the selected alternate adjacent channel in the selected measurement window for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

The numeric suffix after ALTernate<1...11> denotes the first or the second alternate channels. 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 defined with `CALC:LIM:ACP:ALT:ABS`. This mechanism allows automatic checking of the absolute basic values of adjacent channel power as defined in mobile radio standards.

Suffix:

<n>	1...4 irrelevant
<ch>	1...11 alternate channel

Parameters:

	*RST: 0dB The first value is the limit for the lower and the upper alternate adjacent channel. The second limit value is ignored but must be indicated for reasons of compatibility with the FSE family.

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: WCDMA

CALCulate<n>:LIMit1:ACPower:ALTernate<ch>[:RELative]:STATe <State>

This command activates the limit check for the selected alternate adjacent channel in the selected measurement window for adjacent channel power measurements. Before the command, the limit check must be activated using `CALC:LIM:ACP:STAT ON`.

The numeric suffix after ALTernate denotes alternate channel.

The result can be queried with `CALC:LIM:ACP:ALT<1...11>:RES?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are obtained.

Suffix:

<n>	1...4 irrelevant
<ch>	1...11 alternate channel

Parameters:

<State>	*RST: OFF

Example: `CALC:LIM:ACP:ACH:REL:STAT ON`
'Switches on the check of the relative limit values for the first alternate adjacent channels

Mode: WCDMA

CALCulate<n>:LIMit1:ACPower:ALTernate<1...11>ABSolute

This command defines the absolute limit value for the selected alternate adjacent channel power measurement (Adjacent Channel Power) in the selected measurement window.

The numeric suffix after ALTernate denotes the first or the second alternate channel.

It should be noted that the absolute limit value for the limit check has no effect as soon as it is below the relative limit value defined with `CALC:LIM:ACP:ALT:REL`. This mechanism allows automatic checking of the absolute basic values defined in mobile radio standards for the power in adjacent channels.

The suffix <n> is irrelevant.

Parameters:

*RST: -200DBM
The first value is the limit for the lower and the upper alternate adjacent channel. The second limit value is ignored but must be indicated for reasons of compatibility with the FSE family.

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: WCDMA

CALCulate<n>:LIMit1:ACPower:ALTernate<1...11>:ABSolute:STATe <State>

This command activates the limit check for the selected alternate adjacent channel in the selected measurement window for adjacent channel power measurement (Adjacent Channel Power).

Before the command, the limit check must be globally switched on for the channel/ adjacent channel power with the command `CALC:LIM:ACP:STAT ON`.

The numeric suffix after ALTernate denotes the alternate channel.

The result can be queried with `CALC:LIM:ACP:ALT:RES?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are available.

Suffix:

<n> 1...4
irrelevant

Parameters:

ON | OFF
*RST: OFF

Example: `CALC:LIM:ACP:ACH:ABS:STAT ON`
'Switches on the check of absolute limit values for the first alternate adjacent channels.

Mode: WCDMA

CALCulate<n>:LIMit1:ACPower:ALTernate<1...11>:RESult?

This command queries the result of the limit check for the selected alternate adjacent channel in the selected measurement window for adjacent channel power measurements.

The numeric suffix after ALTernate denotes the alternate channel.

If the power measurement of the adjacent channel is switched off, the command produces a query error.

Suffix:
<n> 1...4
irrelevant

Parameters:
The result is returned in the form <result>, <result> where <result> = PASSED | FAILED and where the first (second) returned value denotes the lower (upper) alternate adjacent channel.

Example: `CALC:LIM:ACP:ALT2:RES?`
'Queries the limit check result in the second alternate adjacent channels.

Usage: Query only

Mode: WCDMA

8.2.4 CALCulate:MARKer subsystem

CALCulate<n>:MARKer<m>:AOFF

This command all markers off, including delta markers and marker measurement functions.

Suffix:

<n>	Selects the measurement window.
<m>	depends on mode irrelevant

Example: `CALC:MARK:AOFF`
Switches off all markers.

Usage: Event

Manual operation: See "All Marker Off" on page 73

CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command positions a marker to the next smaller trace maximum on the left of the current position (i.e. in descending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:MARK2:MAX:LEFT`
Positions marker 2 to the next lower maximum value to the left of the current value.

Usage: Event

Manual operation: See "Next Peak Mode" on page 74

CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command positions the marker to the next smaller trace maximum.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:MARK2:MAX:NEXT`
Positions marker 2 to the next lower maximum value.

Usage: Event

Manual operation: See "Next Peak" on page 74
See "Next Peak Mode" on page 74

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command positions the marker on the current trace maximum.

The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Example: `CALC:MARK2:MAX`
Positions marker 2 to the maximum value of the trace.

Usage: Event

Manual operation: See "Peak" on page 74

CALCulate<n>:MARKer<m>:MAXimum:RIGHt

This command positions a marker to the next smaller trace maximum on the right of the current value (i.e. in ascending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MAX:RIGH`
Positions marker 2 to the next lower maximum value to the right of the current value.

Usage: Event

Manual operation: See "Next Peak Mode" on page 74

CALCulate<n>:MARKer<m>:MINimum:LEFT

This command positions a marker to the next higher trace minimum on the left of the current value (i.e. in descending X direction).

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:LEFT`
Positions marker 2 to the next higher minimum value to the left of the current value.

Usage: Event

Manual operation: See "Next Min Mode" on page 75

CALCulate<n>:MARKer<m>:MINimum:NEXT

This command positions ae marker to the next higher trace minimum.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:NEXT`
Positions marker 2 to the next higher maximum value.

Usage: Event

Manual operation: See "Next Min" on page 75
See "Next Min Mode" on page 75

CALCulate<n>:MARKer<m>:MINimum[:PEAK]

This command positions the marker on the current trace minimum.

The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	depends on mode Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.

Usage: Event

Manual operation: See "Min" on page 75

CALCulate<n>:MARKer<m>:MINimum:RIGHt

This command positions a marker to the next higher trace minimum on the right of the current value (i.e. in ascending X direction).

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:RIGH`
Positions marker 2 to the next higher minimum value to the right of the current value.

Usage: Event

Manual operation: See "Next Min Mode" on page 75

CALCulate<n>:MARKer<m>:POWer:RESult:PHZ <State>

This command switches the query response of the power measurement results in the indicated measurement window between output of absolute values (OFF) and output referred to the measurement bandwidth (ON). The measurement results are output with `CALC:MARK:FUNC:POW:RES?`.

Parameters:

<State> ON: Results output referred to measurement bandwidth.
*RST: OFF
OFF: Results output in absolute values.

Example: `CALC:MARK:FUNC:POW:RES:PHZ ON`

Mode: WCDMA

CALCulate<n>:MARKer<m>[:STATe] <State>

This command turns markers on and off.

If the corresponding marker number is currently active as a deltamarker, it is turned into a normal marker.

Suffix:

<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CALC:MARK3 ON` Switches on marker 3 or switches to marker mode.
Manual operation:	See "Marker 1/2/3/4" on page 73 See "Marker Norm/Delta" on page 73 See "Select 1/2/3/4/Δ" on page 74

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command selects the trace a marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

If necessary, the corresponding marker is switched on prior to the assignment.

In the persistence spectrum result display, the command also defines if the marker is positioned on the persistence trace or the maxhold trace.

Suffix:

<n>	Selects the measurement window.
<m>	depends on mode Selects the marker.

Parameters:

<Trace>	**1 ... 6** Trace number the marker is positioned on. **MAXHold** Defines the maxhold trace as the trace to put the delta marker on. This parameter is available only for the persistence spectrum result display. **WRITe** Defines the persistence trace as the trace to put the delta marker on. This parameter is available only for the persistence spectrum result display.
Example:	`CALC:MARK3:TRAC 2` Assigns marker 3 to trace 2.

CALCulate<n>:MARKer<m>:X <Position>

This command positions a marker on a particular coordinate on the x-axis.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

Suffix:

<n>	Selects the measurement window.

<m> Selects the marker.

Parameters:

<Position> Numeric value that defines the marker position on the x-axis. The unit is either Hz (frequency domain) or s (time domain) or dB (statistics).

Range: The range depends on the current x-axis range.

Example: `CALC:MARK2:X 1.7MHz`
Positions marker 2 to frequency 1.7 MHz.

Manual operation: See "Marker 1/2/3/4" on page 73
See "Select 1/2/3/4/Δ" on page 74

CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] <State>

This command turns marker search limits on and off.

If the power measurement in zero span is active, this command limits the evaluation range on the trace.

Suffix:

<n> Selects the measurement window.

<m> marker

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:X:SLIM ON`
Switches on search limitation.

CALCulate<n>:MARKer<m>:X:SLIMits:ZOOM <State>

This command sets the limits of the marker search range to the zoom area.

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]`).

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:X:SLIM:ZOOM ON`
Switches the search limit function on.
`CALC:MARK:X:SLIM:RIGH 20MHz`
Sets the right limit of the search range to 20 MHz.

CALCulate<n>:MARKer<m>:Y <MarkerPosition>

This command queries the measured value of a marker.

If necessary, the command activates the marker or turns a delta marker into a normal marker.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<MarkerPosition> Defines the vertical marker position in the persistence spectrum result display.

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.
In I/Q Analyzer mode, for "Real/Imag (I/Q)", for example:
`1.852719887E-011,0`

Manual operation:

See "Marker 1/2/3/4" on page 73
See "Select 1/2/3/4/Δ" on page 74
See "CPICH" on page 75
See "PCCPCH" on page 75

8.2.5 CALCulate<n>MARKer:FUNCtion subsystem

The CALCulate<n>MARKer:FUNCtion subsystem checks the marker functions in the instrument.

CALCulate<n>:MARKer<m>:FUNCtion:CPICh

This command sets the marker to channel 0.

This command is only available in code domain power and code domain error power result diagrams.

Suffix:

<n>	window; depends on the selected display mode for which the marker is to be valid
<m>	marker number; only 1 allowed

Example: `CALC:MARK:FUNC:CPIC`

Mode: WCDMA

Manual operation: See "CPICH" on page 75

CALCulate<n>:MARKer<m>:FUNCtion:PCCPch

This command sets the marker to the position of the PCCPCH.

This command is only available in code domain power and code domain error power result diagrams.

Suffix:

<n>	window; depends on the selected display mode for which the marker is to be valid
<m>	marker number; only 1 allowed

Example: `CALC:MARK:FUNC:PCCP`

Mode: WCDMA

Manual operation: See "PCCPCH" on page 75

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? <ResultType>

This command queries the result of the performed power measurement in the window specified by the suffix <n>. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer` subsystem.

To obtain a correct result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single sweep mode.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<ResultType> ACPower | CPOWer

ACPower
Adjacent-channel power measurement
Results are output in the following sequence, separated by commas:
Power of transmission channel
Power of lower adjacent channel
Power of upper adjacent channel
Power of lower alternate channel 1
Power of upper alternate channel 1
Power of lower alternate channel 2
Power of upper alternate channel 2
The number of measured values returned depends on the number of adjacent/alternate channels selected with `[SENSe:]POWer:ACHannel:ACPairs`.
With logarithmic scaling (RANGE "LOG"), the power is output in the currently selected level unit; with linear scaling (RANGE "LIN dB" or "LIN %"), the power is output in W. If `[SENSe:]POWer:ACHannel:MODE` is set to "REL", the adjacent/alternate-channel power is output in dB.

CPOWer
Channel power measurement
In a Spectrum Emission Mask measurement, the query returns the power result for the reference range, if this power reference type is selected.
With logarithmic scaling (RANGE LOG), the channel power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the channel power is output in W.

CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect <MeasType>

This command selects – and switches on – the specified power measurement type in the window specified by the suffix <n>.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer` subsystem.

Note: If CPOWer is selected, the number of adjacent channels (`[SENSe:]POWer:ACHannel:ACPairs`) is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.

The channel/adjacent-channel power measurement is performed for the trace selected with `[SENSe:]POWer:TRACe`.

The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of `CALCulate<n>:MARKer<m>:TRACe`.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<MeasType>

ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CNO

ACPower
Adjacent-channel power measurement with a single carrier signal

CPOWer
Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with "NO. OF ADJ CHAN" = 0)

MCACpower
Channel/adjacent-channel power measurement with several carrier signals

OBANdwidth | OBWidth
Measurement of occupied bandwidth

CN
Measurement of carrier-to-noise ratio

CN0
Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth

Example:

`CALC:MARK:FUNC:POW:SEL ACP`
Switches on adjacent-channel power measurement.

CALCulate<n>:MARKer<m>:FUNCtion:WCDPower:MS:RESult? <ResultType>

This command queries the measured and calculated results of the 3GPP FDD UE code domain power measurement.

Suffix:

<n>	irrelevant
<m>	irrelevant

Query parameters:

<ResultType> PTOTal | TFRame | MACCuracy | EVMRms | CERRor | SRATe | CDPabsolute | IQOFfset | MTYPe | RHO | CMAPping | FERRor | TOFFset | PCDerror | EVMPeak | CSLot | CHANnel | CDPRelative | IQIMbalance | PSYMbol | ACHannels | MPIC

PTOTal
total power

TFRame
trigger to frame

MACCuracy
composite EVM

EVMRms
error vector magnitude RMS

CERRor
chip rate error

SRATe
symbol rate

CDPabsolute
channel power absolute

IQOFfset
I/Q offset

MTYPe
modulation type:
BPSK-I: 0
BPSK-Q: 1
4PAM-I: 6
4PAM-Q: 7
NONE: 15

RHO
rho value for every slot

CMAPping
Channel component

FERRor
frequency error in Hz

TOFFset
timing offset

PCDerror
peak code domain error

EVMPeak
error vector magnitude peak

CSLot
channel slot number

CHANnel
channel number

CDPRelative

channel power relative

IQIMbalance
I/Q imbalance

PSYMbol
Number of pilot bits

ACHannels
Number of active channels

MPIC
average power of the inactive codes for the selected slot

Example: `CALC:MARK:FUNC:WCDP:RES? PTOT`

Usage: Query only

Mode: WCDMA MS

Manual operation: See "Result Summary" on page 59

CALCulate<n>:MARKer<m>:FUNCtion:ZOOM <State>

If marker zoom is activated, the number of channels displayed on the screen in code domain power and code domain error power result diagram is reduced to 64.

The currently selected marker defines the center of the displayed range.

Suffix:

<n> irrelevant

<m> 1...4
marker number

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:MARK:FUNC:ZOOM ON`

Mode: WCDMA

Manual operation: See "Marker Zoom" on page 73

8.2.6 Other CALCulate Commands Referenced in this Manual

8.2.6.1 CALCulate:DELTamarker subsystem

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X <Reference>

This command defines the horizontal position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the frequency reference for delta marker 2.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<Reference> Numeric value that defines the horizontal position of the reference.
For frequency domain measurements, it is a frequency in Hz.
For time domain measurements, it is a point in time in s.
*RST: Fixed reference: OFF

Example:

```
CALC:DELT:FUNC:FIX:RPO:X 128 MHz
```

Sets the frequency reference to 128 MHz.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y <RefPointLevel>

This command defines the vertical position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the level reference for delta marker 2.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<RefPointLevel> Numeric value that defines the vertical position of the reference. The unit and value range is variable.

*RST: Fixed reference: OFF

Example: `CALC:DELT:FUNC:FIX:RPO:Y -10dBm`
Sets the reference point level for delta markers to -10 dBm.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe] <State>

This command switches the relative measurement to a fixed reference value on or off. Marker 1 is activated previously and a peak search is performed, if necessary. If marker 1 is activated, its position becomes the reference point for the measurement. The reference point can then be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` commands and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` independently of the position of marker 1 and of a trace. It applies to all delta markers as long as the function is active.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT:FUNC:FIX ON`
Switches on the measurement with fixed reference value for all delta markers.
`CALC:DELT:FUNC:FIX:RPO:X 128 MHZ`
Sets the frequency reference to 128 MHz.
`CALC:DELT:FUNC:FIX:RPO:Y 30 DBM`
Sets the reference level to +30 dBm.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO <State>

This command turns an automatic peak search for the fixed reference marker at the end of a sweep on and off.

Suffix:

<n> Selects the measurement window.

<m> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT:FUNC:PNO:AUTO ON`
Activates an automatic peak search for the reference marker in a phase-noise measurement.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>

This command turns the phase noise measurement at the delta marker position on and off.

The correction values for the bandwidth and the log amplifier are taken into account in the measurement.

The reference marker for phase noise measurements is either a normal marker or a fixed reference. If necessary, the command turns on the reference marker

A fixed reference point can be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` commands independent of the position of marker 1 and of a trace.

Suffix:

<n>	Selects the measurement window.
<m>	irrelevant **Note**: marker 2 is always the deltamarker for phase noise measurement results.

Parameters:

<State>	ON | OFF *RST: OFF

Example: `CALC:DELT:FUNC:PNO ON`
Switches on the phase-noise measurement with all delta markers.
`CALC:DELT:FUNC:FIX:RPO:X 128 MHZ`
Sets the frequency reference to 128 MHz.
`CALC:DELT:FUNC:FIX:RPO:Y 30 DBM`
Sets the reference level to +30 dBm

CALCulate<n>:DELTamarker<m>:LINK <State>

This command links delta marker 1 to marker 1.

If you change the horizontal position of the marker, so does the delta marker.

Suffix:

<n>	Selects the measurement window.
<m>	1 irrelevant

Parameters:

<State>	ON | OFF *RST: OFF

Example: `CALC:DELT:LINK ON`

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command positions the delta marker to the next smaller trace maximum on the left of the current value (i.e. descending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT:MAX:LEFT`
Sets delta marker 1 to the next smaller maximum value to the left of the current value.

Manual operation: See "Next Peak Mode" on page 74

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command positions the delta marker to the next smaller trace maximum. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT2:MAX:NEXT`
Sets delta marker 2 to the next smaller maximum value.

Manual operation: See "Next Peak" on page 74
See "Next Peak Mode" on page 74

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command positions the delta marker to the current trace maximum. If necessary, the corresponding delta marker is activated first.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT3:MAX`
Sets delta marker 3 to the maximum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command positions the delta marker to the next smaller trace maximum on the right of the current value (i.e. ascending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT:MAX:RIGH`
Sets delta marker 1 to the next smaller maximum value to the right of the current value.

Manual operation: See "Next Peak Mode" on page 74

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command positions the delta marker to the next higher trace minimum on the left of the current value (i.e. descending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT:MIN:LEFT`
Sets delta marker 1 to the next higher minimum to the left of the current value.

Manual operation: See "Next Min Mode" on page 75

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command positions the delta marker to the next higher trace minimum. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT2:MIN:NEXT`
Sets delta marker 2 to the next higher minimum value.

Manual operation: See "Next Min" on page 75
See "Next Min Mode" on page 75

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command positions the delta marker to the current trace minimum. The corresponding delta marker is activated first, if necessary.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT3:MIN`
Sets delta marker 3 to the minimum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command positions the delta marker to the next higher trace minimum on the right of the current value (i.e. ascending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Example: `CALC:DELT:MIN:RIGH`
Sets delta marker 1 to the next higher minimum value to the right of the current value.

Manual operation: See "Next Min Mode" on page 75

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command turns delta markers on and off.

If the corresponding marker was a normal marker, it is turned into a delta marker.

No suffix at DELTamarker turns on delta marker 1.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:DELT1 ON`
Switches marker 1 to delta marker mode.

Manual operation: See "Marker 1/2/3/4" on page 73
See "Marker Norm/Delta" on page 73

CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>

This command selects the trace a delta marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

In the persistence spectrum result display, the command also defines if the delta marker is positioned on the persistence trace or the maxhold trace.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<TraceNumber> **1 ... 6**
Trace number the marker is positioned on.

MAXHold
Defines the maxhold trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.

WRITe
Defines the persistence trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.

Example: `CALC:DELT3:TRAC 2`
Assigns delta marker 3 to trace 2.

CALCulate<n>:DELTamarker<m>:X <Position>

This command positions a delta marker on a particular coordinate on the x-axis.

The position is an absolute value.

Suffix:

<n> Selects the measurement window.

<m> Selects the marker.

Parameters:

<Position> 0 to maximum frequency or sweep time

Example: `CALC:DELT:X?`
Outputs the absolute frequency/time of delta marker 1.

Manual operation: See "Marker 1/2/3/4" on page 73

CALCulate<n>:DELTamarker<m>:X:RELative?

This command queries the x-value of the selected delta marker relative to marker 1 or to the reference position (for `CALC:DELT:FUNC:FIX:STAT ON`). The command activates the corresponding delta marker, if necessary.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: `CALC:DELT3:X:REL?`
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Usage: Query only

Manual operation: See "Marker 1/2/3/4" on page 73

CALCulate<n>:DELTamarker<m>:Y

This command queries the measured value of a delta marker. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Depending on the unit defined with `CALC:UNIT:POW` or on the activated measuring functions, the query result is output in the units below:

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example:
`INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.
`CALC:DELT2 ON`
Switches on delta marker 2.
`CALC:DELT2:Y?`
Outputs measurement value of delta marker 2.

Manual operation: See "Marker 1/2/3/4" on page 73

8.2.6.2 CALCulate:LIMit subsystem

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper adjacent channel during adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value has no effect on the limit check as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<LowerLimit>, <UpperLimit>	first value: -200DBM to 200DBM; limit for the lower and the upper adjacent channel *RST: -200DBM

Example: `CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe <State>

This command activates the limit check for the adjacent channel when adjacent-channel power measurement (Adjacent Channel Power) is performed. Before the command, the limit check for the channel/adjacent-channel measurement must be globally switched on using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<State>	ON | OFF *RST: OFF

Example:

```
CALC:LIM:ACP:ACH 30DB, 30DB
```
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
```
CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM
```
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
```
CALC:LIM:ACP ON
```
Switches on globally the limit check for the channel/adjacent-channel measurement.
```
CALC:LIM:ACP:ACH:REL:STAT ON
```
Switches on the check of the relative limit values for adjacent channels.
```
CALC:LIM:ACP:ACH:ABS:STAT ON
```
Switches on the check of absolute limit values for the adjacent channels.
```
INIT;*WAI
```
Starts a new measurement and waits for the sweep end.
```
CALC:LIM:ACP:ACH:RES?
```
Queries the limit check result in the adjacent channels.

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative] <LowerLimit>, <UpperLimit>

This command defines the relative limit of the upper/lower adjacent channel for adjacent-channel power measurements. The reference value for the relative limit value is the measured channel power.

It should be noted that the relative limit value has no effect on the limit check as soon as it is below the absolute limit value defined with the `CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute` command. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<LowerLimit>, <UpperLimit>	0 to 100dB; the value for the lower limit must be lower than the value for the upper limit *RST: 0 dB

Example:

```
CALC:LIM:ACP:ACH 30DB, 30DB
```
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult

This command queries the result of the limit check for the upper/lower adjacent channel when adjacent channel power measurement is performed.

If the power measurement of the adjacent channel is switched off, the command produces a query error.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Return values:

Result	The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Example:

`CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dB.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ACH:STAT ON`
Switches on the limit check for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe <State>

This command activates the limit check for the relative limit value of the adjacent channel when adjacent-channel power measurement is performed. Before this command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:

`CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ACH:STAT ON`
Switches on the check of the relative limit values for adjacent channels.
`CALC:LIM:ACP:ACH:ABS:STAT ON`
Switches on the check of absolute limit values for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper alternate adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value for the limit check has no effect as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values defined in mobile radio standards for the power in adjacent channels.

Suffix:

<n> Selects the measurement window.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<LowerLimit>, <UpperLimit> first value: -200DBM to 200DBM; limit for the lower and the upper alternate adjacent channel

*RST: -200DBM

Example:

`CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative] <LowerLimit>, <UpperLimit>

This command defines the limit for the alternate adjacent channels for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

Note that the relative limit value has no effect on the limit check as soon as it is below the absolute limit defined with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant
<Channel>	1...11 the alternate channel

Parameters:

<LowerLimit>, <UpperLimit>	first value: 0 to 100dB; limit for the lower and the upper alternate adjacent channel *RST: 0 DB

Example: `CALC:LIM:ACP:ALT2 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe <State>

This command activates the limit check for the alternate adjacent channels for adjacent channel power measurements. Before the command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are obtained.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant
<Channel>	1...11 the alternate channel

Parameters:

<State>	ON | OFF *RST: OFF

Example:

`CALC:LIM:ACP:ALT2 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ALT2:STAT ON`
Switches on the check of the relative limit values for the lower and upper second alternate adjacent channel.
`CALC:LIM:ACP:ALT2:ABS:STAT ON`
Switches on the check of absolute limit values for the lower and upper second alternate adjacent channel.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ALT2:RES?`
Queries the limit check result in the second alternate adjacent channels.

CALCulate<n>:LIMit<k>:ACPower[:STATe] <State>

This command switches on and off the limit check for adjacent-channel power measurements. The commands `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe` or `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe` must be used in addition to specify whether the limit check is to be performed for the upper/lower adjacent channel or for the alternate adjacent channels.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<State> ON | OFF
*RST: OFF

Example:

`CALC:LIM:ACP ON`
Switches on the ACLR limit check.

CALCulate<n>:LIMit<k>:FAIL?

This command queries the result of a limit check.

Note that for SEM measurements, the limit line suffix <k> is irrelevant, as only one specific SEM limit line is checked for the currently relevant power class.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:

<n>	irrelevant
<k>	limit line

Return values:

<Result>
0
PASS
1
FAIL

Example: `INIT;*WAI`
Starts a new sweep and waits for its end.
`CALC:LIM3:FAIL?`
Queries the result of the check for limit line 3.

Usage: Query only

8.2.6.3 CALCulate:LIMit:ESPectrum subsystem

The `CALCulate:LIMit:ESPectrum` subsystem defines the limit check for the Spectrum Emission Mask.

CALCulate<n>:LIMit<k>:ESPectrum:LIMits <Limits>

This command sets or queries up to 4 power classes in one step.

Suffix:

<n>	irrelevant
<k>	irrelevant

Parameters:

<Limits>
1–3 numeric values between -200 and 200, separated by commas

-200, <0-3 numeric values between -200 and 200, in ascending order, separated by commas>, 200

Example: `CALC:LIM:ESP:LIM -50,50,70`
Defines the following power classes:
`<-200, -50>`
`<-50, 50>`
`<50, 70>`
`<70, 200>`
Query:
`CALC:LIM:ESP:LIM?`
Response:
`-200,-50,50,70,200`

CALCulate<n>:LIMit<k>:ESPectrum:MODE <Mode>

This command activates or deactivates the automatic selection of the limit line in the Spectrum Emission Mask measurement.

Suffix:

<n> 1...4
window

<k> irrelevant

Parameters:

<Mode> AUTO | MANUAL

AUTO
The limit line depends on the measured channel power.

MANUAL
One of the three specified limit lines is set. The selection is made with the chapter 8.2.6.3, "CALCulate:LIMit:ESPectrum subsystem", on page 148 command.

*RST: AUTO

Example: `CALC:LIM:ESP:MODE AUTO`
Activates automatic selection of the limit line.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] <State>

This command sets the power classes used in the spectrum emission mask measurement. It is only possible to use power classes for which limits are defined. Also, either only one power class at a time or all power classes together can be selected.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:LIM:ESP:PCL1 ON`
Activates the first defined power class.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNt <NoPowerClasses>

This command sets the number of power classes to be defined.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> irrelevant

Parameters:

<NoPowerClasses> 1 to 4
*RST: 1

Example: `CALC:LIM:ESP:PCL:COUN 2`
Two power classes can be defined.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe] <State>

This command defines which limits are evaluated in the measurement.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<State> ABSolute | RELative | AND | OR

ABSolute
Evaluates only limit lines with absolute power values

RELative
Evaluates only limit lines with relative power values

AND
Evaluates limit lines with relative and absolute power values. A negative result is returned if both limits fail.

OR
Evaluates limit lines with relative and absolute power values. A negative result is returned if at least one limit failed.

*RST: REL

Example: `CALC:LIM:ESP:PCL:LIM ABS`

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum <Level>

This command sets the upper limit level for one power class. The unit is dBm. The limit always ends at + 200 dBm, i.e. the upper limit of the last power class can not be set. If more than one power class is in use, the upper limit must equal the lower limit of the next power class.

Suffix:

<n>	irrelevant
<k>	irrelevant
<Class>	1...4 the power class to be evaluated

Parameters:

<Level>	**<numeric value>** *RST: +200

Example: `CALC:LIM:ESP:PCL1:MAX -40 dBm`
Sets the maximum power value of the first power class to -40 dBm.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum <Level>

This command sets the minimum lower level limit for one power class. The unit is dBm. The limit always start at – 200 dBm, i.e. the first lower limit can not be set. If more than one power class is in use, the lower limit must equal the upper limit of the previous power class.

Suffix:

<n>	irrelevant
<k>	irrelevant
<Class>	1...4 the power class to be evaluated

Parameters:

<Level>	**<numeric_value>** *RST: -200 for class1, otherwise +200

Example: `CALC:LIM:ESP:PCL2:MIN -40 dBm`
Sets the minimum power value of the second power class to -40 dBm.

CALCulate<n>:LIMit<k>:ESPectrum:RESTore

This command restores the predefined limit lines for the Spectrum Emission Mask

measurement. All modifications made to the predefined limit lines are lost and the factory-set values are restored.

Suffix:
<n> 1...4
window

<k> irrelevant

Example: `CALC:LIM:ESP:REST`
Resets the limit lines for the Spectrum Emission Mask to the default setting.

CALCulate<n>:LIMit<k>:ESPectrum:VALue <Power>

This command activates the manual limit line selection and specifies the expected power as a value. Depending on the entered value, one of the predefined limit lines is selected.

Suffix:
<n> 1...4
window

<k> irrelevant

Parameters:
<Power> 33 | 28 | 0

33
$P \geq 33$

28
$28 < P < 33$

0
$P < 28$

*RST: 0

Example: `CALC:LIM:ESP:VAL 33`
Activates manual selection of the limit line and selects the limit line for P = 33.

8.2.6.4 CALCulate:MASK Subsystem

The commands of the CALCulate:MASK subsystem configure the frequency mask trigger.

Programming example

```
TRIG:SOUR MASK
//Selects the frequency mask as a trigger source.
MMEM:MDIR 'C:\R_S\instr\freqmask\MyMasks'
CALC:MASK:CDIR 'MyMasks'
//Creates a directory on C:\ called 'FreqMasks' and selects it as the frequency
//mask directory.
//Defining the shape of a lower frequency mask
CALC:MASK:NAME 'MyMask'
```

```
//Creates or loads a frequency mask called 'MyMask'.
CALC:MASK:COMM 'Customized Frequency Mask'
//Adds a comment to the frequency mask.
TRIG:MASK:COND ENT
//Triggers the measurement when the signal enters the frequency mask.
CALC:MASK:MODE ABS
//Selects absolute power level values.
CALC:MASK:LOW -10MHZ,-10,-4MHZ,-10,-4MHZ,-20,4MHZ,-20,4MHZ,-10,10MHZ,-10
//Defines a lower frequency mask with 6 data points.
//The first data point position is at -10 MHz from the center frequency
//and at -10 dBm, the second at -4 MHz from the center frequency etc.
CALC:MASK:LOW:SHIF:X 1MHZ
CALC:MASK:LOW:SHIF:Y 10
//Shifts the lower frequency mask by 1 MHz to the right and 10 dB up.
CALC:MASK:LOW:STAT ON
//Turns the lower frequency mask on.

//Defining the shape of an upper frequency mask
CALC:MASK:NAME 'AnotherMask'
//Creates or loads a frequency mask called 'AnotherMask'
CALC:MASK:MODE ABS
//Selects absolute power level values.
CALC:MASK:UPP -10MHZ,-10,-4MHZ,-10,-4MHZ,-20,4MHZ,-20,4MHZ,-10,10MHZ,-10
//Defines an upper frequency mask with 6 data points.
CALC:MASK:UPP:SHIF:X -1MHZ
CALC:MASK:UPP:SHIF 10
//Shift the upper frequency mask 1 MHz to the left and 10 dB up.
CALC:MASK:UPP:STAT ON
//Turns the upper frequency mask on.
//Alternatively, you can create an upper frequency mask automatically.
CALC:MASK:UPP:AUTO
//Automatically defines the shape of an upper frequency mask.

CALC:MASK:DEL
//Deletes the frequency mask called 'MyMask' in C:\FreqMasks.
```

Before making any changes to a frequency mask, you have to select one by name with CALCulate<n>:MASK:NAME on page 156.

Compared to manual configuration of frequency masks, any changes made to a frequency mask via remote control are saved after the corresponding command has been sent.

CALCulate<n>:MASK:CDIRectory <Subdirectory>

This command selects the directory the R&S FSVR stores frequency masks in.

Parameters:

<Subdirectory> String containing the path to the directory. The directory has to be a subdirectory of the default directory. Thus the path is always relative to the default directory (C:\R_S\INSTR\FREQ-MASK).
An empty string selects the default directory.

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Load Mask" on page 30

CALCulate<n>:MASK:COMMent <Comment>

This command defines a comment for the frequency mask that you have selected with `CALCulate<n>:MASK:NAME` on page 156.

Parameters:

<Comment> String containing the comment for the frequency mask.

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Labelling a frequency mask" on page 27

CALCulate<n>:MASK:DELete

This command deletes the currently selected frequency mask.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 156.

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Usage: Event

Manual operation: See "Delete Mask" on page 30

CALCulate<n>:MASK:LOWer:SHIFt:X <Frequency>

This command shifts the lower frequency mask horizontally by a specified distance. Positive values move the mask to the right, negative values shift the mask to the left.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 156.

Parameters:

<Frequency> Defines the distance of the shift.

Default unit: Hz

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Shifting mask points as a whole" on page 29

CALCulate<n>:MASK:LOWer:SHIFt:Y <Level>

This command shifts the lower frequency mask vertically by a specified distance. Positive values move the mask upwards, negative values shift the mask downwards.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 156.

Parameters:

<Level> Defines the distance of the shift. The shift is relative to the current position.

Default unit: dB

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Shifting mask points as a whole" on page 29

CALCulate<n>:MASK:LOWer[:STATe] <State>

This command turns the lower frequency mask on and off.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 156.

Parameters:

<State> **ON | OFF**

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Working with upper and lower lines" on page 27

CALCulate<n>:MASK:LOWer[:DATA] <Frequency>,<Level>,...

This command defines the shape of the lower frequency mask.

Before making any changes to a frequency mask, you have to select one by name with CALCulate<n>:MASK:NAME on page 156.

The unit of the power levels depends on CALCulate<n>:MASK:MODE on page 156.

If you are using the command with the vector network analysis option (R&S FSV-K70), you can only use this command as a query.

Parameters:

<Frequency>, <Level> [N] pairs of numerical values. [N] is the number of data points the mask consists of.
Each data point is defined by the frequency (in Hz) and the level (in dB or dBm). All values are separated by commas.
Note that the data points have to be inside the current span.

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Positioning data points" on page 29

CALCulate<n>:MASK:MODE <Mode>

This command defines the scaling of the level axis for frequency masks.

Parameters:

<Mode>

ABSolute
absolute scaling of the level axis.

RELative
relative scaling of the level axis.

*RST: RELative

CALCulate<n>:MASK:NAME <Name>

This command creates or selects a frequency mask with the name that you specify by the parameter. When you use it as a query, the command returns the name of the mask currently in use.

Parameters:

<Name> String containing the name of the mask.
Note that an empty string does not select a frequency mask.

Manual operation: See "Labelling a frequency mask" on page 27
See "Load Mask" on page 30

CALCulate<n>:MASK:SPAN <Span>

This command defines the frequency span of the frequency mask.

Parameters:

<Span> Range: 100 Hz to 40 MHz
*RST: 40 MHz

Example: `CALC:MASK:SPAN 10 MHz`
Defines a span of 10 MHz.

Manual operation: See "Defining the frequency mask span" on page 27

CALCulate<n>:MASK:UPPer:AUTO

This command automatically defines the shape of an upper frequency mask according to the spectrum that is currently measured.

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Usage: Event

CALCulate<n>:MASK:UPPer:SHIFt:X <Frequency>

This command shifts the lower frequency mask horizontally by a specified distance. Positive values move the mask to the right, negative values shift the mask to the left.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 156.

Parameters:
<Frequency> Defines the distance of the shift.

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Shifting mask points as a whole" on page 29

CALCulate<n>:MASK:UPPer:SHIFt:Y <Level>

This command shifts the upper frequency mask vertically by a specified distance. Positive values move the mask upwards, negative values shift the mask downwards.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 156.

Parameters:
<Level> Defines the distance of the shift. The shift is relative to the current position.
Default unit: dB

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Shifting mask points as a whole" on page 29

CALCulate<n>:MASK:UPPer[:STATe] <State>

This command turns the upper frequency mask on and off.

Before making any changes to a frequency mask, you have to select one by name with CALCulate<n>:MASK:NAME on page 156.

Parameters:

<State> **ON | OFF**

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Working with upper and lower lines" on page 27

CALCulate<n>:MASK:UPPer[:DATA] <Frequency>,<Level>,...

This command activates and defines the shape of the upper frequency mask trigger mask.

You have to select a mask before you can use this command with CALCulate<n>:MASK:NAME on page 156.

The unit of the power levels depends on CALCulate<n>:MASK:MODE on page 156.

If you are using the command with the vector network analysis option (R&S FSV-K70), you can only use this command as a query.

Parameters:

<Frequency>, <Level> [N] pairs of numerical values. [N] is the number of data points the mask consists of.
Each data point is defined by the frequency (in Hz) and the amplitude (in dB or dBm). All values are separated by commas.
Note that the data points have to be inside the current span.

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Positioning data points" on page 29
See "Automatic alignment of the frequency mask" on page 29

8.2.6.5 CALCulate:PSE subsystem

CALCulate<n>:PEAKsearch|PSEarch[:IMMediate]

This command switches the spurious limit check off.

If you want to read out the values peak values including the delta to a limit, you have to switch on the limit again.

This command is only for FSP compatibility, and not necessary to use on the R&S FSVR.

Suffix:

<n>	irrelevant

Example: `CALC:PSE`
Starts to determine the list.

CALCulate<n>:PEAKsearch|PSEarch:AUTO <State>

This command activates or deactivates the list evaluation.

Suffix:

<n>	Selects the measurement window.

Parameters:

<State>	ON | OFF
	*RST: ON

Example: `CALC:ESP:PSE:AUTO OFF`
Deactivates the list evaluation.

CALCulate<n>:PEAKsearch|PSEarch:MARGin <Margin>

This command sets the margin used for the limit check/peak search.

Suffix:

<n>	Selects the measurement window.

Parameters:

<Margin>	-200 to 200 dB
	*RST: 200 dB

Example: `CALC:ESP:PSE:MARG 100`
Sets the margin to 100 dB.

CALCulate<n>:PEAKsearch|PSEarch:PSHow

This command marks all peaks with blue squares in the diagram.

Suffix:

<n>	Selects the measurement window.

Parameters:

<State>	ON | OFF
	*RST: OFF

Example: `CALC:ESP:PSE:PSH ON`
Marks all peaks with blue squares.

CALCulate<n>:PEAKsearch|PSEarch:SUBRanges <NumberPeaks>

This command sets the number of peaks per range that are stored in the list. Once the selected number of peaks has been reached, the peak search is stopped in the current range and continued in the next range.

Suffix:

<n> irrelevant

Parameters:

<NumberPeaks> 1 to 50

*RST: 25

Example: `CALC:PSE:SUBR 10`

Sets 10 peaks per range to be stored in the list.

8.2.6.6 CALCulate:STATistics subsystem

CALCulate<n>:STATistics:CCDF[:STATe] <State>

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF). On activating this function, the APD measurement is switched off.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:STAT:CCDF ON`

Switches on the CCDF measurement.

CALCulate<n>:STATistics:NSAMples <NoMeasPoints>

This command sets the number of measurement points to be acquired for the statistical measurement functions.

Suffix:

<n> irrelevant

Parameters:

<NoMeasPoints> 100 to 1E9

*RST: 100000

Example: `CALC:STAT:NSAM 500`

Sets the number of measurement points to be acquired to 500.

CALCulate<n>:STATistics:PRESet

This command resets the scaling of the X and Y axes in a statistical measurement. The following values are set:

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

Suffix:

<n> irrelevant

Example: `CALC:STAT:PRES`

Resets the scaling for statistical functions

CALCulate<n>:STATistics:RESult<Trace> <ResultType>

This command reads out the results of statistical measurements of a recorded trace.

Suffix:

<n> irrelevant

<Trace> 1...6
trace

Parameters:

<ResultType> MEAN | PEAK | CFACtor | ALL

MEAN
Average (=RMS) power in dBm measured during the measurement time.

PEAK
Peak power in dBm measured during the measurement time.

CFACtor
Determined CREST factor (= ratio of peak power to average power) in dB.

ALL
Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

The required result is selected via the following parameters:

Example: `CALC:STAT:RES2? ALL`
Reads out the three measurement results of trace 2. Example of answer string: 5.56,19.25,13.69 i.e. mean power: 5.56 dBm, peak power 19.25 dBm, CREST factor 13.69 dB

CALCulate<n>:STATistics:SCALe:AUTO ONCE

This command optimizes the level setting of the instrument depending on the measured peak power, in order to obtain maximum instrument sensitivity.

To obtain maximum resolution, the level range is set as a function of the measured spacing between peak power and the minimum power for the APD measurement and of the spacing between peak power and mean power for the CCDF measurement. In addition, the probability scale for the number of test points is adapted.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Suffix:
<n> irrelevant

Example: `CALC:STAT:SCAL:AUTO ONCE;*WAI`
Adapts the level setting for statistical measurements.

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`

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`

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`

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.

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`

8.2.6.7 Other Referenced CALCulate Commands

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit of the y-axis.

The unit applies to all measurement windows.

Suffix:
<n> irrelevant

Parameters:
<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere
*RST: dBm

Example: `CALC:UNIT:POW DBM`
Sets the power unit to dBm.

Manual operation: See "Unit" on page 92

8.3 CONFigure:WCDPower subsystem (R&S FSV-K73)

This subsystem comprises the commands for configuring the code domain power measurements. Only the numeric suffix 1 is permissible in CONFigure.

CONFigure:WCDPower:MS:MEASurement <Type>

This command selects the 3GPP FDD UE user equipment tests.

Parameters:

<Type> ACLR | ESPectrum | WCDPower | POWer | OBANdwith | OBWidth | CCDF

ACLR
Adjacent-channel power measurement (standard 3GPP WCDMA Forward) with predefined settings

ESPectrum
Measurement of spectrum emission mask

WCDPower
Code domain power measurement. This selection has the same effect as command INSTrument:SELect

POWer
Channel power measurement (standard 3GPP WCDMA Forward) with predefined settings

OBANdwith | OBWidth
Measurement of occupied power bandwidth.

CCDF
Measurement of complementary cumulative distribution function.

*RST: WCDPower

Example: `CONF:WCDP:MS:MEAS POW`

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle[:STATe] <State>

This command switches the channel table on or off. When switch-on takes place, the measured channel table is stored under the name RECENT and is switched on. After the RECENT channel table is switched on, another channel table can be selected with the command `CONFigure:WCDPower:MS:CTABle:SELect` on page 166.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CONF:WCDP:CTAB ON`

Mode: WCDMA

Manual operation: See "Channel Search Mode" on page 49

CONFigure:WCDPower:MS:CTABle:NAME <FileName>

This command selects an existing channel table or creates the name of a new channel table.

Parameters:

<FileName> <file name>

*RST: RECENT

Example: `CONF:WCDP:CTAB:NAME 'NEW_TAB'`

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle:SELect <FileName>

This command selects a predefined channel table file. Before using this command, the RECENT channel table must be switched on first with the command `CONF:WCDP:CTAB:STAT ON`.

Parameters:

<FileName> *RST: RECENT

Example:
```
CONF:WCDP:CTAB1 ON
CONF:WCDP:CTAB:SEL 'CTAB_1'
```

Mode: WCDMA

Manual operation: See "Channel Search Mode" on page 49

CONFigure:WCDPower:MS:CTABle:DATA <TableValues>

This command defines the values of the selected channel table.

Each line of the table consists of 6 values.

Parameters:

<TableValues>

Code Class | Number of active channels | Pilot length | CDP rel 1 | CDP rel 2 | CDP rel 3 | CDP rel 4 | CDP rel 5 | CDP rel 6

Code Class
Code class of channel 1. I-mapped

Number of active channels
1 to 7

Pilot length
Pilot length of channel DPCCH

CDP rel 1
measured value of channel 1, only when queried

CDP rel 2
measured value of channel 2, only when queried

CDP rel 3
measured value of channel 3, only when queried

CDP rel 4
measured value of channel 4, only when queried

CDP rel 5
measured value of channel 5, only when queried

CDP rel 6
measured value of channel 6, only when queried

The Channel DPCCH may only be defined once. If channel DPCCH is missing in the command, it is automatically added at the end of the table.Prior to this command, the name of the channel table has to be defined with the command `CONF:WCDP:CTAB:NAME`

Example:

```
CONF:WCDP:MS:CTAB:DATA 8,0,0,5,1,0.00,
4,1,1,0,1,0.00,4,1,0,0,1,0.00
```

The following channels are defined: DPCCH and two data channels with 960 ksps.

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle:DATA:HSDPcch <State>

This command activates [ON] or deactivates [OFF] the HS-DPCCH entry in a predefined channel table.

Parameters:

<State> *RST: ON

Example: `CONF:WCDP:MS:CTAB:DATA:HSDP ON`

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle:COMMent <Comment>

This command defines a comment for the selected channel table:

Prior to this command, the name of the channel table has to be defined with command `CONF:WCDP:MS:CTAB:NAME` and the values of the table have to be defined with command `CONF:WCDP:MS:CTAB:DATA`.

Parameters:
<Comment>

Example: `CONF:WCDP:MS:CTAB:COMM 'Comment for table 1'`

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle:COPY <FileName>

This command copies one channel table onto another one. The channel table to be copied is selected with command `CONF:WCDP:MS:CTAB:NAME`.

The name of the channel table may contain a maximum of 8 characters. This command is an "event" which is why it is not assigned an *RST value and has no query.

Parameters:
<FileName> <file_name> = name of the new channel table

Example: `CONF:WCDP:MS:CTAB:COPY 'CTAB_2'`

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle:DELete

This command deletes the selected channel table. The channel table to be deleted is selected with the command `CONF:WCDP:MS:CTAB:NAME`.

Example: `CONF:WCDP:MS:CTAB:DEL`

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle:CATalog?

This command reads out the names of all channel tables stored on the hard disk. Syntax of output format: <Sum of file lengths of all subsequent files>,<free memory on hard disk>, <1st file name>,,<1st file length>,<2nd file name>,,<2nd file length>,....,<nth file name>, <nth file length>.

Example: `CONF:WCDP:MS:CTAB:CAT?`

Usage: Query only

Mode: WCDMA

Manual operation: See "Predefined Tables" on page 49

CONFigure:WCDPower:MS:CTABle:EDATa

This command defines the values of the selected channel table.

Code class: code class of channel 1.

Number of active channels: 0 to 4

ECDP rel. 1: measured value of channel 1, only when queried

ECDP rel. 2: measured value of channel 2, only when queried

ECDP rel. 3: measured value of channel 3, only when queried

ECDP rel. 4: measured value of channel 4, only when queried

Example: `CONF:WCDP:MS:CTAB:EDAT`

Mode: WCDMA

CONFigure:WCDPower:MS:CTABle:EDATa:EDPCc

This command activates [ON] or deactivates [OFF] the E-DPCCH entry in a predefined channel table.

Parameters:

*RST: OFF

Example: `CONF:WCDP:MS:CTAB:EDAT:EDPC ON`

Mode: WCDMA

8.4 INSTrument subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

INSTrument[:SELect] <Mode>

This command switches between the measurement modes by means of text parameters.

Parameters:

<Mode> **MWCD**
3G FDD UE Mode (R&S FSV-K73 option)

INSTrument:NSELect <Mode>

This command switches between the measurement modes by means of numbers.

Parameters:

<Mode> **9**
3G FDD UE Mode (R&S FSV-K73 option)

8.5 SENSe subsystem (R&S FSV-K73)

The SENSe subsystem controls the essential parameters of the analyzer. In accordance with the SCPI standard, the keyword SENSe is optional, which means that it is not necessary to include the SENSe node in command sequences.

Note that most commands in the SENSe subsystem are identical to the base unit; only the commands specific to this option are described here.

8.5.1 SENSe:CDPower Subsystem

This subsystem controls the parameters for the code domain mode. The numeric suffix in SENSe is not significant in this subsystem.

[SENSe:]CDPower:BASE <BaseValue>

This command defines the base of the CDP analysis.

Parameters:

<BaseValue> SLOT | FRAMe

SLOT
Only one slot of the signal is analyzed.

FRAMe
The complete 3GPP frame is analyzed.

*RST: FRAMe

Example: `CDP:BASE SLOT`

Mode: WCDMA

Manual operation: See "Analysis Mode" on page 46

[SENSe:]CDPower:CODE <CodeNumber>

This command sets the code number. The code number refers to code class 8 (spreading factor 256).

Parameters:

<CodeNumber> Range: 0 to 255
*RST: 0

Example: `SENS:CDP:CODE 128`

Mode: WCDMA

Manual operation: See "Select Channel" on page 53

[SENSe:]CDPower:ETCHips <State>

This command selects length of the measurement interval for calculation of error vector magnitude (EVM). In accordance with 3GPP specification Release 5, the EVM measurement interval is one slot (4096 chips) minus 25 µs at each end of the burst (3904 chips) if power changes are expected. If no power changes are expected, the evaluation length is one slot (4096 chips).

Parameters:

<State> *RST: OFF
ON: Changes of power are expected. Therefore an EVM measurement interval of one slot minus 25 µs (3904 chips) is considered.
OFF: Changes of power are not expected. Therefore an EVM measurement interval of one slot (4096 chips) is considered

Example: `SENS:CDP:ETCH ON`

Mode: WCDMA

Manual operation: See "Eliminate Tail Chips" on page 52

[SENSe:]CDPower:FILTer[:STATe] <State>

This command selects if a root raised cosine (RRC) receiver filter is used or not. This feature is useful if the RRC filter is implemented in the device under test (DUT).

Parameters:

<State>

ON
If an unfiltered WCDMA signal is received (normal case), the RRC filter should be used to get a correct signal demodulation.

OFF
If a filtered WCDMA signal is received, the RRC filter should not be used to get a correct signal demodulation. This is the case if the DUT filters the signal.

*RST: ON

Example: `SENS:CDP:FILT:STAT OFF`

Mode: WCDMA

Manual operation: See "RRC Filter" on page 46

[SENSe:]CDPower:FRAMe[:VALue] <Frame>

This command defines the frame to be analyzed within the captured data.

Range: <numeric value> [0 ... CAPTURE_LENGTH – 1]

Parameters:

<Frame> <numeric value>

*RST: 1

Example: `CDP:FRAM:VAL 1`

Mode: WCDMA

[SENSe:]CDPower:FRAMe[:LVALue] <Value>

Selects the frame to be analyzed.

Parameters:

<Value> <numeric value> [0 ... CAPTURE_LENGTH – 1]

*RST: 0

Example: `SENS:CDP:FRAM 1`

Mode: WCDMA

Manual operation: See "Frame To Analyze" on page 46

[SENSe:]CDPower:HSDPamode <State>

This command selects if the HS-DPCCH channel is searched or not.

Parameters:

<State>	ON: The HSUPA/HSDPA channel can be detected. *RST: ON OFF: The HSUPA/HSDPA channel cannot be detected.

Example: `CDP:HSDP OFF`

Mode: WCDMA

Manual operation: See "HS-DPA/UPA" on page 49

[SENSe:]CDPower:HSLot <State>

This command switches the R&S FSV-K73 between the analysis of one half and one full slot.

Parameters:

<State>	ON | OFF *RST: OFF

Example: `SENS:CDP:HSL ON`

Mode: WCDMA

Manual operation: See "Meas Interval" on page 52

[SENSe:]CDPower:ICThreshold <ThresholdLevel>

This command defines the minimum power that a single channel must have compared to the total signal in order to be regarded as an active channel. Channels below the specified threshold are regarded as "inactive".

Parameters:

<ThresholdLevel>	Range: -100 dB to 0 dB *RST: -60 dB

Example: `CDP:ICT -50`
Sets the Inactice Channel Threshold to -50 dB.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:IQLength <CaptureLength>

This command specifies the number of frames that are captured by one sweep.

Parameters:

<CaptureLength>	Range: 1 to 100 *RST: 1

Example: `SENS:CDP:IQLength 3`

Mode: WCDMA

Manual operation: See "Capture Length" on page 47

[SENSe:]CDPower:LCODe:TYPE <Type>

This command switches between long and short scrambling code.

Parameters:

<Type>	LONG | SHORt *RST: LONG
Example:	`CDP:LCOD:TYPE SHOR`
Mode:	WCDMA
Manual operation:	See "Type" on page 48

[SENSe:]CDPower:LCODe:SEARch:[IMMediate]?

This command automatically searches for the scrambling codes that lead to the highest signal power. The code with the highest power is stored as the new scrambling code for further measurements.

Searching requires that the correct center frequency and level are set. The scrambling code search can automatically determine the primary scrambling code number. The secondary scrambling code number is expected as 0. Alternative scrambling codes can not be detected. Therefore the range for detection is 0x0000 – 0x1FF0h, where the last digit is always 0.

If the search is successful (PASS), a code was found and can be queried using `[SENSe:]CDPower:LCODe:SEARch:LIST`.

Parameters:

<Status>	**PASSed** Scrambling code(s) found. **FAILed** No scrambling code found.
Example:	`SENS:CDP:LCOD:SEAR?` Searches the scrambling code that leads to the highest signal power and returns the status of the search.
Usage:	Query only
Mode:	WCDMA
Manual operation:	See "Auto Scrambling Code" on page 77

[SENSe:]CDPower:LCODe:SEARch:LIST

This command returns the automatic search sequence (see `[SENSe:]CDPower:LCODe:SEARch:[IMMediate]?` on page 174).

Return values:

Return value: <Code (decimal)>,<Code (hexadecimal)>,<CPICH power (dBm)> for each detected scrambling code

A comma separated result table of the highest power values and the corresponding scrambling codes in decimal and hexadecimal format.

Example:
```
SENS:CDP:LCOD:SEAR:LIST?
```
Result:
```
16,0x10,-18.04,32,0x20,-22.87,48,0x30,-27.62,
64,0x40,-29.46
```
(Explanation in table below)

Mode: WCDMA

code (dec)	code(hex)	CPICH power (dBm)
16,	0x10,	-18.04
32,	0x20,	-22.87
48,	0x30,	-27.62
64,	0x40,	-29.46

[SENSe:]CDPower:LCODe[:VALue] <ScramblingCode>

This command defines the scrambling code in hexadecimal format.

Parameters:

<ScramblingCode>
Range: #H0 to #H1fff
*RST: 0

Example: `CDP:LCOD #H2`

Mode: WCDMA

Manual operation: See "Scrambling Code" on page 48
See "Format" on page 48

[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 FSVR or limiting the dynamic range by an S/N ratio that is too small.

Example: `CDP:LEV:ADJ`
Adjusts the reference level.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:MAPPing <SignalComponent>

This command switches between I and Q component of the signal.

Parameters:

<SignalComponent> I | Q

*RST: Q

Example: `CDP:MAPP Q`

Mode: CDMA, WCDMA

[SENSe:]CDPower: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

Manual operation: See "Normalize" on page 52

[SENSe:]CDPower:OVERview <State>

This command switches to an overview display of a code domain measurement (CDP rel./CDP abs./ CDEP). If enabled, the I branch of the code power is displayed in screen A and the Q branch in screen B. Both results can be read using `TRACE:DATA? TRACE1` and `TRACE:DATA? TRACE2`; respectively. If disabled, screen A displays the I branch and screen B provides the result summary display.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CDP:OVER OFF`

Mode: CDMA, EVDO, WCDMA

[SENSe:]CDPower:PDIsplay <Mode>

This command switches between showing the absolute or relative power to the chosen reference.

This parameter only affects the display mode code domain power.

Parameters:

<Mode> ABS | REL

*RST: ABS

Example: `SENS:CDP:PDIS ABS`

Mode: WCDMA

Manual operation: See "Code Power Displ" on page 52

[SENSe:]CDPower:QINVert <State>

This command inverts the Q component of the signal.

Parameters:

ON | OFF *RST: OFF

Example: `CDP:QINV ON`
Activates inversion of Q component.

Mode: CDMA, EVDO, TDS, WCDMA

Manual operation: See "Invert Q" on page 46

[SENSe:]CDPower:SFACtor <SpreadingFactor>

This command defines the spreading factor. The spreading factor is only significant for display mode PEAK CODE DOMAIN ERROR.

Parameters:

<SpreadingFactor> 4 | 8 | 16 | 32 | 64 | 128 | 256
*RST: 256

Example: `CDP:SFAC 256`

Mode: WCDMA

[SENSe:]CDPower:SLOT <numeric value>

This command selects the slot/Power Control Group (PCG) to be analyzed.

Parameters:

<numeric value> Range: 0 to TDS: 62; CDMA: (capture length-1); WCDMA. 14
Increment: 1
*RST: 0
The capture length is defined via the `[SENSe:]CDPower:IQLength` command.

Example: `CDP:SLOT 7`
Selects slot number 7 for analysis.

Mode: CDMA, EVDO, TDS, WCDMA

Manual operation: See "Select Slot" on page 54

8.5.2 SENSe:POWer Subsystem

This subsystem controls the parameters for the spectral power measurements. The numeric suffix in SENSe<1...4> is not significant in this subsystem.

[SENSe:]POWer:ACHannel:ACPairs <ChannelPairs>

This command sets the number of adjacent channels (upper and lower channel in pairs).The figure 0 stands for pure channel power measurement.

Parameters:

<ChannelPairs> 0 to 12

*RST: 1

Example:

`POW:ACH:ACP 3`

Sets the number of adjacent channels to 3, i.e. the adjacent channel and alternate adjacent channels 1 and 2 are switched on.

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

This command sets the channel bandwidth of the specified TX channel in the radio communication system. The bandwidths of adjacent channels are not influenced by this modification.

With `[SENSe<source>:]POWer:HSPeed` set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 6.4.6, "List of Available RRC and Channel Filters", on page 35.

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.

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <Bandwidth>

This command defines the channel bandwidth of the adjacent channel of the radio transmission system. If the bandwidth of the adjacent channel is changed, the bandwidths of all alternate adjacent channels are automatically set to the same value.

With `[SENSe<source>:]POWer:HSPeed` set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 6.4.6, "List of Available RRC and Channel Filters", on page 35 .

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.

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel> <Bandwidth>

This command defines the channel bandwidth of the specified alternate adjacent channels of the radio transmission system. If the channel bandwidth of one alternate adjacent channel is changed (e.g. channel 3), the bandwidth of all subsequent alternate adjacent channels (e.g. 4–11) is automatically set to the same value.

With `[SENSe<source>:]POWer:HSPeed` set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 6.4.6, "List of Available RRC and Channel Filters", on page 35 .

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`

[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.

[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.

[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`

[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 130).

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.

[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 130).

Parameters:

<Number> 1 to 18

*RST: 1

Example: `POW:ACH:TXCH:COUN 3`

[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.

[SENSe:]POWer:ACHannel:PRESet MCACpower

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 valid 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.

Example: `POW:ACH:PRES MCAC`

Mode: WCDMA

[SENSe:]POWer:ACHannel:SPACing[:ACHannel] <Spacing>

This command defines the spacing between the carrier signal and the adjacent channel (ADJ). The modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, ...): they are all multiplied by the same factor (new spacing value/old spacing value).

Parameters:

<Spacing> 100 Hz to 20 GHz

*RST: 14 kHz

Example: `POW:ACH:SPAC 33kHz`

Sets the spacing between the carrier signal and the adjacent channel to 33 kHz, the alternate adjacent channel 1 to 66 kHz, the alternate adjacent channel 2 to 99 kHz, and so on.

[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.

[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel> <Spacing>

This command defines the channel spacing for the carrier signals.

Suffix:

<channel>	1...11 the TX channel

Parameters:

<Spacing>	14 kHz to 20 GHz *RST: 20 kHz
Example:	`POW:ACH:SPAC:CHAN 25kHz`

[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`

[SENSe:]POWer:NCORrection <Mode>

This command turns noise cancellation on and off.

If noise cancellation is on, the R&S FSVR performs a reference measurement to determine its inherent noise and subtracts the result from the channel power measurement result (first active trace only).

The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A corresponding message is displayed on the screen. Noise correction must be turned on again manually after the change.

Parameters:
<Mode>

ON
Performs noise correction.

OFF
Performs no noise correction.

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

*RST: OFF

Example: `POW:NCOR ON`

Manual operation: See "Noise Correction" on page 95

8.5.3 Other SENSe Commands Referenced in this Manual

[SENSe:]ADJust:ALL

This command determines the ideal frequency and level configuration for the current measurement.

Example: `ADJ:ALL`

Manual operation: See "Auto All" on page 76

[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer <Threshold>

This command defines a lower threshold the signal must drop below before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see `[SENSe:]ADJust:LEVel`).

Parameters:
<Threshold>

Range: 0 to 200
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:LOW 2`

Example: For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level falls below 18 dBm.

Manual operation: See "Lower Level Hysteresis" on page 77

[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer <Threshold>

This command defines an upper threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see `[SENSe:]ADJust:LEVel`).

Parameters:

<Threshold> Range: 0 to 200
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:UPP 2`
For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level rises above 22 dBm.

Manual operation: See "Upper Level Hysteresis" on page 77

[SENSe:]ADJust:CONFigure:LEVel:DURation <Duration>

This command defines the duration of the level measurement used to determine the optimal reference level automatically (for `SENS:ADJ:LEV ON`).

Parameters:

<Duration> <numeric value> in seconds
Range: 0.001 to 16000.0
*RST: 0.001
Default unit: s

Example: `ADJ:CONF:LEV:DUR:5`

Manual operation: See "Meas Time Manual" on page 77

[SENSe:]ADJust:LEVel

This command automatically sets the optimal reference level for the current measurement.

You can define a threshold that the signal must exceed before the reference level is adjusted, see `[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer` and `[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer`.

Example: `ADJ:LEV`

Manual operation: See "Adjust Ref Lvl" on page 45
See "Auto Level" on page 76

[SENSe:]AVERage<n>:COUNt <NoMeasurements>

This command defines the number of measurements which contribute to the average value.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the `[SENSe<source>:]SWEep:COUNt` command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

Suffix:

<n> Selects the measurement window.

Parameters:

<NoMeasurements> 0 to 32767

*RST: 0

Example:

`SWE:CONT OFF`
Switching to single sweep mode.
`AVER:COUN 16`
Sets the number of measurements to 16.
`AVER:STAT ON`
Switches on the calculation of average.
`INIT;*WAI`
Starts the measurement and waits for the end of the 16 sweeps.

[SENSe:]AVERage<n>:TYPE <FunctionType>

This command selects the type of average function.

Suffix:

<n> Selects the measurement window.

Parameters:

<FunctionType> VIDeo | LINear | POWer

VIDeo
The logarithmic power values are averaged.

LINear
The power values are averaged before they are converted to logarithmic values.

POWer
The power level values are converted into unit Watt prior to averaging. After the averaging, the data is converted back into its original unit.

*RST: VIDeo

Example:

`AVER:TYPE LIN`
Switches to linear average calculation.

[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 34.

In realtime mode, the resolution bandwidth is always coupled to the span. In all other modes, a change of the resolution bandwidth automatically turns the coupling to the span off.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND 1 MHz`
Sets the resolution bandwidth to 1 MHz

Manual operation: See "Res BW Manual" on page 97

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command couples and decouples the resolution bandwidth to the span.

The automatic coupling adapts the resolution bandwidth to the current frequency span according to the relationship between frequency span and resolution bandwidth.

Use `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` to define the ratio RBW/span.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:AUTO OFF`
Switches off the coupling of the resolution bandwidth to the span.

Manual operation: See "Res BW Manual" on page 97
See "Res BW Auto" on page 97
See "Default Coupling" on page 102

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>

This command defines the filter mode of FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

This command is only available for sweep type "FFT".

Parameters:

<FilterMode>

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

NARRow
The FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

*RST: AUTO

Example: `BAND:TYPE FFT`
Select FFT filter.

Example: `BAND:FFT NARR`
Select narrow partial span for FFT filter.

Manual operation: See "Auto" on page 100
See "Narrow" on page 100

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio between the resolution bandwidth (Hz) and the span (Hz).

Note that the ratio defined with the remote command (RBW/span) is reciprocal to that of the manual operation (span/RBW).

Parameters:
<Ratio> Range: 0.0001 to 1
*RST: 0.01

Example: `BAND:RAT 0.01`

Manual operation: See "Span/RBW Manual" on page 102

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command selects the type of resolution filter.

For detailed information on filters see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 34 and chapter 6.4.6, "List of Available RRC and Channel Filters", on page 35.

When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.

5 Pole filters are not available when using the sweep type "FFT".

Parameters:
<FilterType>

NORMal
Gaussian filters

CFILter
channel filters

RRC
RRC filters

P5
5 Pole filters

*RST: NORMal

Example: `BAND:TYPE NORM`

Manual operation: See "Filter Type" on page 102

[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>

This command defines the video bandwidth. The available video bandwidths are specified in the data sheet.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND:VID 10 kHz`

Manual operation: See "Video BW Manual" on page 98

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>

This command couples and decouples the VBW to the RBW.

Use `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` to define the ratio VBW/RBW.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:VID:AUTO OFF`

Manual operation: See "Video BW Manual" on page 98
See "Video BW Auto" on page 98
See "Default Coupling" on page 102

[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>

This command defines the ratio between video bandwidth (Hz) and resolution bandwidth (Hz).

Note that the ratio defined with the remote command (VBW/RBW) is reciprocal to that of the manual operation (RBW/VBW).

Parameters:

<Ratio> Range: 0.01 to 1000
*RST: 3

Example: `BAND:VID:RAT 3`
Sets the coupling of video bandwidth to video bandwidth = 3*resolution bandwidth

Manual operation: See "RBW/VBW Sine [1/1]" on page 100
See "RBW/VBW Pulse [.1]" on page 101
See "RBW/VBW Noise [10]" on page 101
See "RBW/VBW Manual" on page 101
See "Span/RBW Auto [100]" on page 101

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency (frequency domain) or measuring frequency (time domain).

Parameters:

<Frequency> Range: 0 to fmax
*RST: fmax/2
Default unit: Hz
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:CENT 100 MHz`

Manual operation: See "Center" on page 44

[SENSe:]FREQuency:CENTer:STEP <StepSize>

This command defines the center frequency step size.

Parameters:

<StepSize> Range: 1 to fmax
*RST: 0.1 x <span value>
Default unit: Hz

Example: `FREQ:CENT:STEP 120 MHz`

Manual operation: See "CF Stepsize" on page 64
See "Manual" on page 88

[SENSe:]FREQuency:CENTer:STEP:AUTO <State>

This command couples the step size of the center frequency to the span (ON) or sets the value of the center frequency entered via `[SENSe:]FREQuency:CENTer` (OFF).

Parameters:

<State> ON | OFF
*RST: ON

Example: `FREQ:CENT:STEP:AUTO ON`
Activates the coupling of the step size to the span.

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples and decouples the center frequency step size to the span or the resolution bandwidth.

Parameters:

<CouplingType>

SPAN
Couples the step size to the span. Available for measurements in the frequency domain.

RBW
Couples the step size to the resolution bandwidth. Available for measurements in the time domain.

OFF
Decouples the step size (manual input).

*RST: SPAN

Example: `FREQ:CENT:STEP:LINK SPAN`

Manual operation:
See "0.1*Span (span > 0)" on page 86
See "0.1*RBW (span > 0)" on page 87
See "0.5*Span (span > 0)" on page 87
See "0.5*RBW (span > 0)" on page 87
See "x*Span (span > 0)" on page 87
See "x*RBW (span > 0)" on page 87

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Factor>

This command defines a step size factor if the center frequency step size is coupled to the span or the resolution bandwidth.

Parameters:

<Factor>

Range: 1 to 100
*RST: 10
Default unit: PCT

Example: `FREQ:CENT:STEP:LINK:FACT 20PCT`

Manual operation:
See "0.1*Span (span > 0)" on page 86
See "0.1*RBW (span > 0)" on page 87
See "0.5*Span (span > 0)" on page 87
See "0.5*RBW (span > 0)" on page 87

[SENSe:]FREQuency:OFFSet <Offset>

This command defines the frequency offset.

Parameters:

<Offset>

Range: -100 GHz to 100 GHz
*RST: 0 Hz
Default unit: Hz

Example: `FREQ:OFFS 1GHZ`

Manual operation:
See "Frequency Offset" on page 44

[SENSe:]FREQuency:SPAN <Span>

This command defines the frequency span.

Parameters:

<Span> In analyzer mode, the span range is 10 Hz to f_{max}. For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: fmax

Example: `FREQ:SPAN 10MHz`

Manual operation: See "Span Manual" on page 89

[SENSe:]FREQuency:SPAN:FULL

This command sets the frequency span to its maximum.

Example: `FREQ:SPAN:FULL`

Manual operation: See "Full Span" on page 89

[SENSe:]FREQuency:STARt <Frequency>

This command defines the start frequency for measurements in the frequency domain.

Parameters:

<Frequency> 0 to (fmax - min span)

In analyzer mode, the span range is 10 Hz to f_{max}. For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: 0

Example: `FREQ:STAR 20MHz`

Manual operation: See "Start" on page 88

[SENSe:]FREQuency:STOP <Frequency>

This command defines the stop frequency for measurements in the frequency domain.

Parameters:

<Frequency> min span to fmax

In analyzer mode, the span range is 10 Hz to f_{max}. For SEM and Spurious Emission measurements, the minimum span 20 Hz.

*RST: fmax

Example: `FREQ:STOP 2000 MHz`

Manual operation: See "Stop" on page 88

[SENSe:]SWEep:COUNt <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameters:

<NumberSweeps> 0 to 32767

*RST: 0 (GSM: 200, PHN:1)

Example: `SWE:COUN 64`
Sets the number of sweeps to 64.
`INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.

Manual operation: See "Sweep Count" on page 69

[SENSe:]SWEep:POINts <NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

Parameters:

<NumberPoints> Range: 101 to 32001
*RST: 691

Example: `SWE:POIN 251`

Manual operation: See "Sweep Points" on page 106

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:

<Polarity> POSitive | NEGative

*RST: POSitive

Example: `SWE:EGAT:POL POS`

Manual operation: See "Trigger Polarity" on page 70

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

Parameters:

<Time> refer to data sheet

*RST: (automatic)

Example: `SWE:TIME 10s`

Manual operation: See "Sweeptime Manual" on page 89

[SENSe:]SWEep:TIME:AUTO <State>

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If `[SENSe:]SWEep:TIME` is used, automatic coupling is switched off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `SWE:TIME:AUTO ON`
Activates automatic sweep time.

Manual operation: See "Sweeptime Manual" on page 89
See "Sweeptime Auto" on page 99
See "Default Coupling" on page 102

[SENSe:]SWEep:TYPE <Type>

This command selects the sweep type.

Parameters:

<Type>

SWE
Selects analog frequency sweeps.

AUTO
Automatically selects the sweep type (FFT or analog frequency sweep).

FFT
Selects FFT sweeps.

*RST: AUTO

Example: `SWE:TYPE FFT`
Selects FFT sweeps.

Manual operation: See "Sweep" on page 99
See "FFT" on page 100
See "Auto" on page 100

8.6 STATus:QUEStionable subsystem (R&S FSV-K73)

The STATus subsystem contains the commands for the status reporting system (for details refer to the remote control basics in the base unit description). *RST does not influence the status registers.

The `STATus:QUEStionable` subsystem contains information about the observance of limits during adjacent power measurements, the reference and local oscillator, the observance of limit lines and limit margins and possible overloads of the unit.

The available remote commands are described in detail in the `STATus:QUEStionable` subsystem in the base unit.

8.6.1 STATus:QUEStionable:SYNC subsystem (R&S FSV-K73)

This register contains information on the error situation in the code domain power analysis of the R&S FS K73 option. It can be queried with the following commands:

STATus:QUEStionable:SYNC:CONDition?

This command reads the information on the error situation in the code domain power analysis.

Return values:

<Result> If the result is ON, an error occurred. Details can be obtained using `STAT:QUES:SYNC:EVEN`.

*RST: OFF

Example: `STAT:QUES:SYNC:COND?`

Usage: Query only

Mode: WCDMA, CDMA, EVDO

STATus:QUEStionable:SYNC[:EVENt]?

This command reads the information on the error situation in the code domain power analysis. The value can only be read once. The possible events are described in the table below.

Example: `STAT:QUES:SYNC[:EVEN]?`

Usage: Query only

Mode: WCDMA, CDMA, EVDO

Bit	Definition
0	Not used.
1	Frame Sync failed This bit is set when synchronization is not possible within the application. Possible reasons: ● Incorrectly set frequency ● Incorrectly set level ● Incorrectly set scrambling code ● Incorrectly set values for Q-INVERT or SIDE BAND INVERT ● Invalid signal at input
2	Not used.
3 to 4	Not used.
5	Incorrect Pilot Symbol This bit is set when one or more of the received pilot symbols are not equal to the specified pilot symbols of the 3GPP standard. Possible reasons: ● Incorrectly sent pilot symbols in the received frame. ● Low signal to noise ratio (SNR) of the WCDMA signal. ● One or more code channels has a significantly lower power level compared to the total power. The incorrect pilots are detected in these channels because of low channel SNR. ● One or more channels are sent with high power ramping. In slots with low relative power to total power, the pilot symbols might be detected incorrectly (check the signal quality by using the symbol constellation display).
6 to 14	Not used.
15	This bit is always 0.

8.7 TRACe subsystem (R&S FSV-K73)

The TRACe subsystem controls access to the instruments internal trace memory.

TRACe<n>[:DATA]? <DataType>

This query reads trace data out of the instrument. The result depends on the specified data type (see also chapter 7.1.3, "Measurement Modes in Code Domain Analyzer", on page 55).

For details on the results see the individual command descriptions.

Suffix:

<n> 1...4
irrelevant

Query parameters:

<DataType> TRACE1 | TRACE2 | TRACE3 | TRACE4 | ABITstream | CWCDp | CTABLe | TPVSlot | CEVM | LIST

Example: `TRAC:DATA? CEVM`

Usage: Query only

Mode: WCDMA

TRACe<n>[:DATA]? ABITstream<n>

This command returns the bit streams of all 15 slots one after the other. The output format may be REAL, UINT or ASCII. The number of bits of a 16QAM-modulated channel is twice that of a QPSK-modulated channel, the number of bits of a 64QAM-modulated channel is three times that of a QPSK-modulated channel.

This query is only available if the result diagram for the corresponding screen is set to "Bitstream", e.g. using the `CALC:FEED 'XTIM:CDP:BSTReam'` command (see `CALCulate<n>:FEED` on page 113).

The output format is identical to that of the CALCulate:FEED subsystem command for an activated Bitstream display. The only difference is the number of symbols which are evaluated. The ABITstream parameter evaluates all symbols of one frame. Each symbol contains two (QPSK) or four (16QAM) consecutive bits. One value is transferred per bit (range 0,1,). The number of symbols is not constant and may vary depending on the selected channel and its symbol modulation type. Individual symbols in the bit stream may be invalid depending on the channel type and the bit rate (symbols without power). In this case the character '9' is returned.

Unit	[]
Value range	{0, 1, 7, 9} 0 - Low state of a transmitted bit 1 - High state of a transmitted bit 6 - Suppressed symbol of a HS-DPCCH slot 9 - Bit of an inactive channel
Bits per slot	$N_{BitPerSymb} = 2$
Number of symbols	$N_{Symb} = 150*2^{(8\text{-Code Class})}$
Number of bits	$N_{Bit} = N_{Symb} * N_{BitPerSymb}$
Format	Bit_{00}, Bit_{01}, Bit_{10}, Bit_{11}, Bit_{20}, Bit_{21},.... , $Bit_{NSymb\ 0}$, $Bit_{NSymb\ 1}$

Suffix:

<n> 1...4
window

Example: `CALC2:FEED "XTIM:CDP:BSTReam"`
Sets the result display for screen B to bitstream.
`TRAC2:DATA? ABITstream2`
Returns the bit streams of all 15 slots in trace 2 (screen B), one after the other.

Usage: Query only

Mode: WCDMA

TRACe<n>[:DATA]? CEVM

This command reads the root mean square (RMS) value of the error vector magnitude (EVM_{RMS}). The measurement interval of the RMS value depends on analyzer settings and the channel configuration of the applied signal (refer to `[SENSe:]CDPower:ETCHips` on page 171. The information of the chip limits of the used measurement interval are given for each slot.

Suffix:
<n> 1...4
window

Return values:
Result 15 groups with 6 values per group are returned
<slot0>,<EVM0>, <BeginMeas0>,<End-Meas0>,<Reserved_A0>,<Reserved_B0>
<slot1>, <EVM1>, <BeginMeas1>, <EndMeas1>, <Reserved_A1>,<Reserved_B1>
...
<slot14>,<EVM14>,<BeginMeas14>,<End-Meas14>,<Reserved_A14>,<Reserved_B14>

Example: `TRAC2:DATA? CEVM`

Usage: Query only

TRACe<n>[:DATA]? CTABLe

This command returns the channel state (active, inactive) in addition to the values returned for "TRACE<n>".

Suffix:
<n> 1...4
window

Return values:
<Result> <class>,<channel number>,<absolute level>,<relative level>,<I/Q component>, <pilot length>, <channel state>

Comma-separated list with 7 values for each channel; the pilot length is always 0.
For details on the other result information, see `TRACe<n>[:DATA]?` on page 203.

Example: `TRAC:DATA? CTABLe`
Returns a list of channel information, including the pilot length and channel state.

Usage: Query only

Mode: WCDMA

TRACe<n>[:DATA]? CWCDp

This command returns pilot length, channel state, channel type, modulation type and a reserved value in addition to the values returned for "TRACE<n>" (see `TRACe<n>[:DATA]?` on page 203). It can only be set if "CODE PWR ABSOLUTE" / RELATIVE, or "CHANNEL TABLE" is selected as the display mode for trace 1.

Suffix:

<n> 1...4
window

Return values:

<Result>

<code class>,<channel number>,<absolute level>,<relative level>, <timing offset>, <pilot length>, <active flag>, <channel type>, <modulation type>, <reserved>

Comma-separated list with 10 values for each channel; the channels are output in ascending order sorted by code number, i.e. in the same sequence they are displayed on screen.

<code class>
Code class of the channel {2 … 8}

<channel number>
Code number of the channel {0 … 255}

<I/Q component>
IQ component of the channel {0,1}
0 - Q component: Channel symbols (Sn) sent from quadrate component; only imaginary part of Sn is used. [Re {Sn} = 0 Im {Sn} ≠ 0]
1 - I component: Channel symbols (Sn) sent from In phase component; only real part of Sn is used. [Re {Sn} ≠ 0 Im {Sn} = 0]

<absolute level>
Absolute level of the code channel at the selected channel slot [dBm]. (The channel slot can be marked by the SELECTED CPICH slot.)

<relative level >
Relative level of the code channel at the selected channel slot referenced to CPICH or total power [dB]. (The channel slot can be marked by the SELECTED CPICH slot.)

<timing offset>
Timing offset of the HS-DPCCH to the frame start. The value is measured in chips. The step width is 256 chips. For all other data channels, the timing offset is zero. {0 … 2560} [chips]

<pilot length>
Pilot length of the DPCCH. {0 to 8} [symbols]

<active flag>
Flag to indicate whether a channel is active
0 – channel not active
1 – channel active

<channel type>
Channel type indication {0 … 4}
0 - DPDCH: Dedicated Physical Data Channel
1 - DPCCH: Dedicated Physical Control Channel
2 - HS-DPCCH: High-Speed Dedicated Physical Control Channel
3 - E-DPCCH: Enhanced Dedicated Physical Control Channel
4 - E_DPDCH: Enhanced Dedicated Physical Data Channel

<modulation type>

Modulation type of the code channel at the selected channel slot. {2 – Modulation type QPSK}

reserved
for future use

Example: `TRAC:DATA? CWCDp`
Returns a list of channel information for each channel in ascending order.

Usage: Query only

Mode: WCDMA

TRACe<n>[:DATA]? LIST

This command returns the peak list of the spectrum emission mask measurement list evaluation (see also `TRACe<n>[:DATA]?` on page 203).

Suffix:

<n> 1...4
window

Return values:

<Result> <No>, <Start>, <Stop>, <Rbw>, <Freq>, <Levelabs>, <Level-rel>, <Delta>, <Limitcheck>, <unused1>, <unused2>

An array of values is returned for each range of the limit line (<value array of range 1>, <value array of range 2>, ….., <value array of range n>).

No []
number of the limit line range

Start [Hz]
start frequency of the limit line range

Stop [Hz]
stop frequency of the limit line range

Rbw [Hz]
resolution band width of the limit line range

Freq [Hz]
frequency of the power peak within the range

Power abs [dBm]
absolute power of the peak within the range

Power rel [dB]
relative power of the peak within the range related to channel power

Delta [dB]
distance to the limit line in dB (positive indicates value above the limit = fail)

Limitcheck [0 | 1]
Limit check (pass = 0, fail = 1), indicates whether the power is below [0] or above [1] the limit line

Unused1/2 []
for future use

Default unit: Hz

Example: `TRAC2DATA? ATRACE2`
Returns a list of absolute frequency errors for all slots in trace 2 (screen B).

Usage: Query only

Mode: WCDMA

TRACe<n>[:DATA]? TPVSlot

This command returns a list of absolute frequency errors vs slot for all slots. In contrast to the scope presentation and the TRACE<n> parameter return value, absolute values are returned. The query is only possible in frame mode and not in slot mode, regardless of the display mode.

Suffix:

<n> 1...4
window

Return values:

<Result> <slot number>, <level value in dBm>

Comma-separated list with 15 pairs of slots (slot number of CPICH) and level values (for 15 slots)

Default unit: Hz

Example: `CALC2:FEED 'XTIM:CDP:PVSLot:ABSolute'`
Sets the result display for screen B to POWER VS SLOT.
`TRAC2:DATA? TPVSlot`
Returns a list of absolute frequency errors for all slots in trace 2 (screen B).

Usage: Query only

Mode: WCDMA

TRACe<n>[:DATA]? TRACE<t>

This command returns the trace data. Depending on the display mode, the trace data format varies. For details see chapter 7.1.3, "Measurement Modes in Code Domain Analyzer", on page 55.

CODE PWR ABSOLUTE/RELATIVE, CHANNEL TABLE

For each channel, the class, the channel number, the absolute level, the relative level and the timing offset are returned. The class denotes the spreading factor of the channel. Class 8 corresponds to the highest spreading factor (256, symbol rate 15 ksps), class 2 to the lowest admissible spreading factor (4, symbol rate 960 ksps).

CODE PWR ABSOLUTE/RELATIVE

The channels are output in ascending order sorted according to the code numbers, i.e. in the same sequence as they are displayed on the screen. For CHANNEL TABLE, the channels are sorted according to the code classes, i.e. the unassigned channels are transmitted last.

CODE DOMAIN ERROR POWER

Five values are transmitted for each code class 8 channel. The channels are sorted according to the code numbers

Format = <code class>1, <code number>1, <CDEP>1, <channel flag>1,

<code class>2, <code number>2, <CDEP>2, <channel flag>2,

...

<code class>256, <code number>256, <CDEP>256, <channel flag>256

where:

<Code class> = Highest code class of an uplink signal. It is always set to 8 (CC8)

<Code number> = Code number of the evaluated CC8 channel

<CDEP> = Code domain error power value of the CC8 channel [dB]

<Channel flag> = Indicates if the CC8 channel belongs to an assigned code channel

- 0b00 0d0 – CC8 is inactive
- 0b01 0d1 – CC8 channel belongs to an active code channel

RESULT SUMMARY

The following results are returned for each channel:

<composite EVM [%]>,

<peak CDE [dB]>,

<carr freq Error [Hz]>,

<chip rate error [ppm]>,

<total power [dB]>,

<trg to frame [s]>,

<EVM peak channel [%]>,

<EVM mean channel [%]>,

<class>,

<channel number>,

<power abs. channel [dB]>,

<power rel. channel [dB referred to the total power of the signal]>,

<I/Q component [abs]>,

<pilot length [bits]>,

<IQ offset [%]>,

<IQ imbalance [%]>

POWER VS SLOT

15 pairs of slot (slot number of CPICH) and level values (for 15 slots) are always transferred.

<slot number>, <level value in dB>,<slot number>,<level value in dB>,.....

SYMBOL EVM

The number of level values depends on the spreading factor:

Spreading factor 256 = 10 values = Spreading factor 128 = 20 values

Spreading factor 64 = 40 values = Spreading factor 32 = 80 values

Spreading factor 16 = 160 values = Spreading factor 8 = 320 values

Spreading factor 4 = 640 values

PEAK CODE DOMAIN ERR / COMPOSITE EVM

15 pairs of slot (slot number of CPICH) and values are always transferred.

PEAK CODE DOMAIN ERR: <slot number>, <level value in dB>,.....

COMPOSITE EVM: <slot number>, <value in %>, ...

SYMBOL CONST

The real and the imaginary part are transferred as a pair:

<re 0>,<im 0>,<re 1>,<im 1>,.....<re n>, <im n>

For the channels have exclusively I or Q components in R&S FS-K73, the <re> or <im> values are 0, depending on the selected component.

The number of level values depends on the spreading factor:

Spreading factor 256 = 10 values = Spreading factor 128 = 20 values

Spreading factor 64 = 40 values = Spreading factor 32 = 80 values

Spreading factor 16 = 160 values = Spreading factor 8 = 320 values

Spreading factor 4 = 640 values

BITSTREAM

The bitstream of one slot is transferred. One value is transferred per bit (range 0,1,). The number of symbols is not constant and may vary for each sweep. Specific symbols in the bitstream may be invalid depending on the channel type and the bit rate (symbols without power). The assigned invalid bits are marked by "9".

EVM VS CHIP

The square root of square difference between received signal and reference signal for each chip are transferred. The values are normalized to the square root of the average power at the selected slot:

Output = List of 2560 vector error values of all chips at the selected slot

MAGNITUDE ERROR VS CHIP

The magnitude difference between received signal and reference signal for each chip are transferred. The values are normalized to the square root of the average power at the selected slot:

Output = List of 2560 vector error values of all chips at the selected slot

PHASE ERROR VS CHIP

The phase differences between received signal and reference signal for each chip are transferred. The values are normalized to the square root of the average power at the selected slot:

Output = List of 2560 vector error values of all chips at the selected slot

Suffix:

<n>	1...4 irrelevant
<t>	1...4 trace

Return values:

<Result> <code class>,<channel number>,<absolute level>,<relative level>, <timing offset>

Comma-separated list with 5 values for each channel; the channels are output in ascending order sorted by code number, i.e. in the same sequence they are displayed on screen.

<code class>
Code class of the channel {2 … 9}

<channel number>
Code number of the channel {0 … 511}

<absolute level>
Absolute level of the code channel at the selected channel slot. (The channel slot can be marked by the SELECTED CPICH slot.)

<relative level >
Relative level of the code channel at the selected channel slot referenced to CPICH or total power. (The channel slot can be marked by the SELECTED CPICH slot.)

<timing offset>
Timing offset of the code channel to the frame start. The value is measured in chips. The step width is 256 chips in the case of code class 2 to 8, and 512 chips in the case of code class 9. {0 … 38400} [chips]

Example: `TRAC2:DATA? TRACE2`
Returns the trace data from trace 2 (screen B).

Usage: Query only

Mode: WCDMA

8.8 Other Commands Referenced in this Manual

The following commands are identical to those in the base unit and are included in this manual only because they are specifically referenced to here.

See also chapter 8.5.3, "Other SENSe Commands Referenced in this Manual", on page 184 and chapter 8.2.6, "Other CALCulate Commands Referenced in this Manual", on page 133

8.8.1 DISPlay Subsystem

DISPlay[:WINDow<n>]:STATe <State>

Activates/deactivates the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background:

Suffix:

<n> window

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DISP:WIND3:STAT ON`
Turns on a third measurement screen.

Mode: CDMA, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command defines the type of display and the evaluation of the traces. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]`.

The number of measurements for AVERage, MAXHold and MINHold is defined with the `[SENSe:]AVERage<n>:COUNt` or `[SENSe:]SWEep:COUNt` commands. It should be noted that synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:

<Mode> WRITe | VIEW | AVERage | MAXHold | MINHold | BLANk

*RST: WRITe for TRACe1, STATe OFF for TRACe2/3/4/5/6

For details on trace modes refer to chapter 6.4.4, "Trace Mode Overview", on page 33.

Example: `INIT:CONT OFF`
Switching to single sweep mode.
`SWE:COUN 16`
Sets the number of measurements to 16.
`DISP:TRAC3:MODE MAXH`
Switches on the calculation of the maximum peak for trace 3.
`INIT;*WAI`
Starts the measurement and waits for the end of the 16 sweeps.

Manual operation: See "Clear Write" on page 33
See "Max Hold" on page 33
See "Min Hold" on page 33
See "Average" on page 34
See "View" on page 34

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command switches on or off the display of the corresponding trace. The other measurements are not aborted but continue running in the background.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:

<State> ON | OFF
*RST: ON for TRACe1, OFF for TRACe2 to 6

Example: `DISP:TRAC3 ON`

Manual operation: See "Blank" on page 34

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis with logarithmic scaling.

The command works only for a logarithmic scaling. You can select the scaling with `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 211.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Range> Range: 10 to 200
*RST: 100
Default unit: dB

Example: `DISP:TRAC:Y 110dB`

Manual operation: See "Range Log 100 dB" on page 91
See "Range Log 50 dB" on page 91
See "Range Log 10 dB" on page 91
See "Range Log 5 dB" on page 91
See "Range Log 1 dB" on page 92
See "Range Log Manual" on page 92

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>

This command selects the type of scaling of the y-axis.

When `SYSTem:DISPlay:UPDate` is turned off, this command has no immediate effect on the screen.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t>	irrelevant

Parameters:

<Mode>

ABSolute
absolute scaling of the y-axis

RELative
relative scaling of the y-axis

*RST: ABS

Example: `DISP:TRAC:Y:MODE REL`

Manual operation: See "Grid Abs/Rel " on page 95

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

Manual operation: See "Y per Div" on page 66

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <ReferenceLevel>

This command defines the reference level.

With the reference level offset ≠ 0, the value range of the reference level is modified by the offset.

Suffix:

<n>	irrelevant.

<t> irrelevant

Parameters:

<ReferenceLevel> The unit is variable.

Range: see datasheet
*RST: -10dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Manual operation: See "Ref Level" on page 44

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command defines a reference level offset.

Suffix:

<n> irrelevant.

<t> irrelevant

Parameters:

<Value> Range: -200 to 200
*RST: 0
Default unit: dB

Example: `DISP:TRAC:Y:RLEV:OFFS -10dB`

Manual operation: See "Ref Level Offset" on page 45

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This command defines the position of the reference level on the display grid..

Suffix:

<n> Selects the measurement window.

<t> irrelevant

Parameters:

<Position> 0 PCT corresponds to the lower display border, 100% corresponds to the upper display border.

Range: 0 to 100
*RST: Spectrum mode: 100 PCT
Default unit: PCT

Example: `DISP:TRAC:Y:RPOS 50PCT`

Manual operation: See "Ref Value Position" on page 66
See "Ref Level Position" on page 95

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>

The command defines the power value assigned to the reference position in the grid.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> *RST: 0 dB, coupled to reference level

Example: `DISP:TRAC:Y:RVAL -20dBm`
Defines a reference position of -20 dBm.

Manual operation: See "Ref Value" on page 66

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling of the y-axis.

Suffix:

<n> Selects the measurement window.

<t> irrelevant

Parameters:

<ScalingType> **LOGarithmic**
Logarithmic scaling.

LINear
Linear scaling in %.

LDB
Linear scaling in dB.

*RST: LOGarithmic

Example: `DISP:TRAC:Y:SPAC LIN`
Select a linear scale.

Manual operation: See "Range Log 100 dB" on page 91
See "Range Log 50 dB" on page 91
See "Range Log 10 dB" on page 91
See "Range Log 5 dB" on page 91
See "Range Log 1 dB" on page 92
See "Range Log Manual" on page 92
See "Range Linear %" on page 92
See "Range Lin. Unit" on page 92

8.8.2 INPut subsystem

INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

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

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<Value> *RST: 10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`
Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Mode: all

Manual operation: See "RF Atten Manual/Mech Att Manual" on page 66

INPut:ATTenuation:AUTO <State>

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<State> ON | OFF
*RST: ON

Example: `INP:ATT:AUTO ON`
Couples the attenuation set on the attenuator to the reference level.

Manual operation: See "RF Atten Auto/Mech Att Auto" on page 67

INPut:COUPling <CouplingType>

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

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<CouplingType> AC | DC

*RST: AC

Example: `INP:COUP DC`

Manual operation: See "Input (AC/DC)" on page 68

INPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital baseband input from the optional R&S Digital I/Q Interface (option R&S FSV-B17).

For details see the section "Interface Status Information" for the R&S Digital I/Q Interface (R&S FSV-B17) in the description of the base unit.

Return values:

<ConnState> Defines whether a device is connected or not.

0
No device is connected.

1
A device is connected.

<DeviceName> Device ID of the connected device

<SerialNumber> Serial number of the connected device

<PortName> Port name used by the connected device

<SampleRate> Maximum or currently used sampling rate of the connected device in Hz (depends on the used connection protocol version; indicated by <SampleRateType> parameter)

<MaxTransferRate> Maximum data transfer rate of the connected device in Hz

<ConnProtState> State of the connection protocol which is used to identify the connected device.

Not Started

Has to be Started

Started

Passed

Failed

Done

<PRBSTestState> State of the PRBS test.

Not Started

Has to be Started

Started

Passed

Failed

Done

<SampleRateType> **0**
Maximum sampling rate is displayed

1
Current sampling rate is displayed

<Placeholder> for future use; currently "0"

Example: `INP:DIQ:CDEV?`
Result:
`1,SMU200A,103634,Out A,70000000,100000000,Passed,Not Started,0,0`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

Manual operation: See "Connected Device" on page 78
See "Digital IQ Info" on page 79

INPut:DIQ:RANGe:AUTO <State>

If enabled, the digital input fullscale level is automatically set to the value provided by the connected device (if available).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `INP:DIQ:RANG:AUTO ON`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:COUPling <State>

If enabled, the reference level for digital input is adjusted to the full scale level automatically if the fullscale level changes.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<State>	ON | OFF	
	*RST:	OFF

Example: `INP:DIQ:RANG:COUP OFF`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

Manual operation: See "Adjust Reference Level to Full Scale Level" on page 79

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 79).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level>	<numeric value>	
	Range:	70.711 nV to 7.071 V
	*RST:	1 V

Example: `INP:DIQ:RANG 1V`

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

Manual operation: See "Full Scale Level" on page 79

INPut:DIQ:RANGe[:UPPer]:UNIT <Unit>

Defines the unit of the full scale level (see "Level Unit" on page 79). The availability of units depends on the measurement application you are using.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level>	V | dBm | dBpW | W | dBmV | dBuV | dBuA | A	
	*RST:	Volt

Example: `INP:DIQ:RANG:UNIT A`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

Manual operation: See "Level Unit" on page 79

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 79).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<SampleRate> Range: 1 Hz to 10 GHz
*RST: 32 MHz

Example: INP:DIQ:SRAT 200 MHz

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

Manual operation: See "Input Sample Rate" on page 79

INPut:DIQ:SRATe:AUTO <State>

If enabled, the sample rate of the digital baseband IQ input signal is set automatically by the connected device, if the currently used sample rate is provided (indicated by the <SampleRateType> parameter in the result of the `INPut:DIQ:CDEVice` command.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (B17) description of the base unit.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `INP:DIQ:SRAT:AUTO ON`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:EATT <Attenuation>

This command defines the electronic attenuation.

If necessary, the command also turns the electronic attenuator on.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

The attenuation can be varied in 1 dB steps from 0 to 25 dB. Other entries are rounded to the next lower integer value.

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

Parameters:
<Attenuation> 0...25
*RST: 0 dB (OFF)

Example: `INP1:EATT 10 dB`

Mode: all

Manual operation: See "El Atten Mode (Auto/Man)" on page 67

INPut:EATT:AUTO <State>

This command switches the automatic behaviour of the electronic attenuator on or off. If activated, electronic attenuation is used to reduce the operation of the mechanical attenuation whenever possible.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:
<State> ON | OFF
*RST: ON

Example: `INP1:EATT:AUTO OFF`

Mode: all

Manual operation: See "El Atten On/Off" on page 67
See "El Atten Mode (Auto/Man)" on page 67

INPut:EATT:STATe <State>

This command turns the electronic attenuator on or off.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `INP:EATT:STAT ON`
Switches the electronic attenuator into the signal path.

INPut:FILTer:YIG[:STATe] <State>

This command activates and deactivates the YIG filter.

Parameters:

<State>	**ON**
	OFF
	*RST: ON

Example: `INP:FILT:YIG OFF`
Deactivates the YIG filter.

Mode: RT

Manual operation: See "YIG Filter (On Off)" on page 96

INPut:GAIN:STATe <State>

This command turns the 20 dB preamplifier on and off.

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using R&S Digital I/Q Interface (R&S FSV-B17).

Parameters:

<State>	ON | OFF
	*RST: OFF

Example: `INP:GAIN:STAT ON`
Turns the preamplifier on.

Manual operation: See "Preamp On/Off" on page 45

INPut:IMPedance <Impedance>

This command selects the nominal input impedance.

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

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<Impedance>	50 | 75
	*RST: 50 Ω

Example: `INP:IMP 75`

Manual operation: See "Input 50 Ω/75 Ω " on page 96

INPut:SELect <Source>

This command selects the signal source for measurements.

Parameters:

<Source> RF | DIQ

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Digital IQ (only available with R&S Digital I/Q Interface, option R&S FSV-B17)

*RST: RF

Example: INP:SEL RF

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

Manual operation: See "Input Path" on page 78

8.8.3 TRIGger Subsystem

TRIGger<n>[:SEQuence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger source (for digital input via the R&S Digital I/Q Interface, R&S FSV-B17).

Suffix:

<n> irrelevant

Parameters:

<Level> Range: -50 dBm to +20 dBm
*RST: -20 DBM

Example: `TRIG:LEV:BB -30DBM`

Mode: All

TRIGger<n>[:SEQuence]:BBPower:HOLDoff <Value>

This command sets the holding time before the next BB power trigger event (for digital input via the R&S Digital I/Q Interface, R&S FSV-B17).

Suffix:

<n> irrelevant

Parameters:

<Value> *RST: 150 ns

Example: `TRIG:SOUR BBP`
Sets the baseband power trigger source.
`TRIG:BBP:HOLD 200 ns`
Sets the holding time to 200 ns.

Mode: all

TRIGger<n>[:SEQuence]:IFPower:HOLDoff <Value>

This command sets the holding time before the next IF power trigger event.

Suffix:

<n>	irrelevant	

Parameters:

<Value>	*RST:	150 ns

Example:
`TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HOLD 200 ns`
Sets the holding time to 200 ns.

TRIGger<n>[:SEQuence]:IFPower:HYSTeresis <Value>

This command sets the limit that the hysteresis value for the IF power trigger has to fall below in order to trigger the next measurement.

Suffix:

<n>	irrelevant	

Parameters:

<Value>	*RST:	3 dB

Example:
`TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HYST 10DB`
Sets the hysteresis limit value.

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

Suffix:

<n>	irrelevant	

Parameters:

<Delay>	Range:	zero span: -sweeptime (see data sheet) to 30 s; span: 0 to 30 s
	*RST:	0 s

Example: `TRIG:HOLD 500us`

Manual operation: See "Trigger Offset" on page 47

TRIGger<n>[:SEQuence]:LEVel[:EXTernal] <TriggerLevel>

This command sets the level of the external trigger source in Volt.

Suffix:

<n>	irrelevant	

Parameters:

<TriggerLevel>	Range:	0.5 V to 3.5 V
	*RST:	1.4 V

Example: `TRIG:LEV 2V`

TRIGger<n>[:SEQuence]:MASK:CONDition <Condition>

This command sets the condition that activates the frequency mask trigger.

Parameters:

<Condition>

ENTer
Triggers on entering the frequency mask.

LEAVing
Triggers on leaving the frequency mask.

INSide
The trigger is active as long as the signal is inside the frequency mask.

OUTSide
The trigger is active as long as the signal is outside the frequency mask.

*RST: INSide

Example: See chapter 8.2.6.4, "CALCulate:MASK Subsystem", on page 152.

Manual operation: See "Setting the trigger condition" on page 28

TRIGger<n>[:SEQuence]:SLOPe <Type>

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Suffix:

<n> irrelevant

Parameters:

<Type> POSitive | NEGative

*RST: POSitive

Example: `TRIG:SLOP NEG`

Manual operation: See "Trg/Gate Polarity" on page 47
See "Trigger Polarity" on page 70

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:

<n> irrelevant

Parameters:

<Source> EXTernal | IFPower | IMMediate | MASK | TIME | VIDeo

Note that the availability of the trigger source depends on the measurement you are in.

EXTernal
Selects an external trigger.

IFPower
Selects the power trigger on the second intermediate frequency.

IMMediate
Selects the free run mode (= no trigger).

MASK
Selects the frequency mask trigger.

TDTRigger
Selects the time domain trigger.

TIME
Selects the time trigger.

VIDeo
Selects the video trigger. The video trigger is available for time domain measurements.

*RST: IMMediate

Example: `TRIG:SOUR EXT`
Selects the external trigger input as source of the trigger signal

Manual operation: See "Trigger Source External" on page 47
See "Trigger Source Free Run" on page 47

8.8.4 Other Referenced Commands

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.

DIAGnostic<n>:SERVice:NSOurce <State>

This command switches the 28 V supply of the noise source on the front panel on or off.

Suffix:

<n>	irrelevant

Parameters:

<State>	ON | OFF *RST: OFF

Example: `DIAG:SERV:NSO ON`

Manual operation: See "Noise Source" on page 78

INITiate<n>:CONMeas

This command restarts a measurement that has been stopped in single sweep mode.

The measurement is restarted at the first sweep point.

As opposed to `INITiate<n>[:IMMediate]`, this command does not reset traces in maxhold, minhold or average mode. Therefore it can be used to continue measurements using max hold or averaging functions.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

Suffix:

<n>	irrelevant

Example:

`INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.
`INIT:CONM;*WAI`
Continues the measurement (next 20 sequences) and waits for the end.

Manual operation: See "Continue Single Sweep" on page 69

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

The sweep is started immediately.

Suffix:
<n> irrelevant

Parameters:
<State> ON | OFF
*RST: ON

Example: `INIT:CONT OFF`
Switches the sequence to single sweep.
`INIT:CONT ON`
Switches the sequence to continuous sweep.

Mode: all

Manual operation: See "Continuous Sweep" on page 68
See "Single Sweep" on page 69

INITiate<n>:ESPectrum

This command starts a Spectrum Emission Mask measurement.

Suffix:
<n> irrelevant

Example: `INIT:ESP`
Starts a Spectrum Emission Mask measurement.

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.

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command stores the selected trace in the specified window in a file with ASCII format. The file format is described in chapter 6.4.7, "ASCII File Export Format", on page 37

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 222).

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:
<Trace> 1 to 6
selected measurement trace

<FileName> DOS file name
The file name includes indication of the path and the drive name. Indication of the path complies with DOS conventions.

Example: `MMEM:STOR:TRAC 3,'TEST.ASC'`
Stores trace 3 in the file TEST.ASC.

OUTPut:IF[:SOURce] <Source>

This command selects the source of the IF output.

Parameters:

<Source>

IF
Outputs the intermediate frequency.

OFF
Turns off the output of a signal.

VIDeo
Outputs the video signal (200 mV).

*RST: IF

Example: `OUTP:IF VID`
Selects the video signal for the IF output connector.

Manual operation: See "Video Output" on page 106

OUTPut:TRIGger <PortLevel>

This command selects level of the Trigger Out port. Thus, you can trigger an additional device via the external trigger port, for example.

Parameters:

<PortLevel> LOW | HIGH

*RST: LOW

Example: `OUTP:TRIG HIGH`

Manual operation: See "Trigger Out" on page 107

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`

9 Error Messages

Error messages are entered in the error/event queue of the status reporting system in the remote control mode and can be queried with the command `SYSTem:ERRor?`.

A short explanation of the device-specific error messages for R&S FSV–K73 is given below.

Status bar message	Description
Sync not found	This message is displayed if synchronization is not possible. Possible causes are that frequency, level, scrambling code, Invert Q values are set incorrectly, or the input signal is invalid.
Sync OK	This message is displayed if synchronization is possible.
Incorrect pilot symbols	This message is displayed if one or more of the received pilot symbols are not equal to the specified pilot symbols of the 3GPP standard. Possible causes are: • Incorrectly sent pilot symbols in the received frame. • Low signal to noise ratio (SNR) of the WCDMA signal. • One or more code channels have a significantly lower power level compared to the total power. The incorrect pilots are detected in these channels because of low channel SNR. • One or more channels are sent with high power ramping. In slots with low relative power to total power, the pilot symbols might be detected incorrectly (check the signal quality by using the symbol constellation display

10 Glossary

Composite EVM	In accordance with the 3GPP specifications, the squared error between the real and imaginary parts of the test signal and an ideal reference signal is determined (EVM referred to the total signal) in a composite EVM measurement.
DPCCH	Dedicated physical control channel, control channel. The DPCCH contains pilot, TFCI, TPC and FBI bits. The control channel is assumed to be present in every signal in R&S FS-K73.
DPDCH	Dedicated physical data channel, data channel. The data channels only contain data bits. Data channels for user equipment signals are assigned a certain scheme defined in 3GPP specifications.
Inactive Channel Threshold	Minimum power that a single channel must have as compared to the total signal to be recognized as an active channel
Peak Code Domain Error	In accordance with the 3GPP specifications, the error between the test signal and the ideal reference signal is projected onto the classes of the different spreading factors in the case of a peak code domain measurement.

List of Commands

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