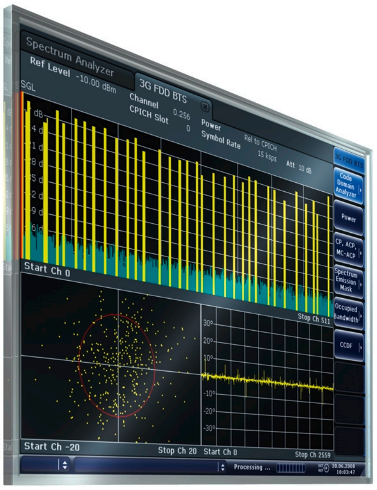
R&S® FSV-K72
Firmware Option 3GPP FDD BTS Measurement
Operating Manual



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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

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

- analyzer-K72 (1310.8055.02)

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

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

The firmware of the instrument makes use of several valuable open source software packages. The most important of them are listed below together with their corresponding open source license. The verbatim license texts are provided on the user documentation CD-ROM (included in delivery).

Package	**Link**	**License**
OpenSSL	http://www.openssl.org	OpenSSL/SSLeavy
Xitami	http://www.xitami.com	2.5b6
PHP	http://www.php.net	PHP v.3
DOJO-AJAX	http://www.dojotoolkit.org	Academic Free License (BSD)
ResizableLib	http://www.geocities.com/ppescher	Artistic License
BOOST Library	http://www.boost.org	Boost Software v.1
ONC/RPC	http://www.plt.rwth-aachen.de/ index.php?id=258	SUN

The product Open SSL includes cryptographic software written by Eric Young (eay@cryptsoft.com) and software written by Tim Hudson (tjh@cryptsoft.com).

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

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

Contents

1 Documentation Overview

The user documentation for the analyzer is divided as follows:

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

Quick Start Guide

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

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

Operating Manuals

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

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

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

The following Operating Manuals are available for the analyzer:

- R&S FSV base unit; in addition:
  - R&S FSV-K9 Power Sensor Support
  - R&S FSV-K14 Spectrogram Measurement
- R&S FSV-K7 Analog Demodulation and R&S FSV-K7S FM Stereo Measurements
- R&S FSV-K10 GSM/EDGE Measurement
- R&S FSV-K30 Noise Figure Measurement
- R&S FSV-K40 Phase Noise Measurement
- R&S FSV-K70 Vector Signal Analysis
- R&S FSV-K72 3GPP FDD BTS Analysis
- R&S FSV-K73 3GPP FDD UE Analysis
- R&S FSV-K76/77 3GPP TD-SCDMA BTS/UE Measurement
- R&S FSV-K82/83 CDMA2000 BTS/MS Analysis
- R&S FSV-K84/85 1xEV-DO BTS/MS Analysis
- R&S FSV-K91 WLAN IEEE 802.11a/b/g/j/n
- R&S FSV-K93 WiMAX IEEE 802.16 OFDM/OFDMA Analysis
- R&S FSV-K100/K104 EUTRA / LTE Downlink Measurement Application
- R&S FSV-K101/K105 EUTRA / LTE Uplink Measurement Application

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

Service Manual

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

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

Online Help

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

Release Notes

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

2 Conventions Used in the Documentation

2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

2.2 Conventions for Procedure Descriptions

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

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

3 How to Use the Help System

Calling context-sensitive and general help

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

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

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

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

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

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

Contents of the help dialog box

The help dialog box contains four tabs:

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

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

Navigating in the table of contents

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

Navigating in the help topics

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

Searching for a topic

1. Change to the "Index" tab.

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

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

Changing the zoom

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

Closing the help window

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

4 3GPP FDD BTS Measurement Option R&S FSV-K72

Overview of Firmware Option R&S FSV-K72

This section contains all information required for operation of an analyzer equipped with application firmware R&S FSV-K72. It covers operation via menus and the remote control commands for the 3GPP FDD BTS base station test.

This part of the documentation consists of the following chapters:

- chapter 4.1, "Setup for Base Station Tests", on page 14
  Describes the measurement setup for base station tests.
- chapter 4.2, "3GPP FDD BTS Test Models", on page 15
  Gives an overview over the test models with different channel configurations.
- chapter 4.3, "Instrument Functions 3GPP Base Station Measurements", on page 17
  Describes the instrument functions of 3GPP Base Station Measurements
- chapter 4.4, "Configuration of 3GPP FDD BTS Measurements", on page 27
  Contains a detailed description of the possible base station test measurements as a reference for manual operation. This chapter also presents a list of remote control commands associated with each function.
- chapter 4.5, "Measurement Examples (R&S FSV-K72)", on page 108
  Explains some basic 3GPP°FDD base station tests.
- chapter 4.6, "Remote Control Commands", on page 118
  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 4.7, "Error Messages", on page 223
  Contains device-specific error messages for R&S FSV-K72.
- chapter 4.8, "Glossary", on page 224
  Contains an explanation of terms related to measured quantities of the code domain measurement.

This part of the documentation includes only functions of the application firmware R&S FSV-K72. For all other descriptions, please refer to the description of the base unit at the beginning of the documentation.

4.1 Setup for Base Station 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 BTS base station 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-K72 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 BTS 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
≥55 to 60 dBm	35 to 40 dB
≥50 to 55 dBm	30 to 35 dB
≥45 to 50 dBm	25 to 30 dB
≥40 to 45 dBm	20 to 25 dB
≥35 to 40 dBm	15 to 20 dB
≥30 to 35 dBm	10 to 15 dB
≥25 to 30 dBm	5 to 10 dB
≥20 to 25 dBm	0 to 5 dB
<20 dBm	0 dB

- For signal measurements at the output of two-port networks, connect the reference frequency of the signal source to the rear reference input of the analyzer (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 base stations. For instance, a rubidium frequency standard may be used as a reference source.
- If the base station 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

4.2 3GPP FDD BTS Test Models

For measurements on base-station signals in line with 3GPP, test models with different channel configurations are specified in the document "Base station conformance testing (FDD)" (3GPP TS 25.141 V5.7.0). An overview of the test models is provided in this chapter.

Table 4-1: Test model 1

Channel type	Number of channels	Power (%)	Level (dB)	Spreading code	Timing offset (×256Tchip)
PCCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	1.6	-18	16	120
SCCPCH (SF=256)	1	1.6	-18	3	0
DPCH (SF=128)	16/32/64	76.8 total	see TS 25.141	see TS 25.141	see TS 25.141

Table 4-2: Test model 2

Channel type	Number of channels	Power (%)	Level (dB)	Spreading code	Timing offset (x256Tchip)
PCCPCH+SCH	1	10	-10	1	0
Primary CPICH	1	10	-10	0	0
PICH	1	5	-13	16	120

Channel type	Number of channels	Power (%)	Level (dB)	Spreading code	Timing offset (x256Tchip)
SCCPCH (SF=256)	1	5	-13	3	0
DPCH (SF=128)	3	2 × 10, 1 × 50	2 × -10, 1 × -3	24, 72, 120	1, 7, 2

Table 4-3: Test model 3

Channel type	Number of channels	Power (%) 16/32	Level (dB) 16/32	Spreading code	Timing offset (×256Tchip)
PCCPCH+SCH	1	12.6/7.9	-9/-11	1	0
Primary CPICH	1	12.6/7.9	-9/-11	0	0
PICH	1	5/1.6	-13/-18	16	120
SCCPCH (SF=256)	1	5/1.6	-13/-18	3	0
DPCH (SF=256)	16/32	63,7/80,4 total	see TS 25.141	see TS 25.141	see TS 25.141

Table 4-4: Test model 4

Channel type	Number of channels	Power (%) 16/32	Level (dB) 16/32	Spreading code	Timing offset (×256Tchip)
PCCPCH+SCH	1	50 to 1.6	-3 to -18	1	0
Primary CPICH*	1	10	-10	0	0

Table 4-5: Test model 5

Channel type	Number of channels	Power (%)	Level (dB)	Spreading code	Timing offset (×256Tchip)
PCCPCH+SCH	1	7.9	-11	1	0
Primary CPICH	1	7.9	-11	0	0
PICH	1	1.3	-19	16	120
SCCPCH (SF=256)	1	1.3	-19	3	0
DPCH (SF=256)	30/14/6	14/14.2/14.4 total	see TS 25.141	see TS 25.141	see TS 25.141
HS_SCCH	2	4 total	see TS 25.141	see TS 25.141	see TS 25.141
HS_PDSCH (16QAM)	8/4/2	63.6/63.4/63.2 total	see TS 25.141	see TS 25.141	see TS 25.141

4.3 Instrument Functions 3GPP Base Station Measurements

The analyzer equipped with the 3GPP Base Station Measurement option R&S FSV-K72 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 Base Station Measurements option offers measurements with predefined settings in the frequency domain, e.g. power measurements.

To open the 3GPP BTS menu

- If the 3G FDD BTS mode is not the active measurement mode, press the MODE key and activate the 3G FDD BTS option.
- If the 3G FDD BTS mode is already active, press the HOME key.

The 3GPP BTS menu is displayed.

Menu and Softkey Description

- chapter 4.4.1.3, "Softkeys of the Code Domain Analyzer (R&S FSV-K72)", on page 48
- chapter 4.4.3.7, "Softkeys and Menus for RF Measurements (K72)", on page 88
- chapter 4.4.1.4, "Softkeys of the Frequency Menu for CDA measurements – FREQ key (R&S FSV-K72)", on page 65
- chapter 4.4.1.5, "Softkeys of the Amplitude Menu – AMPT key (R&S FSV-K72)", on page 66
- chapter 4.4.1.11, "Softkeys of the Auto Set Menu – AUTO SET Key (R&S FSV-K72)", on page 76
- chapter 4.4.1.6, "Softkeys of the Sweep Menu for CDA Measurements – SWEEP key (R&S FSV-K72)", on page 68
- chapter 4.4.1.7, "Softkeys of the Trigger Menu – TRIG key (R&S FSV-K72)", on page 70
- chapter 4.4.1.8, "Softkeys of the Trace Menu for CDA Measurements – TRACE key (R&S FSV-K72)", on page 71
- chapter 4.4.1.9, "Softkeys of the Marker Menu – MKR key (R&S FSV-K72)", on page 73
- chapter 4.4.1.10, "Softkeys of the Marker To Menu – MKR-> key (R&S FSV-K72)", on page 74
- chapter 4.4.1.12, "Softkeys of the Input/Output Menu for CDA Measurements", on page 77

The "Span", "Bandwidth", and "Marker Function" menus are disabled for measurements in the CDA mode. For all other measurements (see root menu), the settings are described together with the measurement. The associated menu corresponds to that of the measurement in the base unit and is described in the manual for the base unit.

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

4.3.1 Measurements and Result Diagrams

The 3GPP Base Station Measurement option provides Code Domain Measurements and RF measurements.

4.3.1.1 Code Domain Measurements

The Code Domain Measurement option provides various test measurement types and result diagrams which are available via the Display Config softkey or the Display Config button in the Settings Overview dialog box.

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 BTS 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" dialog box (see "Settings Overview" on page 49).

For details on the measurement modes, see chapter 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32

4.3.1.2 Time Alignment Error Measurements

Time Alignment Error Measurements are a special type of Code Domain Analysis used to determine the time offset between the signals of both antennas of a base station. The measurement can be activated in the MEAS menu.

The settings for time alignment measurements are the same as for CDA measurements, although some settings may not be available. For a description see chapter 4.4.1.3, "Softkeys of the Code Domain Analyzer (R&S FSV-K72)", on page 48.

The result is displayed numerically on the screen, a graphical result is not available.

For details on Time Alignment Error Measurements see chapter 4.4.2, "Time Alignment Error Measurement", on page 81.

4.3.1.3 RF measurements

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

- Output Power (see chapter 4.4.3.1, "Output Power Measurements", on page 83)
- Spectrum Emission Mask (see chapter 4.4.3.2, "Spectrum Emission Mask", on page 83)

- Adjacent Channel Power (see chapter 4.4.3.3, "Ch Power ACLR", on page 84)
- Occupied Bandwidth (see chapter 4.4.3.4, "Occupied Bandwidth", on page 84)
- CCDF (see chapter 4.4.3.5, "CCDF", on page 85)
- RF Combi (see chapter 4.4.3.6, "RF Combi", on page 86 ")

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 Base Station Measurements option to the base unit and vice versa, which allows you to switch between applications quickly and easily:

- center frequency
- reference level
- attenuation
- reference level offset
- center frequency step size
- trigger source
- trigger offset

4.3.2 Further Information

4.3.2.1 Short List of Abbreviations

Term or abbreviation	Description
BTS	base transmission station
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)

4.3.2.2 Channels of the Code Domain Channel Table and Their Usage

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

Channel	Description
CPICH	The common pilot channel is used to synchronize the signal in the case of CPICH synchronization. It is expected at code class 8 and code number 0.
PSCH	The primary synchronization channel is used to synchronize the signal in the case of SCH synchronization. It is a non-orthogonal channel. Only the power of this channel is determined.
SSCH	The secondary synchronization channel is a non-orthogonal channel. Only the power of this channel is determined.
PCCPCH	The primary common control physical channel is used to synchronize the signal in the case of SCH synchronization. It is expected at code class 8 and code number 1.
SCCPCH	The secondary common control physical channel is a QPSK-modulated channel without any pilot symbols. In the 3GPP test models, this channel can be found in code class 8 and code number 3. However, the code class and code number need not to be fixed and can vary. For this reason, the following rules are used to indicate SCCPCH. • "HSDPA/HSUPA On/Off" softkey set to Off – Only one QPSK-modulated channel without pilot symbols is detected and displayed as the SCCPCH. Any further QPSK-modulated channels without pilot symbols are not detected as active channels. – If the signal contains more than one channel without pilot symbols, the channel that is received in the highest code class and with the lowest code number is displayed as the SCCPCH. It is expected that only one channel of this type is included in the received signal. According to this assumption, this channel is probably the SCCPCH. • "HSDPA/HSUPA On/Off" softkey set to On – All QPSK-modulated channels without pilot symbols are detected. If one of these channels is received at code class 8 and code number 3, it is displayed as the SCCPCH. QPSK-modulated channels without pilot symbols and a code class higher than or equal to 7 are marked with the channel type CHAN. QPSK-modulated channels without pilot symbols and a code class lower than 7 are marked with channel type HSPDSCH.
PICH	The paging indication channel is expected at code class 8 and code number 16.
DPCH	The dedicated physical channel is a data channel that contains pilot symbols. The displayed channel type is DPCH. The status is inactive (channel is not active), active (channel is active and all pilot symbols are correct), or pilotf (channel is active but it contains incorrect pilot symbols).

Channel	Description
HS-PDSCH (HSDPA)	The high speed physical downlink shared channel does not contain any pilot symbols. It is a channel type that is expected in code classes equal to or higher than 7: HSPDSCH(QPSK)_ (QPSK-modulated slot of an HS-PDSCH channel), HSPDSCH(16QAM)_ (16QAM-modulated slot of an HS-PDSCH channel), HSPDSCH(NONE)_ (slot without power of an HS-PDSCH channel). The modulation type of these channels can be varied depending on the selected slot. The status is inactive (channel is not active) or active (channel is active and all pilot symbols are correct).
HS-SCCH (HSDPA)	The high speed shared control channel does not contain any pilot symbols. It is a channel type that is expected in code classes equal to or higher than 7. The modulation type should always be QPSK. The channel does not contain any pilot symbols. The status is inactive (channel is not active) or active (channel is active and all pilot symbols are correct).
CHAN	Any arbitrary channel that does not carry a valid pilot symbol sequence is displayed as an arbitrary channel. It is not possible to decide which channel type is transmitted. The only prerequisite is that the channel carries symbols of a sufficient signal to noise ratio. ● Chan Type: CHAN (QPSK-modulated channel without any pilot symbols) ● Status: inactive if the channel is not active; active if the channel is active
E-HICH	Enhanced HARQ hybrid acknowledgement indicator channel Carries hybrid ARQ ACK/NACK E-RGCH Enhanced relative grant channel Carries relative grant allocation for a UE E-AGCH Enhanced absolute grant channel Carries absolute grant allocation for a UE

4.3.2.3 Detector Overview

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

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

Table 4-6: 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

Detector	Indicator	Function
Sample	Sa	Selects the last value within a measurement point
Quasi Peak	QP	Determines the quasipeak power within a measurement point for EMI measurements (not available for SEM)

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

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

Number of measured values

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

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

RMS detector and VBW

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

4.3.2.4 Trace Mode Overview

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

The analyzer offers 6 different trace modes:

Clear Write

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

All available detectors can be selected.

SCPI command:

`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 170

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

The detector is automatically set to "Positive Peak".

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

This mode is not available for statistics measurements.

SCPI command:
DISP:TRAC:MODE MAXH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 170

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

The detector is automatically set to "Negative Peak".

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

This mode is not available for statistics measurements.

SCPI command:
DISP:TRAC:MODE MINH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 170

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

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 4.3.2.3, "Detector Overview", on page 21).

This mode is not available for statistics measurements.

For more information see

- "Sweep Count" on page 69

SCPI command:
DISP:TRAC:MODE AVER, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 170

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

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

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

SCPI command:

`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 170

Blank

Hides the selected trace.

SCPI command:

`DISP:TRAC OFF`, see `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]` on page 171

4.3.2.5 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

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

The following filter types are available:

- Normal (3dB) (Gaussian) filters
  The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.
- EMI (6dB) filters
  The available bandwidths are specified in the data sheet.
- Channel filters
  For details see chapter 4.3.2.6, "List of Available RRC and Channel Filters", on page 24 .
  Channel filters do not support FFT mode.
- RRC filters
  For details see chapter 4.3.2.6, "List of Available RRC and Channel Filters", on page 24 .
  RRC filters do not support FFT mode.
- 5-Pole filters
  The available bandwidths are specified in the data sheet.
  5-Pole filters do not support FFT mode.

4.3.2.6 List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table).

For filters of type RRC (Root Raised Cosine), the filter bandwidth indicated describes the sampling rate of the filter. For all other filters (CFILter) the filter bandwidth is the 3 dB bandwidth.

Table 4-7: Filter types

Filter Bandwidth	Filter Type	Application
100 Hz	CFILter	A0
200 Hz	CFILter	
300 Hz	CFILter	
500 Hz	CFILter	
1 kHz	CFILter	
1.5 kHz	CFILter	SSB
2 kHz	CFILter	
2.4 kHz	CFILter	DAB, Satellite
2.7 kHz	CFILter	
3 kHz	CFILter	ETS300 113 (12.5 kHz channels)
3.4 kHz	CFILter	AM Radio
4 kHz	CFILter	
4.5 kHz	CFILter	
5 kHz	CFILter	
6 kHz	CFILter	
8.5 kHz	CFILter	
9 kHz	CFILter	
10 kHz	CFILter	CDMAone
12.5 kHz	CFILter	ETS300 113 (20 kHz channels)
14 kHz	CFILter	ETS300 113 (25 kHz channels)
15 kHz	CFILter	TETRA
16 kHz	CFILter	PDC
18 kHz, α=0.35	RRC	IS 136
20 kHz	CFILter	CDPD, CDMAone
21 kHz	CFILter	
24.3 kHz, α=0.35	RRC	
25 kHz	CFILter	
30 kHz	CFILter	
50 kHz	CFILter	

Filter Bandwidth	Filter Type	Application
100 kHz 150 kHz 192 kHz 200 kHz 300 kHz 500 kHz	CFILter CFILter CFILter CFILter CFILter CFILter	FM Radio PHS J.83 (8-VSB DVB, USA)
1 MHz 1.228 MHz 1.28 MHz 1.5 MHz 2 MHz 3 MHz 3.75 MHz 3.84 MHz, α=0.22 4.096 MHz, α=0.22 5 MHz 20 MHz 28 MHz 40 MHz	CFILter CFILter RRC CFILter CFILter CFILter CFILter RRC RRC CFILter CFILter CFILter CFILter	CDMAone CDMAone DAB W-CDMA 3GPP W-CDMA NTT DOCoMo

4.3.2.7 ASCII File Export Format

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

File contents: header and data section	Description
Type;FSV;	Instrument model
Version;1.50;	Firmware version
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display

File contents: header and data section	Description
Demodulator;Offset QPSK;	Demodulation type
ResultMode;Trace;	Result mode
x unit;sym;	Unit of the x axis
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

4.4 Configuration of 3GPP FDD BTS Measurements

The R&S FSV-K72 option appears in the "Select Mode" menu (MODE key) as "3GPP FDD BTS". This softkey can be used to start the R&S FSV-K72 options.

The most important parameters for the 3GPP FDD BTS base station tests are summarized in the root menu of the R&S FSV-K72 option and explained below using the softkey functions. The root menu is available by pressing the "3G FDD BTS" 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 base station tests in the analyzer mode. Pressing the associated softkey defines the settings required by 3GPP specifications. A subsequent modification of settings is possible.

The "Time Alignment" softkey activates the time alignment error measurement mode and opens the submenus for setting the measurement.

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 4.4.1, "Code Domain Analyzer Measurements", on page 28	Activates the code domain measurement mode and opens another submenu for selecting and configuring the parameters. All other menus of the analyzer are adapted to the functions of the code domain measurement mode.
chapter 4.4.3.1, "Output Power Measurements", on page 83	Activates the channel power measurement with defined settings in the analyzer mode.
chapter 4.4.3.3, "Ch Power ACLR", on page 84	Activates the adjacent-channel power measurement with defined settings in the analyzer mode.
chapter 4.4.3.2, "Spectrum Emission Mask", on page 83	Compares the signal power in different carrier offset ranges with the maximum values specified by 3GPP.
chapter 4.4.3.4, "Occupied Bandwidth", on page 84	Activates the measurement of the occupied bandwidth (analyzer mode).

chapter 4.4.3.5, "CCDF", on page 85	Evaluates the signal with regard to its statistical characteristics (distribution function of the signal amplitudes).
chapter 4.4.3.6, "RF Combi", on page 86	Activates the RF combination measurement of adjacent channel leakage error (ACP), spectrum emission mask (SEM) and occupied bandwidth (OBW).
chapter 4.4.2, "Time Alignment Error Measurement", on page 81	Activates the Time Alignment Error Measurement for the combined signals of both antennas of a base station.

4.4.1 Code Domain Analyzer Measurements

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

For a brief introduction to the display concept of the code domain analyzer measurements refer to chapter 4.4.1.1, "Display Concept", on page 29.

In chapter 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32 the available measurement modes for code domain analysis and their results are described.

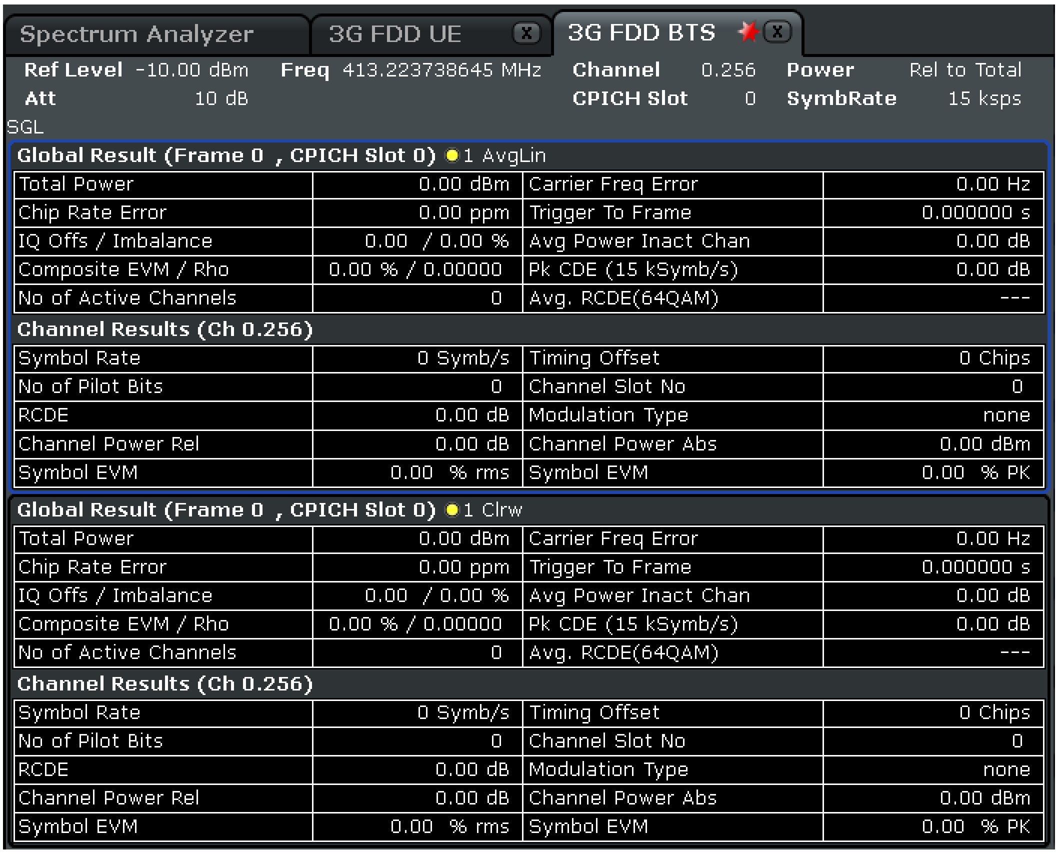
Refer to chapter 4.4.1.3, "Softkeys of the Code Domain Analyzer (R&S FSV-K72)", on page 48 for an introduction to the code domain analyzer settings, as well as the softkeys and menus for code domain analyzer measurements.

4.4.1.1 Display Concept

Measurement results

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

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 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32 .

For more information on the display configuration, see the description of the "Display Config" on page 63 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 51
Att	Attenuation
Freq	Center frequency defined in "Center" on page 51
Channel	Channel with spreading factor
CPICH Slot	CPICH slot
Power	"Demod Settings" on page 60: ""Code Power Display"" and ""Power Reference"" , e.g. ""Relative to Total"" (i.e. relative to *all* channels)
SymbRate	Symbol rate of the current channel

Overview of all measurement settings

You can easily display an overview of all measurement settings using the "Settings Overview" on page 49 softkey.

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

Screen focus

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

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 170
4. Select the required result diagram to be displayed in the selected screen.

   Tip: SCPI command: `CALCulate<n>:FEED` on page 123
5. Press "Close".

To select a predefined display configuration

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

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

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

To store the current display configuration

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

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

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

To remove a predefined display configuration

You can remove one of the stored display configurations.

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

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

To restore the default display configurations

You can restore the default set of predefined display configurations.

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

4.4.1.2 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, you can display the following evaluation types (see "Display Config" on page 63 softkey). Therefore it is not necessary to restart the measurement in order to switch the display mode.

The display mode is defined in the "Display Config" dialog box (see "Display Config" on page 63) or using the remote command `CALCulate<n>:FEED` on page 123. The selected display mode also affects the results of the trace data query (see `TRACe<n>[:DATA]` on page 209).

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

Code Domain Power

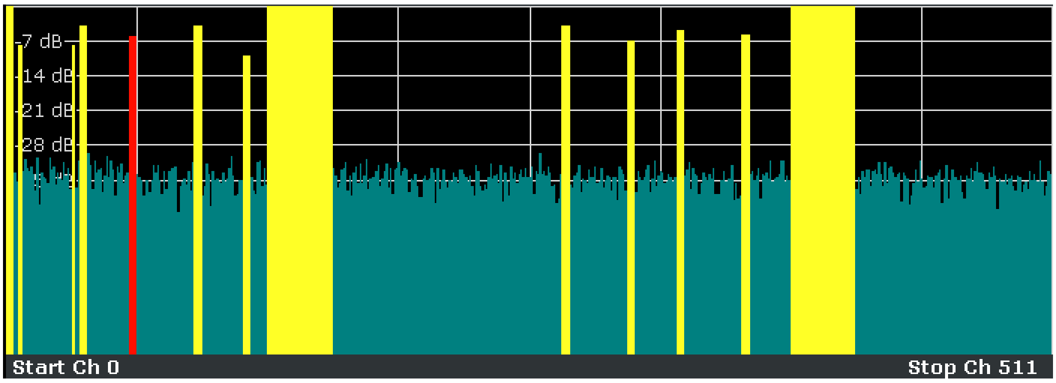


Fig. 4-1: Code Domain Power Display for R&S FSV-K72

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 displayed yellow. The code channel which is defined via "Select Channel" is marked red. The codes where no channel could be detected are displayed cyan.

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

If HS-DPA/UPA is enabled in the "Channel Detection Settings" dialog box (see "Channel Detection Settings" on page 56), channels without pilot symbols, e.g. channels of type HS-PDSCH, are recognized as active.

Result data for remote query

SCPI command:

`CALC:FEED "XPOW:CDP"`, see chapter 4.6.2.1, "CALCulate:FEED subsystem", on page 122

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 5 values are transmitted for each channel:

- the code class
- the channel number
- the absolute level
- the relative level
- the timing offset

The code class defines the spreading factor of the channel. Class 9 corresponds to the highest spreading factor (512, symbol rate 7.5 ksps), class 2 to the lowest admissible spreading factor (4, symbol rate 960 ksps).

The channels are output in ascending order sorted by code number, i.e. in the same sequence they are displayed on screen.

Channel Table

The "Code Domain Channel Table" display mode selects the display of the channel assignment table. The channel assignment table can contain a maximum of 512 entries, corresponding to the 512 codes that can be assigned within the class of spreading factor 512.

The upper part of the table indicates the channels that have to be available in the signal to be analyzed:

<table>
<tr><td>CPICH</td><td colspan="3">The Common Pilot Channel is used to synchronize the signal in the case of CPICH synchronization. It is expected at code class 8 and code number 0.</td></tr>
<tr><td>PSCH</td><td colspan="3">The Primary Synchronization Channel is used to synchronize the signal in the case of SCH synchroniza-tion. It is a nonorthogonal channel. Only the power of this channel is determined.</td></tr>
<tr><td>SSCH</td><td colspan="3">The Secondary Synchronization Channel is a nonorthogonal channel. Only the power of this channel is determined.</td></tr>
<tr><td>PCCPCH</td><td colspan="3">The Primary Common Control Physical Channel is also used to synchronize the signal in the case of SCH synchronization. It is expected at code class 8 and code number 1.</td></tr>
<tr><td>SCCPCH</td><td colspan="3">The Secondary Common Control Physical Channel is a QPSK-modulated channel without any pilot symbols. In the 3GPP test models, this channel can be found in code class 8 and code number 3. However, the code class and code number need not to be fixed and can vary. For this reason, the following rules are used to inidicate the SCCPCH.
• Only one QPSK-modulated channel without pilot symbols is detected and dis-played as the SCCPCH. Any fur-ther QPSK-modulated channels without pilot symbols are not detected as active channels.
• If the signal contains more than one channel without pilot symbols, the channel that is received in the highest code class and with the lowest code number is displayed as the SCCPCH. It is expected that only one channel of this type is included in the received signal. According to this assumption, this channel is prob-ably the SCCPCH

If HS-DPA/UPA is set "ON" in the "Channel Detection Settings"/"Common Settings" dialog box, all QPSK-modulated channels without pilot symbols are detected. If one of these channels is received at code class 8 and code number 3, it is displayed as the SCCPCH. Any other QPSK-modulated channels without pilot symbols and a code class higher than or equal to 7 are marked with the channel type CHAN. All further QPSK-modulated channels without pilot symbols and a code class lower than 7 are marked with channel type HSPDSCH.</td></tr>
<tr><td>PICH</td><td colspan="3">The Paging Indication Channel is expected at code class 8 and code number 16.

The lower part of the table indicates the data channels contained in the signal. A data channel is any channel that does not have a predefined channel number and symbol rate. There are different types of data channels, which can be indicated by the entry in the column "Chan Type".</td></tr>
<tr><td rowspan="2">DPCH</td><td colspan="3">The Dedicated Physical Channel is a data channel that contains pilot symbols. The displayed channel type is DPCH.</td></tr>
<tr><td>Chan Type:</td><td>DPCH</td><td></td></tr>
</table>

	Status:	inactive	channel is not active
		active	channel is active and all pilot symbols are correct
		pilotf	channel is active but it contains incorrect pilot symbols
HS-PDSCH	The High Speed Physical Downlink Shared Channel (HSDPA) does not contain any pilot symbols. It is a channel type that is expected in code classes lower than 7. The modulation type of these channels can be varied depending on the selected slot.		
	Chan Type:	HSPDSCH-QPSK_	QPSK-modulated slot of an HS PDSCH channel
		HSPDSCH-16QAM_	16QAM-modulated slot of an HS PDSCH channel
		HSPDSCH-NONE_	slot without power of an HS PDSCH channel
	Status:	inactive	channel is not active
		active	channel is active
HS-SSCH	The High Speed Shared Control Channel (HSDPA) does not contain any pilot symbols. It is a channel type that is expected in code classes equal to or higher than 7. The modulation type should always be QPSK. The channel does not contain any pilot symbols.		
	Chan Type:	CHAN_	QPSK-modulated channel without any pilot symbols
	Status:	inactive	channel is not active
		active	channel is active
	If HS-DPA/UPA is set "ON" in the "Channel Detection Settings"/"Common Settings" dialog box,, the channels of HSDPA will be found among the data channels. If the type of a channel can be fully recognized, as for example with a DPCH (based on pilot sequences) or HS-PDSCH (based on modulation type), the type will be entered in the field TYPE. All other channels without pilot symbols are of type CHAN. The channels are in descending order according to symbol rates and, within a symbol rate, in ascending order according to the channel numbers. There-fore, the unassigned codes are always to be found at the end of the table. If the modulation type for a channel can vary, the measured value of the modulation type will be appended to the type of the channel.		

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

Table 4-8: Parameters determined by the CDP measurement

Chan Type	Type of channel (active channels only). If the modulation type of a channel can vary (HS-PDSCH, if HS-DPA/UPA is set "ON" in the "Channel Detection Settings"/"Common Settings" dialog box), the value of the modulation type measured by the firmware application will be appended to the channel type. Data channels that do not have a type that can be fully recognized are of type CHAN.
Ch. SF	Number of channel spreading code (0 to [spreading factor-1])
Symbol Rate [ksps]	Symbol rate at which the channel is transmitted (7.5 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.
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 BTS frame.

A data channel is considered to be active if the required pilot symbols (see 3GPP specification, exception: PICH) are to be found at the end of each slot. In addition, the channel should have minimum power (see "Inactive Channel Threshold" in "Channel Detection Settings" on page 56).

In the R&S FSV-K72, 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

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:ERR:CTAB"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 5 values are transmitted for each channel:

- the class
- the channel number
- the absolute level
- the relative level
- the timing offset

The channels are sorted by code class, i.e. the unassigned channels are transmitted last.

Units:	Absolute level: dBm Relative level: dB referenced to CPICH or total power
Timing offset:	chips

Example:

The following example shows the results of a query for three channels with the following configuration:

Channel	Spreading factor	Channel number	Timing offset
1st	512	7	0
2nd	4	1	256 chips
3rd	128	255	2560 chips

This yields the following result:

9, 7, -40, -20, 0, 2, 1, -40, -20, 256, 7, 255, -40, -20, 2560

The channel order is the same as in the CDP diagram, i.e. it depends on their position in the code domain of spreading factor 512.

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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:ERR:PCD"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 4 values are transmitted for each channel with code class 9:

code class	Highest code class of a downlink signal, always set to 9 (CC9)
code number	Code number of the evaluated CC9 channel [0...511]
CDEP	Code domain error power value of the CC9 channel in [dB]
channel flag	Indicates whether the CC9 channel belongs to an assigned code channel: 0b00-0d0: CC9 is inactive. 0b01-0d1: CC9 channel belongs to an active code channel. 0b11-0d3: CC9 channel belongs to an active code channel; sent pilot symbols are incorrect

The channels are sorted by code number.

Power vs Slot

The "Power vs Slot" display mode displays the average power of a given channel over all slots. The power is measured relative to the power of the pilot channel inside the slot. Therefore the unit is dB. For Antenna OFF or Antenna No 1 the PICH channel is used as reference. For Antenna No 2 the TDPICH channel is used. The channel width (width of the bars) depends on the IQ capture length. The bars have all the same width and use the complete range of the x axis.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:PVSL"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 16 pairs of slots (slot number of CPICH) and level values are transferred:

<slot number>, <level value in dB> (for 16 slots)

Result Summary

The display mode Result Summary displays a list of measurement results on the screen. 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.

Two different types of results are displayed: global results and channel results.

Table 4-9: Global results

<table>
<tr><td>Total Power:</td><td colspan="3">Displays the total signal power (average power of total evaluated 3GPP FDD BTS slot).</td></tr>
<tr><td>Chip Rate Error:</td><td colspan="3">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 BTS signal. The result is valid even if synchronization of the analyzer and signal failed.</td></tr>
<tr><td>IQ Offset:</td><td colspan="3">DC offset of the signal in the selected slot in %</td></tr>
<tr><td>Composite EVM:</td><td colspan="3">The composite EVM is the difference between the test signal and the ideal reference signal in the selected slot in % (see "Composite EVM (RMS)", on page 40).</td></tr>
<tr><td>CPICH Slot No:</td><td colspan="3">Displays the number of the CPICH slot at which the measurement is performed.</td></tr>
<tr><td>No of Active Chan:</td><td colspan="3">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.</td></tr>
<tr><td rowspan="5">Carrier Freq Error:</td><td colspan="3">Displays the frequency error relative to the center frequency of the analyzer. The absolute frequency error is the sum of the analyzer and DUT frequency error. The specified value is averaged via one slot; the frequency offset of the slot selected under SELECT CPICH SLOT applies.
The maximum frequency error that can be compensated is specified in the table below as a function of the sync mode. Transmitter and receiver should be synchronized as far as possible.</td></tr>
<tr><td>SYNC mode</td><td>ANTENNA DIV</td><td>Max. Freq. Offset</td></tr>
<tr><td>CPICH</td><td>X</td><td>5.0 kHz</td></tr>
<tr><td>SCH</td><td>OFF</td><td>1.6 kHz</td></tr>
<tr><td>SCH</td><td>ANT 1</td><td>330 Hz</td></tr>
</table>

	SCH	ANT 2	330 Hz
Trigger to Frame:	This result displays the time difference between the beginning of the recorded signal section to the start of the analyzed 3GPP FDD BTS frame. In the case of triggered data collection, this difference is identical with the time difference of frame trigger (+ trigger offset) – frame start. If synchronization of the analyzer and W-CDMA signal fails, the value of Trigger to Frame is not significant.		
IQ Imbalance:	I/Q imbalance of signals in the selected slot in %		
Pk CDE (30 ksps):	The Peak Code Domain Error 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 (see "Peak Code Domain Error", on page 40). The spreading factor onto which projection is made is shown beneath the measurement result.		
CPICH Power	The power of the CPICH channel in the selected slot		
Avg. RCDE (64 QAM)	Average Relative Code Domain Error over all channels detected with 64 QAM in the selected frame.		
RHO	Quality parameter RHO for each slot.		

Table 4-10: Channel Results

Symbol Rate:	Symbol rate at which the channel is transmitted.
Channel Code:	Number of the spreading code of the selected channel.
No of Pilot Bits:	Number of pilot bits of the selected channel.
Chan Power Rel:	Channel power, relative (referenced to CPICH or total signal power)
Chan Power Abs:	Channel power, absolute
Modulation Type:	Modulation type of an HSDPA channel. High speed physical data channels can be modulated with QPSK, 16 QAM or 64 QAM modulation.
Timing Offset:	Offset between the start of the first slot in the channel and the start of the analyzed 3GPP FDD BTS frame.
Channel Slot No:	The channel slot number is obtained by combining the value of the selected CPICH and the channel's timing offset.
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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:ERR:SUMM"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the results of the RESULT SUMMARY are output in the following order:

<composite EVM [%]>,

<peak CDE [dB]>,

<carr freq error [Hz]>,

<chip rate error [ppm]>,

<total power [dB]>,

<trg to frame [µs]>,

<EVM peak channel [%]>,

<EVM mean channel [%]>,

<code class>,

<channel number>,

<power abs. channel [dB]>,

<power rel. channel [dB], referenced to CPICH or total power>,

<timing offset [chips]>,

<I/Q offset [%]>,

<I/Q imbalance [%]>

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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:ERR:MACC"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 15 pairs of slots (slot number of CPICH) and level values are transferred:

<slot number>, <level value in %> (for 15 slots)

Peak Code Domain Error

With "Peak Code Domain Error" display mode for a given slot and for all codes the maximum of the code domain error values are determined. 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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:ERR:PCD"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 15 pairs of slots (slot number of CPICH) and level values are transferred:

<slot number>, <level value in dB> (for 15 slots)

Composite Constellation

The "Composite Const" measurement analyzes the entire signal given 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 are displayed for the specified slot. 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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:COMP:CONS"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the real and the imaginary components of the chip constellation at the selected slot are transferred:

<Re1>, <Im1>, <Re2>, <Im2>, ..., <Re2560>, <Im2560>

The values are normalized to the square root of the average power at the selected slot.

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 are 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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:PVSY"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the power of each symbol at the selected slot is transferred. The values indicate the difference to the reference power in dB. The number of the symbols depends on the spreading factor of the selected channel:

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

Symbol Constellation

The "Symbol Constellation" 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 would improve the visibility.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:CONS"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the real and the imaginary components are transferred:

<Re$_0$>, <Im$_0$>, <Re$_1$>, <Im$_1$>, ..., <Re$_n$>, <Im$_n$>

The number of level values depends on the spreading factor:

Spreading factor	Number of level values
512	5
256	10
128	20
64	40
32	80
16	160
8	320
4	640

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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:EVM"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the real and the imaginary components are transferred:

<Re$_0$>, <Im$_0$>, <Re$_1$>, <Im$_1$>, ..., <Re$_n$>, <Im$_n$>

The number of level values depends on the spreading factor:

Spreading factor	Number of level values
512	5
256	10
128	20
64	40
32	80
16	160
8	320
4	640

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).

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:BSTR"`, see `CALCulate<n>:FEED` on page 123

TRACe<1...4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, the bit stream of one slot is transferred. Each symbol contains two consecutive bits in the case of a QPSK modulated slot and 4 consecutive bits in the case of a 16QAM modulated slot. One value is transferred per bit (range 0, 1). The number of symbols is not constant and may vary for each sweep. Individual symbols in the bit stream may be invalid depending on the channel type and the bit rate (symbols without power). The assigned invalid bits are marked by on of the digits "6", "7" or "9".

If "HS-DPA/UPA" is disabled (see "Channel Detection Settings" on page 56 or `[SENSe:]CDPower:HSDPamode` on page 177), the values and number of the bits are as follows:

Unit	[]
Value range	{0, 1, 6, 9} 0 - Low state of a transmitted bit 1 - High state of a transmitted bit 6 - Bit of a symbol of a suppressed slot of a DPCH in Compressed Mode (DPCH-CPRSD) 9 - Bit of a suppressed symbol of a DPCH (e.g. TFCI off)
Bits per slot	$N_{BitPerSymb} = 2$

Number of symbols	$N_{Symb} = 10*2^{(8\text{-Code Class})}$
Number of bits	$N_{Bit} = N_{Symb} * N_{BitPerSymb}$
Format	Bit_{00}, Bit_{01}, Bit_{10}, Bit_{11}, Bit_{20}, Bit_{21},.... , $Bit_{NSymb\ 0}$, $Bit_{NSymb\ 1}$

If "HS-DPA/UPA" is enabled (see "Channel Detection Settings" on page 56 or [SENSe:]CDPower:HSDPamode on page 177), the values and number of the bits are as follows:

Unit	[]
Value range	{0, 1, 6, 7, 8, 9} 0 - Low state of a transmitted bit 1 - High state of a transmitted bit 6 - Bit of a symbol of a suppressed slot of a DPCH in Compressed Mode (DPCH-CPRSD) 7 - Bit of a switched-off symbol of an HS-PDSCH channel 8 - Fill value for unused bits of a lower order modulation symbol in a frame containing higher order modulation 9 - Bit of a suppressed symbol of a DPCH (e.g. TFCI off)
Bits per symbol	$N_{BitPerSymb} = \{2, 4, 6\}$
Symbols per slot	$N_{Symb\_Slot} = 10*2^{(8\text{-Code Class})}$
Symbols per frame	$N_{Symb\_Frame} = 15*N_{Symb\_Slot} = 150*2^{(8\text{-Code Class})}$
Number of bits	$N_{Bit} = N_{Symb\_Frame} * N_{BitPerSymb\_MAX}$
Format (16QAM)	Bit_{00},Bit_{01},Bit_{02},Bit_{03},Bit_{10},Bit_{11},Bit_{12},Bit_{13},.... ... , $Bit_{NSymb\_Frame\ 0}$,$Bit_{NSymb\_Frame\ 1}$,$Bit_{NSymb\_Frame\ 2}$, $Bit_{NSymb\_Frame\ 3}$
Format (64QAM)	Bit_{00}, Bit_{01}, Bit_{02}, Bit_{03}, Bit_{04}, Bit_{05}, Bit_{10}, Bit_{11}, Bit_{12}, Bit_{13}, Bit_{14}, Bit_{15}, ..., $Bit_{NSymb\_Frame\ 0}$,$Bit_{NSymb\_Frame\ 1}$,$Bit_{NSymb\_Frame\ 2}$,$Bit_{NSymb\_Frame\ 3}$,$Bit_{NSymb\_Frame\ 4}$,$Bit_{NSymb\_Frame\ 5}$

Frequency Error vs Slot

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

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:FVSL"`, see CALCulate<n>:FEED on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 15 pairs of slot (slot number of CPICH) and values are transferred:

<slot number>, <value in Hz>

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.

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:PSVSL"`, see `CALCulate<n>:FEED` on page 123

TRACe<1...4>[:DATA]? TRACE<1...4>

When the trace data for this mode is queried, 15 pairs of slot (slot number of CPICH) and values are transferred:

<slot number>, <value in deg>

EVM vs Chip

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

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

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

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:CHIP:EVM"`, see `CALCulate<n>:FEED` on page 123

TRACe<1...4>[:DATA]? TRACE<1...4>

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

Mag Error vs Chip

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

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

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

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:CHIP:MAGN"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

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

Phase Error vs Chip

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

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

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

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:CHIP:PHAS"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

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

Symbol Magnitude Error

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

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:EVM:MAGN"`, see `CALCulate<n>:FEED` on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

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

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

Symbol Phase Error

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

Result data for remote query

SCPI command:

`CALC:FEED "XTIM:CDP:SYMB:EVM:PHAS"`, see `CALCulate<n>:FEED`
on page 123

TRACe<1…4>[:DATA]? TRACE<1...4>

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

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

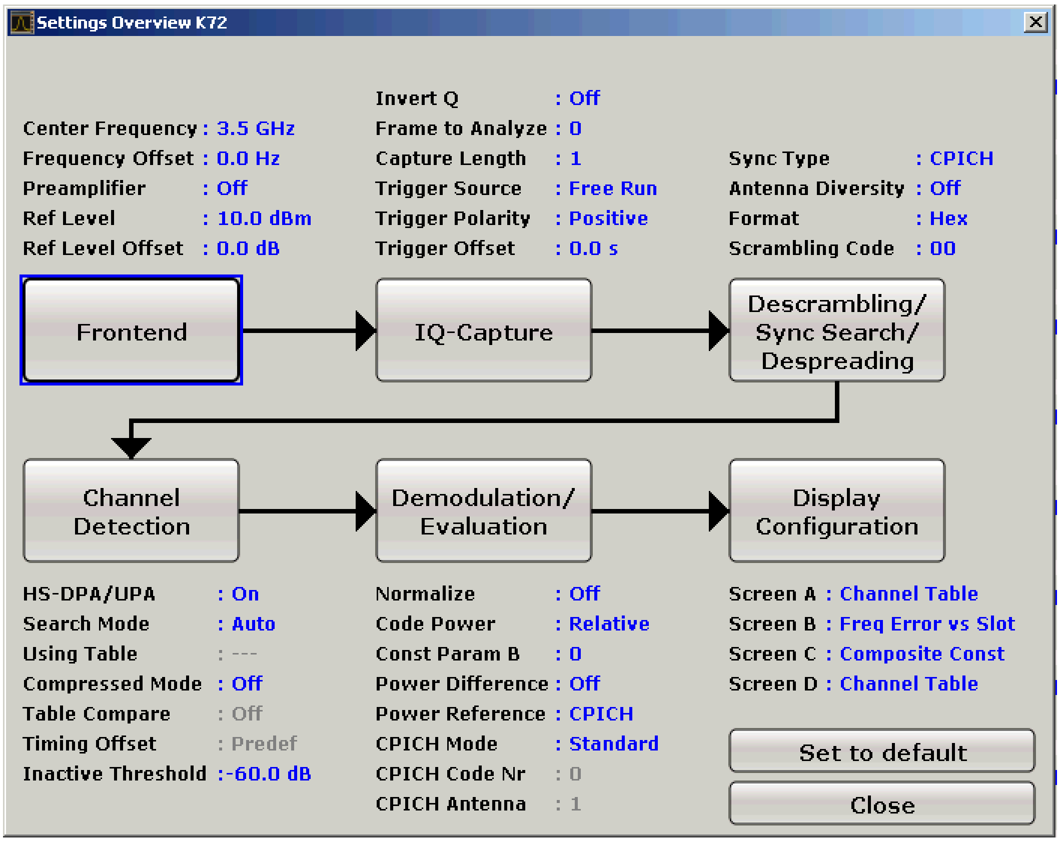
4.4.1.3 Softkeys of the Code Domain Analyzer (R&S FSV-K72)

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.

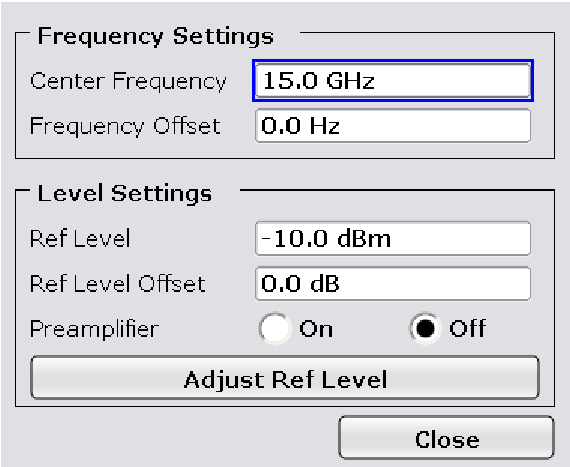
To change the settings, either use the rotary knob or the curser keys to change the focus to another button and press the ENTER key to open the corresponding dialog box. To open the dialog boxes displayed in the "Settings Overview" dialog box, you can also press the particular softkey in the "Code Domain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



Frontend	refer to "Frontend Settings" on page 50
IQ-Capture	refer to "IQ Capture Settings" on page 52
Descrambling/Sync Search/Despreading	refer to "Sync/Scrambling Settings" on page 54
Channel Detection	refer to "Channel Detection Settings" on page 56
Demodulation/Evaluation	refer to "Demod Settings" on page 60
Display Configuration	refer to chapter 4.4.1.1, "Display Concept", on page 29

Frontend Settings

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



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

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

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

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

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

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

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

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

SCPI command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 172

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

SCPI command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet on page 173

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

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

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

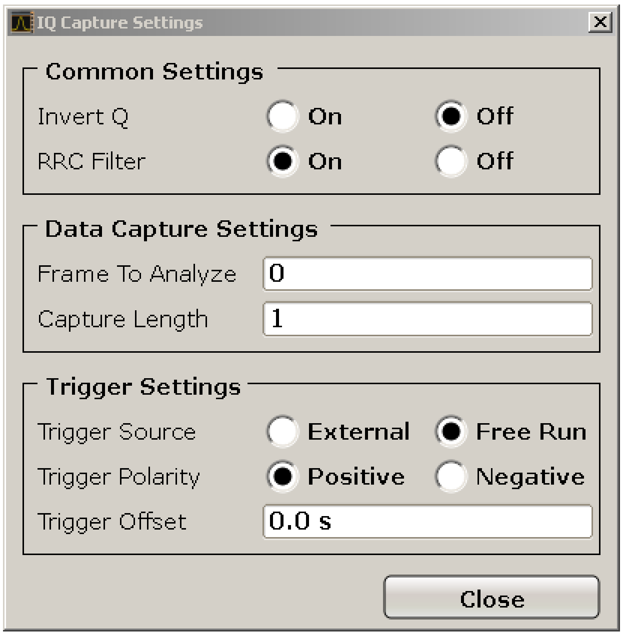
This function is not available for I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:
`INPut:GAIN:STATe` on page 217

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

SCPI 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.

SCPI command:
`[SENSe:]CDPower:QINVert` on page 182

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.

SCPI command:
`[SENSe:]CDPower:FILTer[:STATe]` on page 177

Frame To Analyze ← IQ Capture Settings
Enter the Frame to analyze and to be displayed.

SCPI command:
`[SENSe:]CDPower:FRAMe[:LVALue]` on page 177

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

SCPI command:
`[SENSe:]CDPower:IQLength` on page 178

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.

SCPI command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 222

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

SCPI command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 222

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" 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.

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

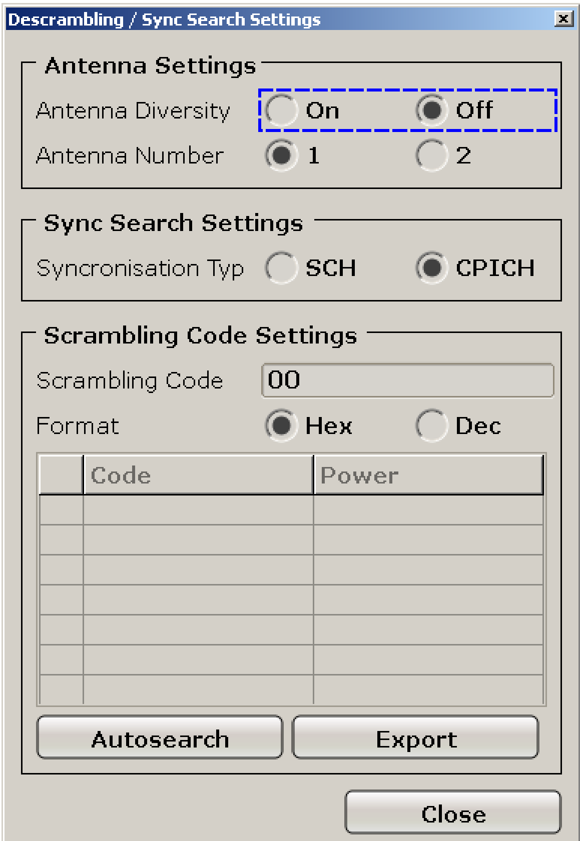
In the "External" or "IF Power" trigger mode, a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger delay (trigger offset) as well.

SCPI command:

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] on page 221

Sync/Scrambling Settings

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



Antenna Diversity ← Sync/Scrambling Settings
This option switches the antenna diversity mode on and off.

SCPI command:
`[SENSe:]CDPower:ANTenna` on page 176

Antenna Number ← Sync/Scrambling Settings
This option switches between diversity antennas 1 and 2. Depending on the softkey settings, R&S FSV-K72 synchronizes to the CPICH of antenna 1 or antenna 2.

SCPI command:
`[SENSe:]CDPower:ANTenna` on page 176

Synchronization Type ← Sync/Scrambling Settings
Enables synchronization with or without CPICH.

"CPICH" R&S FSV-K72 assumes that the CPICH control channel is present in the signal and attempts to synchronize to this channel. If the signal does not contain CPICH, synchronization fails.

"SCH" R&S FSV-K72 synchronizes to the signal without assuming the presence of a CPICH. This setting is required for measurements on test model 4 without CPICH. While this setting can also be used with other channel configurations, it should be noted that the probability of synchronization failure increases with the number of data channels.

SCPI command:
`[SENSe:]CDPower:STYPe` on page 183

Scrambling Code ← Sync/Scrambling Settings
Enter the scrambling code. The scrambling codes are used to distinguish between different base stations. Each base station has its own scrambling code.

SCPI command:
`[SENSe:]CDPower:LCODe:DVALue` on page 179

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

SCPI command:
`[SENSe:]CDPower:LCODe:DVALue` on page 179
`[SENSe:]CDPower:LCODe[:VALue]` on page 179

Scrambling Codes ← Sync/Scrambling Settings
This table includes all found scrambling codes from the last autosearch sequence. In the first column each row has a radio button to select a found scrambling code.

SCPI command:
`[SENSe:]CDPower:LCODe:SEARch:LIST` on page 179

Autosearch ← Sync/Scrambling Settings
Push this button to start 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.

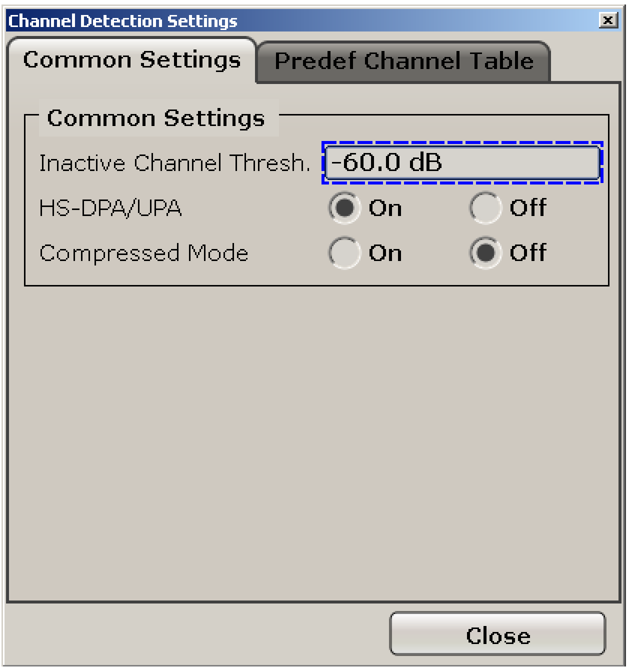
SCPI command:
[SENSe:]CDPower:LCODe:SEARch:[IMMediate] on page 179

Export ← Sync/Scrambling Settings
Writes the Detected Scrambling Codes together with their powers into a textfile in the R&S user directory (c:\R_S\Instr\User\ScrCodes.txt)

Channel Detection Settings
Opens the "Channel Detection Settings" dialog box which contains the following tabs:

- "Common Settings tab" on page 56
- "Predef Channel Table tab" on page 57

Common Settings tab ← Channel Detection Settings
This tab contains common settings for channel detection.



Inactive Channel Threshold ← Common Settings tab ← Channel Detection Settings
Set the minimum power that a single channel must have compared to the total signal in order to be recognized as an active channel.

SCPI command:
[SENSe:]CDPower:ICTReshold on page 178

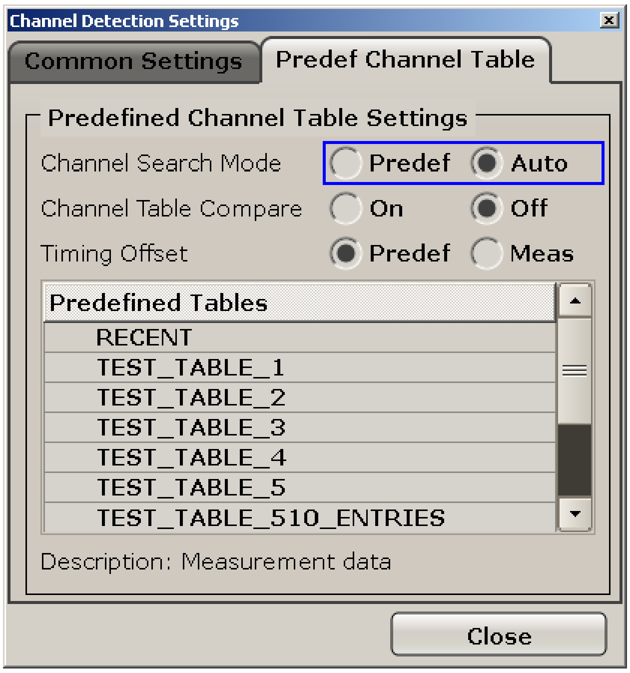
HS-DPA/UPA ← Common Settings tab ← Channel Detection Settings
If enabled, the application detects HSUPA/DPA-channels and shows them in the channel table.

SCPI command:
`[SENSe:]CDPower:HSDPamode` on page 177

Compressed Mode ← Common Settings tab ← Channel Detection Settings
If compressed mode is switched on, some slots of a channel are suppressed. To keep the overall data rate, the slots just before or just behind a compressed gap can be sent with half spreading factor (SF/2).

SCPI command:
`[SENSe:]CDPower:PCONtrol` on page 181

Predef Channel Table tab ← Channel Detection Settings
This tab contains settings for the predefined channel tables.



Channel Search Mode ← Predef Channel Table tab ← Channel Detection Settings
Defines the channel search mode.

"Predefined" Searches in predefined channel tables

"Auto" Channels are detected automatically

SCPI command:
`CONFigure:WCDPower[:BTS]:CTABle[:STATe]` on page 164
`CONFigure:WCDPower[:BTS]:CTABle:SELect` on page 166
`CONFigure:WCDPower[:BTS]:CTABle:SELect` on page 166

Channel Table Compare ← Predef Channel Table tab ← Channel Detection Settings
If enabled, the R&S FSV-K72 uses predefined tables and not the standard mode for comparison.

SCPI command:
`CONFigure:WCDPower[:BTS]:CTABle:COMPare` on page 165

Timing Offset ← Predef Channel Table tab ← Channel Detection Settings
Defines the timing offset.

"Predefined" The R&S FSV-K72 uses a timing offset from a predefined table.

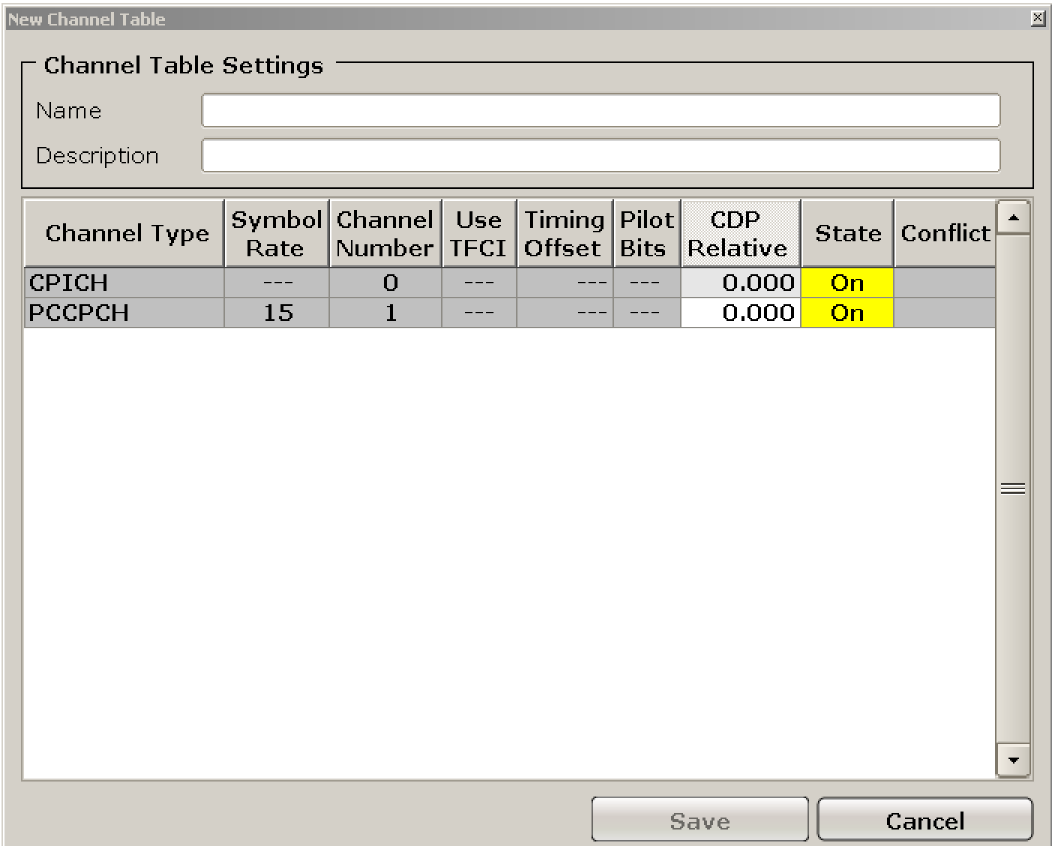
"MEAS" The measurement values are used

SCPI command:
`CONFigure:WCDPower[:BTS]:CTABle:TOFFset` on page 169

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

SCPI command:
`CONFigure:WCDPower[:BTS]:CTABle:CATalog` on page 169

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])
Use TFCI	
Timing Offset	
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.
Conflict	

Delete Channel ← New ← Channel Detection Settings
Removes the selected channel from the table.

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

Sort ← New ← Channel Detection Settings
Sorts the channel table entries.

Save ← New ← Channel Detection Settings
Saves the changes to the table and closes the "Channel Table Settings" dialog box.

Cancel ← New ← Channel Detection Settings
Closes the "Channel Table Settings" dialog box without saving the changes.

Add Channel ← New ← Channel Detection Settings
Adds a channel to the table.

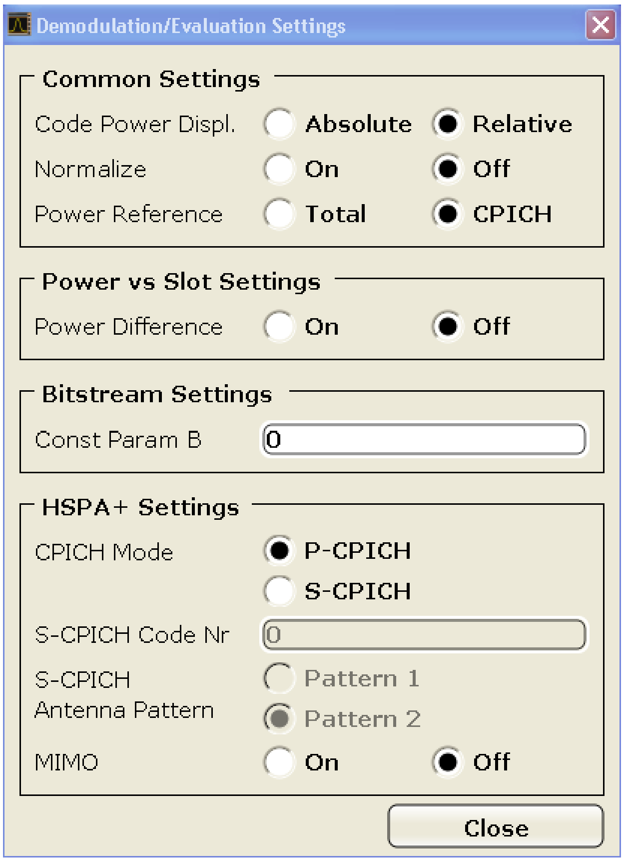
Copy ← Channel Detection Settings
Opens the "Copy Channel Table" dialog box to copy the currently displayed channel table. Enter a name for the new table, edit the settings as described for a new table (see "New" on page 58) and select "Save".

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 58) and select "Save".

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

Restore Default Tables ← Channel Detection Settings
Restores the predefined channel tables delivered with the instrument.

Demod Settings
Opens the "Demodulation Settings" dialog box. This dialog box contains settings for demodulation and specific evaluation modes (display configuration).



Common Settings ← Demod Settings
These settings are required for all evaluation modes.

Code Power Display ← Common Settings ← 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".

SCPI command:
`[SENSe:]CDPower:PDIsplay` on page 182

Normalize ← Common Settings ← Demod Settings
Change the elimination of the DC-offset. If enabled, the DC offset is eliminated. Otherwise the DC offset is not eliminated.

SCPI command:
`[SENSe:]CDPower:NORMalize` on page 181

Power Reference ← Common Settings ← Demod Settings
Switch the power reference for the code domain power display mode between the total power and the power of the CPICH.

SCPI command:
`[SENSe:]CDPower:PREFerence` on page 182

Power vs Slot Settings ← Demod Settings
These settings are required for the "Power vs Slot" evaluation.

Power Difference ← Power vs Slot Settings ← Demod Settings
Selects the indication of the slot power difference between the actual slot and the previous slot. To get the results it is necessary to activate the power versus slot measurement in the result display (see "Display Config" on page 63).

SCPI command:
`[SENSe:]CDPower:PDIFf` on page 181

Bitstream Settings ← Demod Settings
These settings are required for "Bitstream" evaluation.

Const Param B ← Bitstream Settings ← Demod Settings
Set the constellation parameter B. According to 3GPP specification the mapping of 16QAM symbols to an assigned bit -stream depends on the constellation parameter B. This parameter can be adjusted to decide which bit mapping should be used for bit-stream evaluation.

SCPI command:
`[SENSe:]CDPower:CPB` on page 176

HSPA+ Settings ← Demod Settings
These settings are required for measurements that use the HSPA+ standard.

CPICH Mode ← Demod Settings
Defines whether the common pilot channel (CPICH) is defined by its default position or a user-defined position.

"P-CPICH"	Standard configuration (CPICH is always on channel 0)
"S-CPICH"	User-defined configuration. Enter the CPICH code number in the S-CPICH Code Nr field.

SCPI command:
`[SENSe:]CDPower:UCPich[:STATe]` on page 184

S-CPICH Code Nr ← Demod Settings
If a user-defined CPICH definition is to be used, enter the code of the CPICH based on the spreading factor 256. Possible values are 0 to 255.

SCPI command:
`[SENSe:]CDPower:UCPich:CODE` on page 183

S-CPICH Antenna Pattern ← Demod Settings
Defines the pattern used for evaluation .

SCPI command:
`[SENSe:]CDPower:UCPich:PATTern` on page 184

MIMO
Activates or deactivates single antenna MIMO measurement mode.

If activated, HS-PDSCH channels with exclusively QPSK or exclusively 16 QAM on both transport streams are automatically detected and demodulated. The corresponding channel types are denoted as "HS-MIMO-QPSK" and "HS-MIMO-16QAM", respectively.

The MIMO constellations resulting on a single antenna consist of three amplitudes (-1, 0, 1) per dimension in the case of QPSK x QPSK, and seven amplitudes (-3, -2, -1, 0, 1, 2, 3) per dimension in the case of 16 QAM x 16 QAM. The symbol decisions of these constellations can be retrieved via the bitstream output. The mapping between bits and constellation points is given by the following table.

Table 4-11: Mapping between bits and constellation points for MIMO-QPSK

Constellation point (normalized)	Bit sequence
0,0	0,1,0,1
1,0	0,1,0,0
-1,0	0,1,1,1
0,1	0,0,0,1
1,1	0,0,0,0
-1,1	0,0,1,1
0,-1	1,1,0,1
1,-1	1,1,0,0
-1,-1	1,1,1,1

For MIMO-16QAM, the bit sequence is the same in both I and Q. Only one dimension is given here.

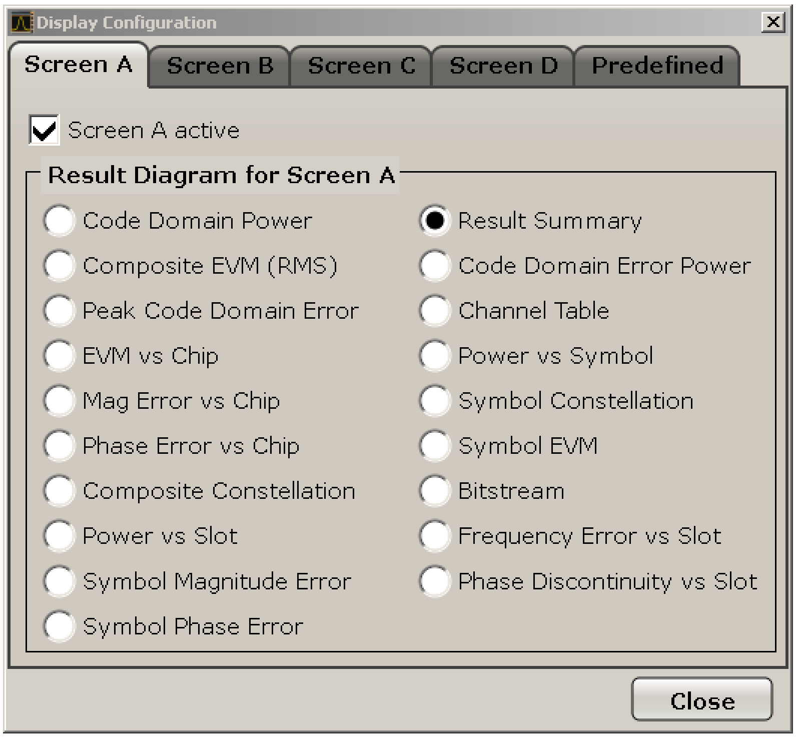
Table 4-12: Mapping between bits and constellation points for MIMO-16QAM

Constellation point (normalized)	Bit sequence
-3	1,1,1
-2	1,1,0
-1	1,0,0
0	1,0,1
1	0,0,1

Constellation point (normalized)	Bit sequence
2	0,0,0
3	0,1,0

SCPI command:
[SENSe:]CDPower:MIMO on page 180

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



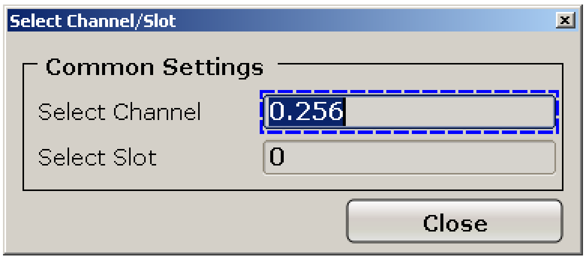
The code domain analyzer can show up to four result diagrams in four different screens (windows) at one time. For each screen, you can define which type of result diagram is to be displayed, or deactivate the screen temporarily.

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

For details see chapter 4.4.1.1, "Display Concept", on page 29.

For a description of available display modes, see chapter 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32.

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



Select Channel ← Select Channel/Slot
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 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32).

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.

SCPI command:
`[SENSe:]CDPower:CODE` on page 177

Select Slot ← Select Channel/Slot

Selects the slot for evaluation. This affects the following result diagrams (see also chapter 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32):

- 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

SCPI command:
[SENSe:]CDPower:SLOT on page 183

4.4.1.4 Softkeys of the Frequency Menu for CDA measurements – FREQ key (R&S FSV-K72)

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

Some softkey functions are not available in CDP mode. Refer to "Softkeys of the Frequency Menu", on page 88 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: $span_{min}/2 \leq f_{center} \leq f_{max} - span_{min}/2$

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

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

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

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

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

SCPI command:
[SENSe:]FREQuency:CENTer:STEP[:VALue] on page 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 setting. The allowed values range from -100 GHz to 100 GHz. The default setting is 0 Hz.

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

4.4.1.5 Softkeys of the Amplitude Menu – AMPT key (R&S FSV-K72)

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.

The following options are available in the submenu:

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

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

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 172

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 173

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 172

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 173

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

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

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

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

SCPI command:
`INPut:GAIN:STATe` on page 217

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

The mechanical attenuation can be set in 10 dB steps.

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

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

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

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

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

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

SCPI command:
`INPut:ATTenuation` on page 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 I/Q Digital Baseband input (option R&S FSV-B17).

SCPI 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 I/Q Digital Baseband input (option R&S FSV-B17).

- To define the mechanical attenuation, use the RF Atten Manual/Mech Att Manual or RF Atten Auto/Mech Att Auto softkeys.

- To define the electronic attenuation, use the El Atten Mode (Auto/Man) softkey.

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

SCPI command:

`INPut:EATT:AUTO` on page 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.

SCPI 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.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 173

Input (AC/DC)

Toggles the RF input of the analyzer between AC and DC coupling.

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

SCPI command:

`INPut:COUPling` on page 213

4.4.1.6 Softkeys of the Sweep Menu for CDA Measurements – SWEEP key (R&S FSV-K72)

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

The following chapter describes all softkeys available in the "Sweep" menu in "3GPP Base Station Measurement" Mode for Code Domain Analysis measurements. For all other measurements, the softkeys are described in "Softkeys of the Sweep Menu", on page 104.

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).

SCPI command:

`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 211

Single Sweep

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

SCPI command:

`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 211

Continue Single Sweep

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

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

SCPI command:

`INITiate<n>:CONMeas` on page 211

Sweep Count

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

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

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

SCPI command:

`[SENSe:]SWEep:COUNt` on page 195

4.4.1.7 Softkeys of the Trigger Menu – TRIG key (R&S FSV-K72)

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.

SCPI command:

`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 222

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.

SCPI command:

`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 222

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.

SCPI command:

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

`[SENSe:]SWEep:EGATe:POLarity` on page 195

Trigger Offset

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

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

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

SCPI command:

`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 221

4.4.1.8 Softkeys of the Trace Menu for CDA Measurements – TRACE key (R&S FSV-K72)

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 Base Station Measurement" 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.

SCPI command:

`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 170

Max Hold

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

The detector is automatically set to "Positive Peak".

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

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MAXH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 170

Min Hold

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

The detector is automatically set to "Negative Peak".

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

This mode is not available for statistics measurements.

SCPI command:

DISP:TRAC:MODE MINH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 170

Average

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

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 4.3.2.3, "Detector Overview", on page 21).

This mode is not available for statistics measurements.

For more information see

- "Sweep Count" on page 69

SCPI command:

DISP:TRAC:MODE AVER, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 170

View

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

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

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

SCPI command:

DISP:TRAC:MODE VIEW, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 170

4.4.1.9 Softkeys of the Marker Menu – MKR key (R&S FSV-K72)

The MKR key opens a submenu for the marker settings.

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

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, and they can be defined as a marker or delta marker using the Marker Norm/Delta softkey.

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.

SCPI command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 155
`CALCulate<n>:MARKer<m>:X` on page 156
`CALCulate<n>:MARKer<m>:Y` on page 157
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 138
`CALCulate<n>:DELTamarker<m>:X` on page 139
`CALCulate<n>:DELTamarker<m>:X:RELative` on page 139
`CALCulate<n>:DELTamarker<m>:Y` on page 140

Marker Norm/Delta

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

SCPI command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 155
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 138

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.

SCPI command:

`CALCulate<n>:MARKer<m>:FUNCtion:ZOOM` on page 131

All Marker Off

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

SCPI command:

`CALCulate<n>:MARKer<m>:AOFF` on page 152

4.4.1.10 Softkeys of the Marker To Menu – MKR-> key (R&S FSV-K72)

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

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

Select 1/2/3/4/Δ

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

`CALCulate<n>:MARKer<m>[:STATe]` on page 155

`CALCulate<n>:MARKer<m>:X` on page 156

`CALCulate<n>:MARKer<m>:Y` on page 157

Peak

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

SCPI command:

`CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 153

Next Peak

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

SCPI command:

CALCulate<n>:MARKer<m>:MAXimum:NEXT on page 152

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT on page 136

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.

SCPI command:

CALC:MARK:MAX:LEFT (<): CALCulate<n>:MARKer<m>:MAXimum:LEFT on page 152

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT on page 136

CALC:MARK:MAX:RIGH (>): CALCulate<n>:MARKer<m>:MAXimum:RIGHt on page 153

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt on page 137

CALC:DELT:MAX:NEXT (abs): CALCulate<n>:MARKer<m>:MAXimum:NEXT on page 152

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT on page 136

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 125

CALCulate<n>:MARKer<m>:Y on page 157

PCCPCH

Sets the marker to the PCCPCH channel.

SCPI command:

CALCulate<n>:MARKer<m>:FUNCtion:PCCPch on page 126

CALCulate<n>:MARKer<m>:Y on page 157

Min

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

SCPI command:

CALCulate<n>:MARKer<m>:MINimum[:PEAK] on page 154

Next Min

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

SCPI command:

`CALCulate<n>:MARKer<m>:MINimum:NEXT` on page 154

`CALCulate<n>:DELTamarker<m>:MINimum:NEXT` on page 137

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.

SCPI command:

`CALC:MARK:MIN:LEFT` (>): `CALCulate<n>:MARKer<m>:MINimum:LEFT` on page 153

`CALCulate<n>:DELTamarker<m>:MINimum:LEFT` on page 137

`CALC:MARK:MIN:RIGH` (>): `CALCulate<n>:MARKer<m>:MINimum:RIGHt` on page 154

`CALCulate<n>:DELTamarker<m>:MINimum:RIGHt` on page 138

`CALC:MARK:MIN:NEXT` (abs): `CALCulate<n>:MARKer<m>:MINimum:NEXT` on page 154

`CALCulate<n>:DELTamarker<m>:MINimum:NEXT` on page 137

4.4.1.11 Softkeys of the Auto Set Menu – AUTO SET Key (R&S FSV-K72)

The AUTOSET key opens a menu to configure automatic settings.

The following softkey functions are available for CDA measurements.

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

Auto All

Performs all automatic settings.

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

SCPI 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.

SCPI 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.

SCPI command:

`[SENSe:]CDPower:LCODe:SEARch:[IMMediate]` on page 179

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 77). The default value is 1 ms.

SCPI command:

`[SENSe:]ADJust:CONFigure:LEVel:DURation` on page 184

Meas Time Auto ← Settings

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

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

4.4.1.12 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 "Softkeys of the Input/Output Menu for RF Measurements", on page 107.

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

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

SCPI command:
`INPut:COUPling` on page 213

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

SCPI command:
`DIAGnostic<n>:SERVice:NSOurce` on page 211

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

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

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

SCPI command:
`INPut:SELect` on page 218

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

The device name is unknown.

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

SCPI 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.

SCPI command:

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

Level Unit ← Signal Source

Defines the unit used for the full scale level.

SCPI 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.

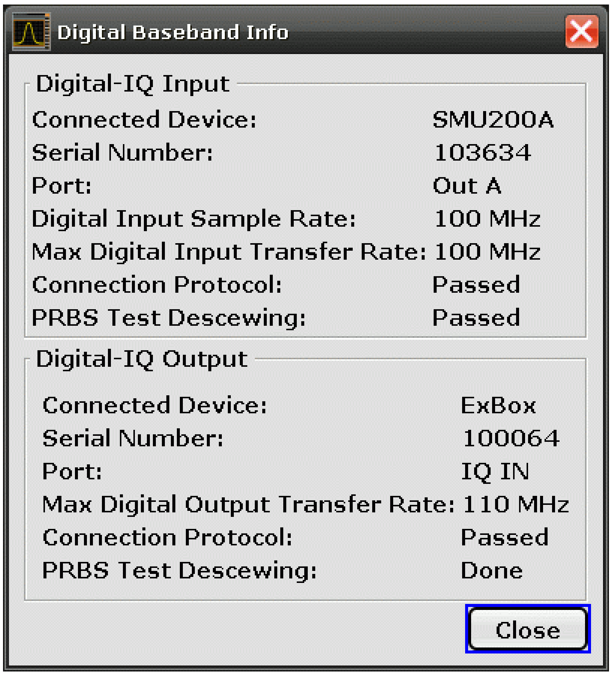
SCPI command:

`INPut:DIQ:RANGe:COUPling` on page 215

Digital Baseband Info

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.4.2 Time Alignment Error Measurement

The "Time Alignment Error" softkey activates the Time Alignment Error (TAE) measurement for the combined signals of both antennas of a base station.

The antenna signals of the two BTS transmitter branches are fed to the analyzer via a combiner. Each antenna must provide a common pilot channel, i.e. P-CPICH for antenna 1 and P-CPICH or S-CPICH for antenna 2. The figure 4-2 shows the measurement setup.

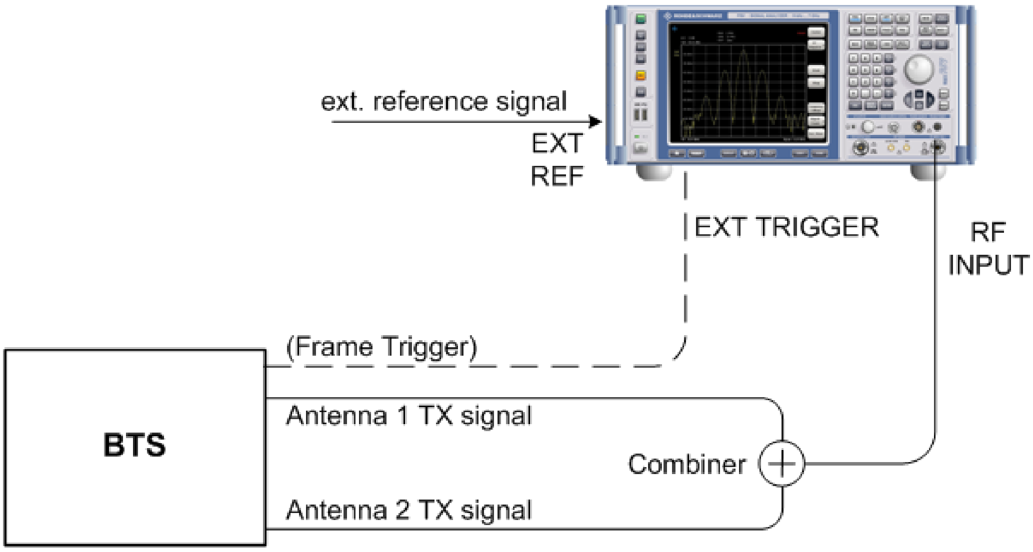


Fig. 4-2: Time Alignment Error Measurement setup

The settings for time alignment measurements are the same as for CDA measurements, although some settings may not be available. For a description see:

- "Frontend Settings" on page 50
- "IQ Capture Settings" on page 52
- "Sync/Scrambling Settings" on page 54
- "Demod Settings" on page 60

As a result, the measured time offset between the two signals in chips is displayed.

Remote commands:

`CONFigure:WCDPower:BTS:MEAS TAERror`

Activates the time alignment error measurement, see `CONFigure:WCDPower[:BTS]:MEASurement` on page 164.

`CALCulate:MARKer:FUNCtion:TAERror:RESult? TAERror`

Queries the results of the time alignment measurement, see `CALCulate<n>:MARKer<1>:FUNCtion:TAERror:RESult` on page 128.

`STAT:QUES:SYNC[:EVEN]?`

Reads the information in a possible error situation, see `STATus:QUEStionable:SYNC[:EVENt]` on page 199.

4.4.3 RF Measurements

4.4.3.1 Output Power Measurements

The analyzer 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.

`CONFigure:WCDPower[:BTS]:MEASurement` on page 164

4.4.3.2 Spectrum Emission Mask

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

This measurement is identical to the Spectrum Emission Mask measurements of the base system. By entering the measurement, the configuration to measure the 3GPP standard is 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

`CONFigure:WCDPower[:BTS]:MEASurement` on page 164

4.4.3.3 Ch Power ACLR

Selecting "Ch Power ACLR" activates the adjacent channel power measurement in the default setting according to 3GPP specifications (adjacent channel leakage ratio). The analyzer 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 "Ch Power ACLR" softkey activates the analyzer mode with defined settings:

CHAN PWR/ACLR	CP/ACLR ON	
CP/ACLR STANDARD	W-CDMA 3GPP FWD	
CP/ACLR 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 ACLR MODUS

For further details about the ACLR measurements refer to "Measuring Channel Power and Adjacent-Channel Power" in the base unit description.

`CONFigure:WCDPower[:BTS]:MEASurement` on page 164

Query of results:

`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` on page 126

4.4.3.4 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 (Occ BW) and the frequency markers are displayed in the marker information in the diagram grid.

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 "Occupied Bandwidth" softkey activates the analyzer mode with defined settings. To restore adapted measurement parameters, the following 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 "Measuring the Occupied Bandwidth" in the base unit description.

`CONFigure:WCDPower[:BTS]:MEASurement` on page 164

Query of results:

`CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult` on page 126

4.4.3.5 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 presetting:

- 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 "Defining Gated Triggering for APD and CCDF" of the base unit.

`CONFigure:WCDPower[:BTS]:MEASurement` on page 164

or

`CALCulate<n>:STATistics:CCDF[:STATe]` on page 159

Query of results:

`CALCulate<n>:MARKer<m>:Y` on page 157

`CALCulate<n>:STATistics:RESult<Trace>` on page 160

4.4.3.6 RF Combi

This measurement combines the Adjacent Channel Power (chapter 4.4.3.3, "Ch Power ACLR", on page 84) measurement with chapter 4.4.3.4, "Occupied Bandwidth", on page 84 and chapter 4.4.3.2, "Spectrum Emission Mask", on page 83. The ACP and OBW are measured on trace 1 from which the SEM trace 2 is derived with integration method.

The advantage of the RF COMBI measurement is that all RF results are measured with a single measurement process. This measurement is faster than the three single measurements.

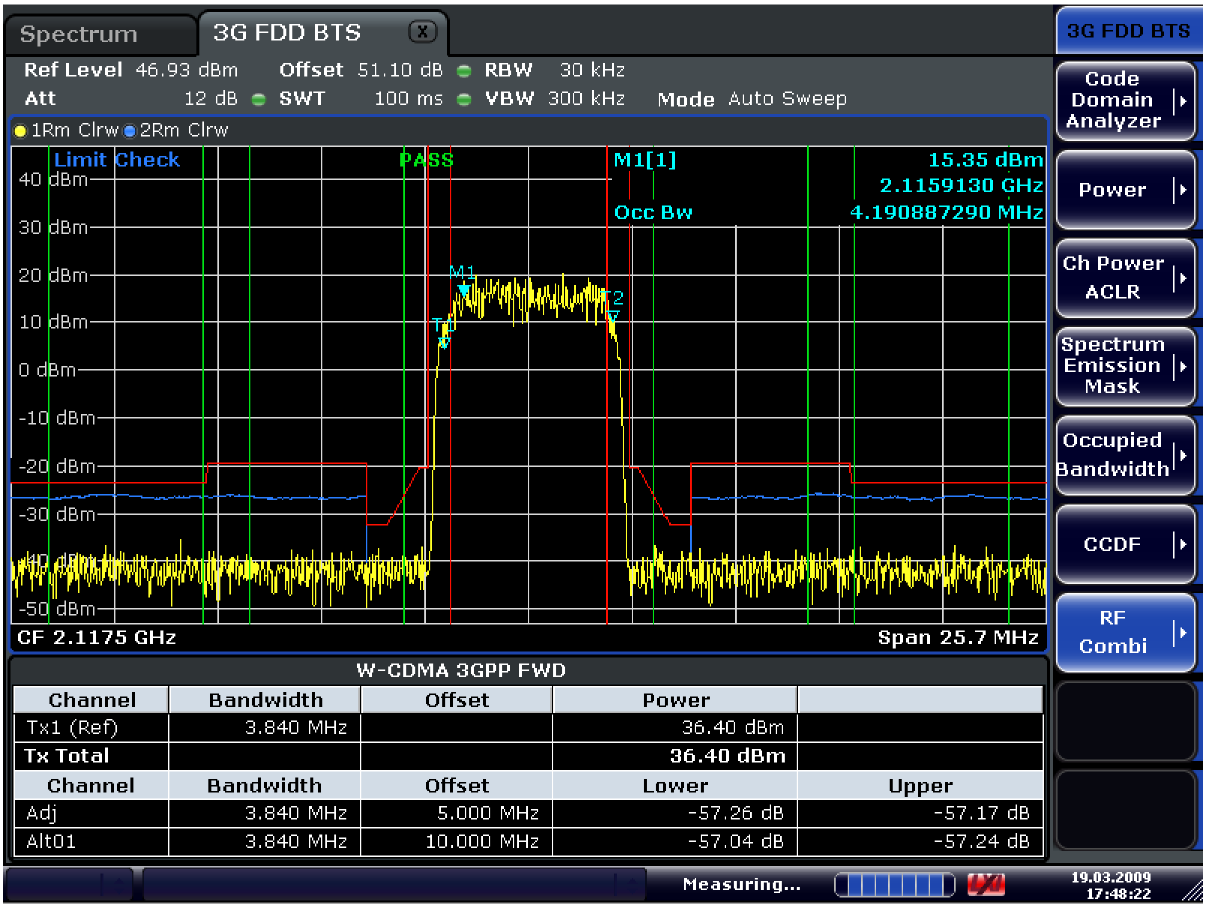


Fig. 4-3: RF Combi measurement

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

- Level parameters
- Center Frequency + Frequency Offset
- All trigger settings

CHAN PWR/ACP	CP/ACP ON (TRACE 1)	
CP/ACP STANDARD	W-CDMA 3GPP REV	
CP/ACP CONFIG	NO. OF ADJ CHAN	2
SPAN		25.5 MHz
DETECTOR		RMS
BW	RBW MANUAL	30 kHz
BW	SWEEP TIME MANUAL	100 ms
OCC BW	ACTIVE ON TRACE 1	
SEM	ACTIVE ON TRACE 2	

Using these settings, the analyzer can perform many functions featured in Spectrum mode.

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

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

`CONFigure:WCDPower[:BTS]:MEASurement` on page 164

4.4.3.7 Softkeys and Menus for RF Measurements (K72)

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

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

Softkeys of the Frequency Menu

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

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

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

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

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

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

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

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

This softkey is available for RF measurements.

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

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

0.1*RBW (zero span) ← CF Stepsize
Sets the step size for the center frequency to 10 % of the resolution bandwidth. This is the default setting.

SCPI command:
`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 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.

SCPI 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 (zero span) ← CF Stepsize

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

SCPI command:

`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 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 % of the span.

SCPI 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 (zero span) ← CF Stepsize

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

SCPI command:

`FREQ:CENT:STEP:LINK RBW`, see `[SENSe:]FREQuency:CENTer:STEP:LINK` on page 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 during measurements of the signal harmonic content because by entering the center frequency each stroke of the arrow key selects the center frequency of another harmonic.

=Marker ← CF Stepsize

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

Manual ← CF Stepsize

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

SCPI command:

`[SENSe:]FREQuency:CENTer:STEP[:VALue]` on page 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.

SCPI 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.

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

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

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 is kept constant. The following range is allowed:

span = 0: 0 Hz

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

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

SCPI command:
`[SENSe:]FREQuency:SPAN` on page 191

Sweeptime Manual
Opens an edit dialog box to enter the sweep time.

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

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

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

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

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

SCPI command:

`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 196

`[SENSe:]SWEep:TIME` on page 196

Full Span

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

SCPI command:

`[SENSe:]FREQuency:SPAN:FULL` on page 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.

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 currently active unit (dBm, dBμV, etc).

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

SCPI command:

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 172

Range

Opens a submenu to define the level display range.

This softkey and its submenu are available for RF measurements.

Range Log 100 dB ← Range

Sets the level display range to 100 dB.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 174.)

DISP:WIND:TRAC:Y 100DB (see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 171).

Range Log 50 dB ← Range

Sets the level display range to 50 dB.

SCPI command:

DISP:WIND:TRAC:Y:SPAC LOG

(To define logarithmic scaling, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 174.)

DISP:WIND:TRAC:Y 50DB

Sets the level display range to 50 dB (see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 171).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 174.)
`DISP:WIND:TRAC:Y 10DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 171).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 174.)
`DISP:WIND:TRAC:Y 5DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 171).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 174.)
`DISP:WIND:TRAC:Y 1DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 171).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 174.)
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 171

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

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

SCPI command:
`DISP:TRAC:Y:SPAC LIN`,see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 174

Range Lin. Unit ← Range

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

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

SCPI command:

`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 174

Unit

Opens the "Unit" submenu to select the unit for the level axis. The default setting is dBm. If a transducer is switched on, the softkey is not available.

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

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

SCPI command:

`CALCulate<n>:UNIT:POWer` on page 163

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

Switches the preamplifier on or off.

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

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

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

SCPI command:

`INPut:GAIN:STATe` on page 217

RF Atten Manual/Mech Att Manual

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

The mechanical attenuation can be set in 10 dB steps.

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

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

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

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

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

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

SCPI command:

`INPut:ATTenuation` on page 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 I/Q Digital Baseband input (option R&S FSV-B17).

SCPI 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 I/Q Digital Baseband input (option R&S FSV-B17).

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

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

SCPI command:

`INPut:EATT:AUTO` on page 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.

SCPI 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.

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 173

Ref Level Position

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

Only available for RF measurements.

Grid Abs/Rel

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

Only available for RF measurements.

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

SCPI command:

`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 172

Input (AC/DC)

Toggles the RF input of the analyzer between AC and DC coupling.

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

SCPI command:

`INPut:COUPling` on page 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 I/Q Digital Baseband input (option R&S FSV-B17).

SCPI command:

`INPut:IMPedance` on page 218

Softkeys of the Bandwidth Menu

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

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

Res BW Manual

Opens an edit dialog box to enter a value for the resolution bandwidth. The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 4.3.2.5, "Selecting the Appropriate Filter Type", on page 24.

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.

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

Res BW Auto

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

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

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

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

Video BW Manual

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

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

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

Note: RMS detector and VBW.
If an RMS detector is used, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves. For details on detectors see chapter 4.3.2.3, "Detector Overview", on page 21.

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

SCPI command:
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 188
`[SENSe:]BANDwidth|BWIDth:VIDeo` on page 188

Video BW Auto

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

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

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

SCPI command:
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 188

Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

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

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

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

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

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

SCPI command:
SWE:TIME:AUTO OFF, see [SENSe:]SWEep:TIME:AUTO on page 196
[SENSe:]SWEep:TIME on page 196

Sweeptime Auto

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

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

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

SCPI command:
[SENSe:]SWEep:TIME:AUTO on page 196

Sweep Type

Opens a submenu to define the sweep type.

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

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

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 101
- "FFT" on page 101 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 4.3.2.5, "Selecting the Appropriate Filter Type", on page 24)
- "Auto" on page 101

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

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

SCPI command:
`SWE:TYPE SWE`, see `[SENSe:]SWEep:TYPE` on page 196

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

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

FFT is not available when using 5-Pole filters, Channel filters or RRC filters.

Note: Not all measurement configurations allow for FFT mode. For instance, the Quasi peak detector does not support FFT. In this case, sweep mode is used. The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active.
FFT mode is also available for:

- sweep time
- video bandwidth
- all detectors except Quasi peak
- gated trigger measurements
- signal count

SCPI command:
`SWE:TYPE FFT`, see `[SENSe:]SWEep:TYPE` on page 196

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

SCPI command:
`SWE:TYPE AUTO`, see `[SENSe:]SWEep:TYPE` on page 196

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

Auto ← FFT Filter Mode ← Sweep Type
The firmware determines whether to use wide or narrow filters to obtain the best measurement results.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 186

Narrow ← FFT Filter Mode ← Sweep Type
For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 186

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

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

RBW/VBW Sine [1/1] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth"

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

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

This setting is only effective for Video BW Auto.

SCPI command:
`BAND:VID:RAT 1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 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 is only effective for Video BW Auto.

SCPI 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 is only effective for the Video BW Auto selection in the main menu.

SCPI command:
`BAND:VID:RAT 0.1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 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 is only effective for the Video BW Auto selection in the main menu.

SCPI command:
`BAND:VID:RAT 10`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 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 analyzer.

This setting is only effective for the Res BW Auto selection in the main menu.

SCPI command:
`BAND:VID:RAT 0.001`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 189

Span/RBW Manual ← Coupling Ratio
Activates the manual input of the coupling ratio.

This setting is only effective for the Res BW Auto selection in the main menu.

The span/resolution bandwidth ratio can be set in the range 1 to 10000.

SCPI command:
`BAND:VID:RAT 0.1`, see `[SENSe:]BANDwidth|BWIDth:VIDeo:RATio` on page 189

Default Coupling ← Coupling Ratio
Sets all coupled functions to the default state ("AUTO"). In addition, the ratio "RBW/VBW" is set to "SINE [1/1]" and the ratio "SPAN/RBW" to *100.*

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO` on page 186
`[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO` on page 188
`[SENSe:]SWEep:TIME:AUTO` on page 196

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 (3dB)
- EMI (6dB)
- Channel
- RRC
- 5-Pole (not available for sweep type "FFT")

For detailed information on filters see chapter 4.3.2.5, "Selecting the Appropriate Filter Type", on page 24 and chapter 4.3.2.6, "List of Available RRC and Channel Filters", on page 24.

SCPI command:

`[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE` on page 187

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).

SCPI command:

`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 211

Single Sweep

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

SCPI command:

`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 211

Continue Single Sweep

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

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

SCPI command:

`INITiate<n>:CONMeas` on page 211

Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

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

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

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

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

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

SCPI command:

`SWE:TIME:AUTO OFF`, see `[SENSe:]SWEep:TIME:AUTO` on page 196

`[SENSe:]SWEep:TIME` on page 196

Sweeptime Auto

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

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

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

SCPI command:

`[SENSe:]SWEep:TIME:AUTO` on page 196

Sweep Type

Opens a submenu to define the sweep type.

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

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

In frequency sweep mode, the analyzer provides several possible methods of sweeping:

- "Sweep" on page 101
- "FFT" on page 101 (not available with 5-Pole filters, channel filters or RRC filters, see chapter 4.3.2.5, "Selecting the Appropriate Filter Type", on page 24)
- "Auto" on page 101

Sweep ← Sweep Type

Sets the Sweep Type to standard analog frequency sweep.

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

SCPI command:

`SWE:TYPE SWE`, see [SENSe:]SWEep:TYPE on page 196

FFT ← Sweep Type

Sets the Sweep Type to FFT mode.

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

FFT is not available when using 5-Pole filters, Channel filters or RRC filters.

Note: Not all measurement configurations allow for FFT mode. For instance, the Quasi peak detector does not support FFT. In this case, sweep mode is used. The same applies when a tracking generator (internal or external, options R&S FSV-B9/B10) is active.
FFT mode is also available for:

- sweep time
- video bandwidth
- all detectors except Quasi peak
- gated trigger measurements
- signal count

SCPI command:

`SWE:TYPE FFT`, see [SENSe:]SWEep:TYPE on page 196

Auto ← Sweep Type

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

SCPI command:

`SWE:TYPE AUTO`, see [SENSe:]SWEep:TYPE on page 196

FFT Filter Mode ← Sweep Type

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

Auto ← FFT Filter Mode ← Sweep Type

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

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 186

Narrow ← FFT Filter Mode ← Sweep Type

For an RBW ≤ 10kHz, the FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT` on page 186

Sweep Count

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

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

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

SCPI command:
`[SENSe:]SWEep:COUNt` on page 195

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.

SCPI command:
`[SENSe:]SWEep:POINts` on page 195

Softkeys of the Input/Output Menu for RF Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for RF measurements. For CDA measurements, see chapter 4.4.1.12, "Softkeys of the Input/Output Menu for CDA Measurements", on page 77.

Input (AC/DC)

Toggles the RF input of the analyzer between AC and DC coupling.

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

SCPI command:

`INPut:COUPling` on page 213

Noise Source

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

SCPI command:

`DIAGnostic<n>:SERVice:NSOurce` on page 211

Video Output

Sends a video output signal according to the measured level to the connector on the rear panel of the analyzer.

Note: Video output does not return valid values in IQ or FFT mode.

SCPI command:

`OUTP:IF VID` , see `OUTPut:IF[:SOURce]` on page 222

Power Sensor

For precise power measurement a power sensor can be connected to the instrument via the front panel (USB connector) or the rear panel (power sensor, option R&S FSV-B5). The Power Sensor Support firmware option (R&S FSV-K9) provides the power measurement functions for this test setup.

This softkey is only available if the analyzer option Power Sensor (R&S FSV-K9) is installed.

For details see the chapter "Instrument Functions Power Sensor (K9)" in the base unit description.

This softkey is available for RF measurements.

Trigger Out

Sets the Trigger Out port in the Additional Interfaces (option R&S FSV-B5 only) to low or high. Thus, you can trigger an additional device via the external trigger port, for example.

SCPI command:

`OUTPut:TRIGger` on page 223

4.5 Measurement Examples (R&S FSV-K72)

This chapter gives an overview of the chapter 4.5.1, "Basic Settings in Code Domain Measurement Mode", on page 109 and explains some basic 3GPP°FDD base station tests. It describes how operating and measurement errors can be avoided using correct presetting. The measurements are performed with an R&S FSV equipped with option R&S FSV-K72.

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 4.5.2, "Measurement 1: Measurement of the Signal Channel Power", on page 110
- chapter 4.5.3, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 111
- chapter 4.5.4, "Measurement 3: Measurement of the Relative Code Domain Power", on page 111
- chapter 4.5.5, "Measurement 4: Triggered Measurement of Relative Code Domain Power", on page 114
- chapter 4.5.6, "Measurement 5: Measurement of the Composite EVM", on page 115
- chapter 4.5.7, "Measurement 6: Measurement of Peak Code Domain Error", on page 116
- chapter 4.5.8, "Measurement 7: Measurement of the Trigger To Frame Time", on page 117

The measurements are performed using the following units and accessories:

- The R&S FSV with Application Firmware R&S FSV-K72: 3GPP FDD BTS base station 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

4.5.1 Basic Settings in Code Domain Measurement Mode

In the default mode after a PRESET, the analyzer 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 FWD
Sweep	CONTINUOUS
CDP mode	CODE CHAN AUTOSEARCH
Trigger settings	FREE RUN
Trigger offset	0
Scrambling code	0
Threshold value	-60 dB

Parameter	Setting
Symbol rate	15 ksps
Code number	0
Slot number	0
Display	Screen A: CODE DOMAIN POWER Screen B: RESULT SUMMARY

4.5.2 Measurement 1: Measurement of the Signal Channel Power

The analyzer 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 the zero span mode (time domain measurement) using a digital channel filter of 5 MHz in bandwidth, according to the 3GPP standard.

1. Test setup
   Connect the RF output of the R&S SMU to the RF input of the analyzer (coaxial cable with N connectors).
2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   [Baseband]
   [3GPP FDD BTS]
   [Test Setup]
   [Test_Model_1_32channels]
   STATE: ON
3. Settings on the analyzer
   [**PRESET**]
   [**CENTER**: 2.1175 GHz]
   [**AMPT**: 0 dBm]
   [MODE: 3G FDD BTS]
   [**MEAS**: POWER]
4. Measurement on the analyzer

The following is displayed:

- Time domain trace of the WCDMA signal.
- Signal channel power within a bandwidth of 5 MHz (in the marker info field)

4.5.3 Measurement 2: Measurement of the Spectrum Emission Mask

The 3GPP specification defines a measurement that monitors compliance with a spectral mask in a range of at least ± 12.5 MHz around the WCDMA 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 30 kHz filter, and in the ranges far away from the carrier by means of a 1 MHz 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 analyzer (coaxial cable with N connectors).
2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   [Baseband]
   [3GPP FDD BS]
   [Test Setup]
   [Test_Model_1_32channels]
   STATE: ON
3. Settings on the analyzer
   [**PRESET**]
   [**CENTER**: 2.1175 GHz]
   [**AMPT**: 0 dBm]
   [MODE: 3G FDD BTS]
   [**MEAS**: Spectrum Emission Mask]
4. Measurement on the analyzer

The following is displayed:

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

4.5.4 Measurement 3: Measurement of the Relative Code Domain Power

A code domain power measurement on one of the test models (model 1 with 32 channels) is shown in the following. To demonstrate the effects, the basic parameters of the CDP measurements permitting an analysis of the signal are changed one after the other from values adapted to the measurement signal to non-adapted values.

1. Test setup
   a) Connect the RF output of the R&S SMU to the RF input of the analyzer (coaxial cable with N connectors).

b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer to the reference input (REF) on the rear panel of the R&S SMU (coaxial cable with BNC connectors).

2. Settings on the R&S SMU
[**PRESET**]
[**LEVEL**: 0 dBm]
[**FREQ**: 2.1175 GHz]
[Baseband]
[3GPP FDD BS]
[Test Setup]
[Test_Model_1_32channels]
STATE: ON
3. Settings on the analyzer
[**PRESET**]
[**CENTER**: 2.1175 GHz]
[**AMPT**: 10 dBm]
[MODE: 3G FDD BTS]
[SETTINGS: SCRAMBLING CODE 0]
4. Measurement on the analyzer

The following is displayed:

- Screen A: Code domain power of signal (test model 1 with 32 channels)
- Screen B: Numeric results of CDP measurement

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 4.5.3, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 111
3. Settings on the analyzer
See chapter 4.5.3, "Measurement 2: Measurement of the Spectrum Emission Mask", on page 111
In addition:
SETUP: REFERENCE EXT
4. Measurement on the analyzer
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 analyzer
   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 the accuracy of the code domain power measurement.
   b) Above a frequency error of 1 kHz, the probability of impaired synchronization increases. With continuous measurements, all channels are at times displayed in blue with almost the same level.
   c) Above a frequency error of approx. 2 kHz, a CDP measurement cannot be performed. The analyzer displays all possible codes in blue with a similar level.

► Settings on the R&S SMU
  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 analyzer
   Set scrambling code to new value.
   [MEAS CONFIG]
   [Sync/Scrambling Settings]

[Scrambling Code 01]

4. Measurement on the analyzer
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.

4.5.5 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 BTS 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 analyzer.
   b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer 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 analyzer (EXT TRIG GATE) to the external trigger output on the rear panel of the R&S SMU (TRIG-OUT1 of PAR DATA).
2. Settings on the R&S SMU
   See chapter 4.5.4, "Measurement 3: Measurement of the Relative Code Domain Power", on page 111
3. Settings on the analyzer
   See chapter 4.5.4, "Measurement 3: Measurement of the Relative Code Domain Power", on page 111
   In addition:
   [**TRIG** EXTERN]
4. Measurement on the analyzer

The following is displayed:

- Screen A: Code domain power of signal (test model 1 with 32 channels)
- Screen B: Numeric results of CDP measurement
- Trigger to Frame: Offset between trigger event and start of 3GPP FDD BTS 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 BTS frame can be compensated by modifying the trigger offset.

1. Settings on the analyzer:
   [**TRIG**] -> [**TRIGGER OFFSET**] -> 100 µs
2. Measurement on the analyzer:
   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.

4.5.6 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 analyzer.
   b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer 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 analyzer (EXT TRIG GATE) to the external trigger output on the rear panel of the R&S SMU (TRIG-OUT1 of PAR DATA).
2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   a) [Baseband]
   b) [3GPP FDD BS]
   c) [Test Setup]
   d) [Test_Model_1_32channels]
      STATE: ON
3. Settings on the analyzer
   [**PRESET**]
   [**CENTER**: 2.1175 GHz]
   [**REF**: 10 dBm]

[MODE: 3G FDD BTS]
[**TRIG** EXTERN]
[RESULTS COMPOSITE EVM]
[MEAS CONFIG]
[Result Diagrams]
[Screen B: Composite EVM]

4. Measurement on the analyzer

The following is displayed:

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

4.5.7 Measurement 6: Measurement of Peak Code Domain Error

The peak code domain error measurement is defined in the 3GPP specification for WCDMA 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 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 analyzer.
   b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer 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 analyzer (EXT TRIG GATE) to the external trigger output on the rear panel of the R&S SMU (TRIG-OUT1 of PAR DATA).

2. Settings on the R&S SMU
   [**PRESET**]
   [**LEVEL**: 0 dBm]
   [**FREQ**: 2.1175 GHz]
   [Baseband]
   [3GPP FDD BS]
   [Test Setup]
   [Test_Model_1_32channels]
   [STATE: ON]

3. Settings on the analyzer
   [**PRESET**]
   [**CENTER**: 2.1175 GHz]
   [**REF**: 0 dBm]

[3G FDD BTS]
[**TRIG** EXTERN]
[MEAS CONFIG]
[Result Diagrams]
[Screen B: Composite EVM]

4. Measurement on the analyzer

The following is displayed:

- Screen A: Code domain power of signal (Test model 1 with 32 channels)
- Screen B: Peak code domain error (projection of error onto the class with spreading factor 256)

4.5.8 Measurement 7: Measurement of the Trigger To Frame Time

The trigger to frame (TTF) time measurement yields the time between an external trigger event and the start of the 3GPP WCDMA frame. The result is displayed in the result summary. The trigger event is expected in a time range of one slot (667 µs) before the frame start. The resolution and absolute accuracy depend on the analyzer type and the measurement mode.

Resolution of the TTF time measurement

The resolution of the TTF time depends on the analyzer type that is used and the applied trace statistic mode. By using an average mode, the resolution can be increased. The higher the number of sweeps is, the higher is the resolution at the expense of measurement time. In the average mode, the TTF time is averaged for a number of sweeps (TRACE -> SWEEP COUNT). If the TTF time of the applied signal does not change during for this number of sweeps, the trigger resolution can be improved.

Absolute accuracy of theTTF time measurement

The absolute accuracy of the TTF time measurement depends on the level of the trigger pulse. The analyzer is calibrated to display the minimum deviation at a trigger pulse level of 4 V. The trigger threshold for an external trigger event is 1.4 V. Due to an internal lowpass between the back panel and the trigger detector, the trigger pulse is delayed in correlation to its own level.

Trace statistic in the result summary display

The trace statistic functions can be enabled by focussing SCREEN B. After screen B is focussed, the "Trace" menu can be called (by pressing the TRACE key). In the "Trace" menu, the type of trace statistic can be selected.

The parameter "SWEEP COUNT" determines the number of sweeps. If measured with the trace statistic, the channel table is automatically switched to predefined mode. The last measured channel table is used and stored to "RECENT". In this case, any change in the signal channel configuration does not influence the displayed channel table.

1. Test setup

a) Connect the RF output of the R&S SMU to the input of the analyzer.
b) Connect the reference input (EXT REF IN/OUT) on the rear panel of the analyzer 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 analyzer (EXT TRIG GATE) to the external trigger output on the rear panel of the R&S SMU (TRIG-OUT1 of PAR DATA).

2. Settings on the R&S SMU
   [PRESET]
   [LEVEL: 0 dBm]
   [FREQ: 2.1175 GHz]
   Baseband
   3GPP FDD BS
   Test Setup
   Test_Model_1_32channels
   STATE: ON
3. Settings on the analyzer
   [PRESET]
   [CENTER: 2.1175 GHz]
   [REF: 0 dBm]
   [3G FDD BTS]
   [TRIG EXTERN]
   [Result Diagrams]
   [Screen B: Result Summary
   [Change Focus to Screen B]]
   [TRACE AVERAGE]
   [SWEEP COUNT <numeric value>]
4. Measurement on the analyzer

The following is displayed:

- Screen A: Code domain power of signal (Test model 1 with 32 channels)
- Screen B: Result summary with trace statistic evaluation

4.6 Remote Control Commands

In this section all remote control commands specific to the base station test option R&S FSV-K72 are described in detail. For details on conventions used in this chapter refer to chapter 4.6.1, "Notation", on page 119.

For further information on analyzer or basic settings commands, refer to the corresponding subsystem in the base unit description.

In particular, the following subsystems are identical to the base unit; refer to the base unit description:

- CALCulate:DELTamarker
- CALCulate:MARKer (except for the specific commands described in chapter 4.6.2, "CALCulate subsystem (R&S FSV-K72)", on page 122)
- DISPlay subsystem
- FORMat subsystem
- INITiate subsystem
- INPut subsystem
- MMEM subsystem
- OUTput subsystem
- SENSe subsystem (except for the specific commands described in chapter 4.6.6, "SENSe subsystem (R&S FSV-K72)", on page 175)
- TRIGger subsystem

4.6.1 Notation

In the following sections, all commands implemented in the instrument are first listed and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

Individual Description

The individual description contains the complete notation of the command. An example for each command, the *RST value and the SCPI information are included as well.

The options and operating modes for which a command can be used are indicated by the following abbreviations:

Abbreviation	Description
A	signal analysis
A-F	signal analysis – span > 0 only (frequency mode)
A-T	signal analysis – zero span only (time mode)
ADEMOD	analog demodulation (option R&S FSV-K7)
BT	Bluetooth (option R&S FSV-K8)
CDMA	CDMA 2000 base station measurements (option R&S FSV-K82)
EVDO	1xEV-DO base station analysis (option R&S FSV-K84)
GSM	GSM/Edge measurements (option R&S FSV-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSV-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSV-K93)
NF	Noise Figure measurements (R&S FSV-K30)
PHN	Phase Noise measurements (R&S FSV-K40)
PSM	Power Sensor measurements (option R&S FSV-K9)
SFM	Stereo FM measurements (optionR&S FSV-K7S)
SPECM	Spectogram mode (option R&S FSV-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSV-K76/K77)
VSA	Vector Signal Analysis (option R&S FSV-K70)
WCDMA	3GPP Base Station measurements (option R&S FSV-K72), 3GPP UE measurements (option R&S FSV-K73)
WLAN	WLAN TX measurements (option R&S FSV-K91)

The signal analysis (spectrum) mode is implemented in the basic unit. For the other modes, the corresponding options are required.

Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description (see chapter 5 "Remote Control – Basics"). The instrument itself does not distinguish between upper and lower case letters.

Special Characters

|	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.

Example:

`SENSe:FREQuency:CW|:FIXed`

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

`SENSe:FREQuency:CW 1E3`

`SENSe:FREQuency:FIXed 1E3`

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example: Selection of the parameters for the command

`[SENSe<1…4>:]AVERage<1…4>:TYPE VIDeo | LINear`

[]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards. Parameters in square brackets can be incorporated optionally in the command or omitted as well.

{}	Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.

Description of Parameters

Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<…>) and is briefly explained in the following (see also chapter 5 "Remote Control – Basics", section "Parameters").

<Boolean>

This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword OFF or by the numeric value 0, the "on" state is indicated by ON or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value> <num>

These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data). The following keywords given below are permitted:

- MAXimum: This keyword sets the parameter to the largest possible value.
- MINimum: This keyword sets the parameter to the smallest possible value.

- DEFault: This keyword is used to reset the parameter to its default value.
- UP: This keyword increments the parameter value.
- DOWN: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

SENSe:FREQuency:CENTer? MAXimum

Returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

4.6.2 CALCulate subsystem (R&S FSV-K72)

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.

4.6.2.1 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 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32.

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'

'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: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

4.6.2.2 CALCulate:MARKer:FUNCtion subsystem

The CALCulate: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

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

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? <ResultType>

This command queries the result of the performed power measurement in the window specified by the suffix <n>. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the SENSe:POWer subsystem.

To obtain a correct result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single sweep mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<ResultType> ACPower | CPOWer

ACPower
Adjacent-channel power measurement
Results are output in the following sequence, separated by commas:
Power of transmission channel
Power of lower adjacent channel
Power of upper adjacent channel
Power of lower alternate channel 1
Power of upper alternate channel 1
Power of lower alternate channel 2
Power of upper alternate channel 2
The number of measured values returned depends on the number of adjacent/alternate channels selected with `[SENSe:]POWer:ACHannel:ACPairs`.
With logarithmic scaling (RANGE LOG), the power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the power is output in W. If `[SENSe:]POWer:ACHannel:MODE` is set to REL, the adjacent/alternate-channel power is output in dB.

CPOWer
Channel power measurement
In a Spectrum Emission Mask measurement, the query returns the power result for the reference range, if this power reference type is selected.
With logarithmic scaling (RANGE LOG), the channel power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the channel power is output in W.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect <MeasType>

This command selects – and switches on – the specified power measurement type in the window specified by the suffix <n>.

The channel spacings and channel bandwidths are configured in the `SENSe:POWer` subsystem.

Note: If CPOWer is selected, the number of adjacent channels (`[SENSe:]POWer:ACHannel:ACPairs`) is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.

The channel/adjacent-channel power measurement is performed for the trace selected with `[SENSe:]POWer:TRACe`.

The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of `CALCulate<n>:MARKer<m>:TRACe`.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<MeasType> ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CNO

ACPower
Adjacent-channel power measurement with a single carrier signal

CPOWer
Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with "NO. OF ADJ CHAN" = 0)

MCACpower
Channel/adjacent-channel power measurement with several carrier signals

OBANdwidth | OBWidth
Measurement of occupied bandwidth

CN
Measurement of carrier-to-noise ratio

CN0
Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth

Example: `CALC:MARK:FUNC:POW:SEL ACP`
Switches on adjacent-channel power measurement.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:MARKer<1>:FUNCtion:TAERror:RESult? <ResultType>

This command queries the result of a time alignment measurement (see chapter 4.4.2, "Time Alignment Error Measurement", on page 81).

Suffix:

<n> irrelevant

Query parameters:

<ResultType> **TAERror**
Returns the time offset between the two antenna signals in chips.

Example: `CALC:MARK:FUNC:TAER:RES? TAER`

Usage: Query only

Mode: WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:WCDPower[:BTS]:RESult? <Results>

This command queries the measured and calculated results of the 3GPP FDD BTS code domain power measurement.

Suffix:

<n>	irrelevant
<m>	1 irrelevant

Parameters:

<Results>

ACHannels | ARCDerror | CDPabsolute | CDPRelative | CERRor | CHANnel | CSLot | EVMPeak | EVMRms | FERRor | IOFFset | IQIMbalance | IQOFfset | MACCuracy | MPIC | MTYPe | PCDerror | PSYMbol | PTOTal | QOFFset | RCDerror | RHO | SRATe | TFRame | TOFFset

ACHannels
Number of active channels

ARCDerror
relative code domain error averaged over all channels with modulation type 64QAM

CDPabsolute
channel power absolute

CDPRelative
channel power relative

CERRor
chip rate error

CHANnel
channel number

CSLot
channel slot number

EVMPeak
error vector magnitude peak

EVMRms
error vector magnitude RMS

FERRor
frequency error in Hz

IOFFset
imaginary part of the I/Q offset

IQIMbalance
I/Q imbalance

IQOFfset
I/Q offset

MACCuracy
composite EVM

MPIC
average power of inactive channels

MTYPe
modulation type:
2 – QPSK
4 – 16 QAM
5 – 64 QAM
15 – NONE

PCDerror
peak code domain error

PSYMbol
number of pilot bits

PTOTal
total power

QOFFset
real part of the I/Q offset

RCDerror
relative code domain error

RHO
rho value for every slot

SRATe
symbol rate

TFRame
trigger to frame

TOFFset
timing offset

The parameter specifies the required evaluation method.

Example: `CALC:MARK:FUNC:WCDP:RES? PTOT`

Usage: Query only

Mode: WCDMA

CALCulate<n>:MARKer<m>:FUNCtion:ZOOM <State>

If marker zoom is activated, the number of channels displayed on the screen in code domain power and code domain error power result diagram is reduced to 64.

The currently selected marker defines the center of the displayed range.

Suffix:

<n> irrelevant

<m> 1...4
marker number

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:FUNC:ZOOM ON`

Mode: CDMA, EVDO, PHN, TDS, WCDMA

4.6.2.3 Other CALCulate Commands

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

4.6.2.4 Other CALCulate Commands Referenced in this Manual

CALCulate:DELTamarker subsystem

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X <Reference>

For a measurement with a fixed reference value (see `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe]` on page 134), this command defines a new frequency reference (span > 0) or time (span = 0) for all delta markers in the window specified by the suffix <n>.

For phase-noise measurements (see `CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO` on page 134), the command defines a new frequency reference or time for delta marker 2.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number

Parameters:

<Reference> **<numeric_value>**

*RST: ("CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed" is set to OFF)

Example: `CALC:DELT:FUNC:FIX:RPO:X 128 MHz`
Sets the frequency reference to 128 MHz.

Mode: A, ADEMOD, EVDO, TDS, WCDMA

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y <RefPointLevel>

For a measurement with a fixed reference point (`CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe]`), this command defines a new reference point level for all delta markers in the window specified by the suffix <n>.

For phase-noise measurements (`CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe]` on page 135), the command defines a new reference point level for delta marker 2.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number

Parameters:

<RefPointLevel> **<numeric_value>**

*RST: ("CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed" is set to OFF)

Example: `CALC:DELT:FUNC:FIX:RPO:Y -10dBm`
Sets the reference point level for delta markers to -10 dBm.

Mode: A, ADEMOD, EVDO, TDS, WCDMA

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe] <State>

This command switches the relative measurement to a fixed reference value on or off. Marker 1 is activated previously and a peak search is performed, if necessary. If marker 1 is activated, its position becomes the reference point for the measurement. The reference point can then be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` commands and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` independently of the position of marker 1 and of a trace.
It applies to all delta markers in the window specified by the suffix <n> as long as the function is active.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number

Parameters:

<State>	ON | OFF *RST: OFF

Example:
`CALC:DELT:FUNC:FIX ON`
Switches on the measurement with fixed reference value for all delta markers.
`CALC:DELT:FUNC:FIX:RPO:X 128 MHZ`
Sets the frequency reference to 128 MHz.
`CALC:DELT:FUNC:FIX:RPO:Y 30 DBM`
Sets the reference level to +30 dBm.

Mode: A, ADEMOD, EVDO, TDS, WCDMA

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO <State>

This command activates an automatic peak search for the reference fixed marker 1 at the end of each particular sweep in the window specified by the suffix <n>.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	irrelevant

Parameters:

<State>	ON | OFF *RST: OFF

Example:
`CALC:DELT:FUNC:PNO:AUTO ON`
Activates an automatic peak search for the reference marker in a phase-noise measurement.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>

This command switches on or off the phase-noise measurement with all active delta markers in the window specified by the suffix <n>. The correction values for the bandwidth and the log amplifier are taken into account in the measurement.

Marker 1 is activated, if necessary, and a peak search is performed. If marker 1 is activated, its position becomes the reference point for the measurement.

The reference point can then be modified with the `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X` and `CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y` commands independently of the position of marker 1 and of a trace (the same commands used for the measurement with fixed reference point).

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> irrelevant
Note: marker 2 is always the deltamarker for phase noise measurement results.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT:FUNC:PNO ON`
Switches on the phase-noise measurement with all delta markers.
`CALC:DELT:FUNC:FIX:RPO:X 128 MHZ`
Sets the frequency reference to 128 MHz.
`CALC:DELT:FUNC:FIX:RPO:Y 30 DBM`
Sets the reference level to +30 dBm

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM

CALCulate<n>:DELTamarker<m>:LINK <State>

This command links delta marker 1 to marker 1. If you change the horizontal position of the marker, so does the delta marker.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> 1
irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT:LINK ON`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM VSA

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command positions the delta marker to the next smaller maximum value to the left of the current value (i.e. descending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number
Example:	`CALC:DELT:MAX:LEFT` Sets delta marker 1 to the next smaller maximum value to the left of the current value.
Mode:	A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command positions the delta marker to the next smaller maximum value on the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number
Example:	`CALC:DELT2:MAX:NEXT` Sets delta marker 2 to the next smaller maximum value.
Mode:	A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command positions the delta marker to the current maximum value on the measured curve in the window specified by the suffix <n>. If necessary, the corresponding delta marker is activated first.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number
Example:	`CALC:DELT3:MAX` Sets delta marker 3 to the maximum value of the associated trace.
Mode:	A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command positions the delta marker to the next smaller maximum value to the right of the current value (i.e. ascending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number
Example:	`CALC:DELT:MAX:RIGH` Sets delta marker 1 to the next smaller maximum value to the right of the current value.
Mode:	A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command positions the delta marker to the next higher minimum value to the left of the current value (i.e. descending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number
Example:	`CALC:DELT:MIN:LEFT` Sets delta marker 1 to the next higher minimum to the left of the current value.
Mode:	A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command positions the delta marker to the next higher minimum value of the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number
Example:	`CALC:DELT2:MIN:NEXT` Sets delta marker 2 to the next higher minimum value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command positions the delta marker to the current minimum value on the measured curve in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT3:MIN`
Sets delta marker 3 to the minimum value of the associated trace.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command positions the delta marker to the next higher minimum value to the right of the current value (i.e. ascending X values) in the window specified by the suffix <n>. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT:MIN:RIGH`
Sets delta marker 1 to the next higher minimum value to the right of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command defines the marker specified by the suffix <m> as a delta marker for the window specified by the suffix <n>. If the corresponding marker was not already active, it is activated and positioned on the maximum of the measurement curve.

If no suffix is given for DELTamarker, delta marker 1 is selected automatically.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT1 ON`
Switches marker 1 to delta marker mode.

Mode: All

CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>

This command assigns the selected delta marker to the indicated trace in the window specified by the suffix <n>. The selected trace must be active, i.e. its state must be different from "BLANK".

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<TraceNumber> **1 to 6**
Selects trace 1 through 6.

Example: `CALC:DELT3:TRAC 2`
Assigns delta marker 3 to trace 2.

Mode: A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, SPECM, RT, VSA

CALCulate<n>:DELTamarker<m>:X <Position>

This command positions the selected delta marker to the indicated value in the window specified by the suffix <n>. The input is in absolute values.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<Position> 0 to maximum frequency or sweep time

Example: `CALC:DELT:X?`
Outputs the absolute frequency/time of delta marker 1.

Mode: A, ADEMOD, CDMA, EVDO, PHN, TDS, WCDMA, VSA

CALCulate<n>:DELTamarker<m>:X:RELative

This command queries the x-value of the selected delta marker relative to marker 1 or to the reference position (for `CALC:DELT:FUNC:FIX:STAT ON`) in the window specified by the suffix <n>. The command activates the corresponding delta marker, if necessary.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:DELT3:X:REL?`
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:DELTamarker<m>:Y

This command queries the measured value of the selected delta marker in the specified window. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with `CALC:NIT:POW` or on the activated measuring functions, the query result is output in the units below:

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.
`CALC:DELT2 ON`
Switches on delta marker 2.
`CALC:DELT2:Y?`
Outputs measurement value of delta marker 2.

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, VSA

CALCulate:LIMit subsystem

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper adjacent channel during adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value has no effect on the limit check as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> — window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> — irrelevant

Parameters:

<LowerLimit>, <UpperLimit> — first value: -200DBM to 200DBM; limit for the lower and the upper adjacent channel

*RST: -200DBM

Example: `CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe <State>

This command activates the limit check for the adjacent channel when adjacent-channel power measurement (Adjacent Channel Power) is performed. Before the command, the limit check for the channel/adjacent-channel measurement must be globally switched on using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n> — window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> — irrelevant

Parameters:

<State> — ON | OFF

*RST: OFF

Example: `CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent-channel measurement.
`CALC:LIM:ACP:ACH:REL:STAT ON`
Switches on the check of the relative limit values for adjacent channels.
`CALC:LIM:ACP:ACH:ABS:STAT ON`
Switches on the check of absolute limit values for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative] <LowerLimit>, <UpperLimit>

This command defines the relative limit of the upper/lower adjacent channel for adjacent-channel power measurements. The reference value for the relative limit value is the measured channel power.

It should be noted that the relative limit value has no effect on the limit check as soon as it is below the absolute limit value defined with the `CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute` command. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Parameters:

<LowerLimit>, <UpperLimit> 0 to 100dB; the value for the lower limit must be lower than the value for the upper limit

*RST: 0 dB

Example: `CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult

This command queries the result of the limit check for the upper/lower adjacent channel when adjacent channel power measurement is performed.

If the power measurement of the adjacent channel is switched off, the command produces a query error.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<k>	irrelevant

Return values:

Result	The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Example:

`CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dB.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ACH:STAT ON`
Switches on the limit check for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

Mode: A, CDMA, EVDO, TDS, WLAN, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe <State>

This command activates the limit check for the relative limit value of the adjacent channel when adjacent-channel power measurement is performed. Before this command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<k>	irrelevant

Parameters:

<State>	ON | OFF
	*RST: OFF

Example: `CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ACH:STAT ON`
Switches on the check of the relative limit values for adjacent channels.
`CALC:LIM:ACP:ACH:ABS:STAT ON`
Switches on the check of absolute limit values for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper alternate adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value for the limit check has no effect as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values defined in mobile radio standards for the power in adjacent channels.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

<Channel> 1...11
the alternate channel

Parameters:

<LowerLimit>, <UpperLimit> first value: -200DBM to 200DBM; limit for the lower and the upper alternate adjacent channel

*RST: -200DBM

Example: `CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative] <LowerLimit>, <UpperLimit>

This command defines the limit for the alternate adjacent channels for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

Note that the relative limit value has no effect on the limit check as soon as it is below the absolute limit defined with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<k>	irrelevant
<Channel>	1...11 the alternate channel

Parameters:

<LowerLimit>, <UpperLimit>	first value: 0 to 100dB; limit for the lower and the upper alternate adjacent channel *RST: 0 DB

Example: `CALC:LIM:ACP:ALT2 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.

Mode: A, CDMA, EVDO, TDS, WLAN, WCDMA

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe <State>

This command activates the limit check for the alternate adjacent channels for adjacent channel power measurements. Before the command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are obtained.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<k>	irrelevant
<Channel>	1...11 the alternate channel

Parameters:

<State>	ON | OFF *RST: OFF

Example:
`CALC:LIM:ACP:ALT2 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ALT2:STAT ON`
Switches on the check of the relative limit values for the lower and upper second alternate adjacent channel.
`CALC:LIM:ACP:ALT2:ABS:STAT ON`
Switches on the check of absolute limit values for the lower and upper second alternate adjacent channel.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ALT2:RES?`
Queries the limit check result in the second alternate adjacent channels.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ACPower[:STATe] <State>

This command switches on and off the limit check for adjacent-channel power measurements. The commands `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe` or `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe` must be used in addition to specify whether the limit check is to be performed for the upper/lower adjacent channel or for the alternate adjacent channels.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<k> irrelevant

Parameters:

<State> ON | OFF

*RST: OFF

Example:
`CALC:LIM:ACP ON`
Switches on the ACLR limit check.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:FAIL

This command queries the result of the limit check of the indicated limit line. It should be noted that a complete sweep must have been performed for obtaining a correct result. A synchronization with *OPC, *OPC? or *WAI should therefore be provided. The result of the limit check is given with 0 for PASS, 1 for FAIL, and 2 for MARGIN.

Suffix:

<n>	irrelevant
<k>	limit line

Return values:

Return values	0 for pass, 1 for fail

Example:	`INIT;*WAI`
	Starts a new sweep and waits for its end.
	`CALC:LIM3:FAIL?`
	Queries the result of the check for limit line 3.

Mode:	A, ADEMOD, CDMA, EVDO, NF, PHN, TDS, WLAN, WCDMA

CALCulate:LIMit:ESPectrum subsystem

The `CALCulate:LIMit:ESPectrum` subsystem defines the limit check for the Spectrum Emission Mask.

CALCulate<n>:LIMit<k>:ESPectrum:LIMits <Limits>

This command sets or queries up to 4 power classes in one step.

Suffix:

<n>	irrelevant
<k>	irrelevant

Parameters:

<Limits>	1–3 numeric values between -200 and 200, separated by commas -200, <0-3 numeric values between -200 and 200, in ascending order, separated by commas>, 200

Example: `CALC:LIM:ESP:LIM -50,50,70`
Defines the following power classes:
`<-200, -50>`
`<-50, 50>`
`<50, 70>`
`<70, 200>`
Query:
`CALC:LIM:ESP:LIM?`
Response:
`-200,-50,50,70,200`

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:MODE <Mode>

This command activates or deactivates the automatic selection of the limit line in the Spectrum Emission Mask measurement.

Suffix:

<n> 1...4
window

<k> irrelevant

Parameters:

<Mode> AUTO | MANUAL

AUTO
The limit line depends on the measured channel power.

MANUAL
One of the three specified limit lines is set. The selection is made with the "CALCulate:LIMit:ESPectrum subsystem", on page 147 command.

*RST: AUTO

Example: `CALC:LIM:ESP:MODE AUTO`
Activates automatic selection of the limit line.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] <State>

This command sets the power classes used in the spectrum emission mask measurement. It is only possible to use power classes for which limits are defined. Also, either only one power class at a time or all power classes together can be selected.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CALC:LIM:ESP:PCL1 ON` Activates the first defined power class.
Mode:	A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNt <NoPowerClasses>

This command sets the number of power classes to be defined.

Suffix:

<n>	irrelevant
<k>	irrelevant
<Class>	irrelevant

Parameters:

<NoPowerClasses>	1 to 4 *RST: 1
Example:	`CALC:LIM:ESP:PCL:COUN 2` Two power classes can be defined.
Mode:	A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe] <State>

This command defines which limits are evaluated in the measurement.

Suffix:

<n>	irrelevant
<k>	irrelevant
<Class>	1...4 the power class to be evaluated

Parameters:

<State> ABSolute | RELative | AND | OR

ABSolute
Evaluates only limit lines with absolute power values

RELative
Evaluates only limit lines with relative power values

AND
Evaluates limit lines with relative and absolute power values. A negative result is returned if both limits fail.

OR
Evaluates limit lines with relative and absolute power values. A negative result is returned if at least one limit failed.

*RST: REL

Example: `CALC:LIM:ESP:PCL:LIM ABS`

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum <Level>

This command sets the upper limit level for one power class. The unit is dBm. The limit always ends at + 200 dBm, i.e. the upper limit of the last power class can not be set. If more than one power class is in use, the upper limit must equal the lower limit of the next power class.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<Level> **<numeric value>**
*RST: +200

Example: `CALC:LIM:ESP:PCL1:MAX -40 dBm`
Sets the maximum power value of the first power class to -40 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum <Level>

This command sets the minimum lower level limit for one power class. The unit is dBm. The limit always start at – 200 dBm, i.e. the first lower limit can not be set. If more than one power class is in use, the lower limit must equal the upper limit of the previous power class.

Suffix:

<n> irrelevant

<k> irrelevant

<Class> 1...4
the power class to be evaluated

Parameters:

<Level> **<numeric_value>**
*RST: -200 for class1, otherwise +200

Example: `CALC:LIM:ESP:PCL2:MIN -40 dBm`
Sets the minimum power value of the second power class to -40 dBm.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:RESTore

This command restores the predefined limit lines for the Spectrum Emission Mask

measurement. All modifications made to the predefined limit lines are lost and the factory-set values are restored.

Suffix:

<n>	1...4 window
<k>	irrelevant

Example: `CALC:LIM:ESP:REST`
Resets the limit lines for the Spectrum Emission Mask to the default setting.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate<n>:LIMit<k>:ESPectrum:VALue <Power>

This command activates the manual limit line selection and specifies the expected power as a value. Depending on the entered value, one of the predefined limit lines is selected.

Suffix:

<n>	1...4 window
<k>	irrelevant

Parameters:

<Power> 33 | 28 | 0

33
P ≥ 33

28
28 < P < 33

0
P < 28

*RST: 0

Example: `CALC:LIM:ESP:VAL 33`
Activates manual selection of the limit line and selects the limit line for P = 33.

Mode: A, CDMA, EVDO, TDS, WCDMA

CALCulate:MARKer subsystem

CALCulate<n>:MARKer<m>:AOFF

This command switches off all active markers, delta markers, and marker measurement functions in the specified window.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
irrelevant

Example: `CALC:MARK:AOFF`
Switches off all markers.

Mode: all

CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command positions the marker to the next smaller maximum value to the left of the current value (i.e. in descending X values) on the trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:MARK2:MAX:LEFT`
Positions marker 2 to the next lower maximum value to the left of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command positions the marker to the next smaller maximum value of the corresponding trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:MARK2:MAX:NEXT`
Positions marker 2 to the next lower maximum value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command positions the marker to the current maximum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	depends on mode marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.
Example:	`CALC:MARK2:MAX` Positions marker 2 to the maximum value of the trace.
Mode:	A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF

CALCulate<n>:MARKer<m>:MAXimum:RIGHt

This command positions the marker to the next smaller maximum value to the right of the current value (i.e. in ascending X values) on the corresponding trace in the window specified by the suffix <n>.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number
Example:	`CALC:MARK2:MAX:RIGH` Positions marker 2 to the next lower maximum value to the right of the current value.
Mode:	A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:MARKer<m>:MINimum:LEFT

This command positions the marker to the next higher minimum value to the left of the current value (i.e. in descending X direction) on the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:LEFT`
Positions marker 2 to the next higher minimum value to the left of the current value.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, SPECM, VSA

CALCulate<n>:MARKer<m>:MINimum:NEXT

This command positions the marker to the next higher minimum value of the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.
`CALC:MARK2:MIN:NEXT`
Positions marker 2 to the next higher maximum value.

Mode: A, ADEMOD, CDMA, EVDO, SPECM, TDS, VSA, WCDMA

CALCulate<n>:MARKer<m>:MINimum[:PEAK]

This command positions the marker to the current minimum value of the corresponding trace in the specified window. The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> depends on mode
marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Example: `CALC:MARK2:MIN`
Positions marker 2 to the minimum value of the trace.

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA, VSA, SPECM, NF

CALCulate<n>:MARKer<m>:MINimum:RIGHt

This command positions the marker to the next higher minimum value to the right of the current value (i.e. in ascending X direction) on the corresponding trace in the window specified by the suffix <n>.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	marker number

Example:	`CALC:MARK2:MIN`
	Positions marker 2 to the minimum value of the trace.
	`CALC:MARK2:MIN:RIGH`
	Positions marker 2 to the next higher minimum value to the right of the current value.

Mode:	A, ADEMOD, CDMA, EVDO, SPECM, TDS, VSA, WCDMA

CALCulate<n>:MARKer<m>[:STATe] <State>

This command activates a marker in the specified window. If no indication is made, marker 1 is selected automatically. If activate, the marker is switched to normal mode.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	depends on mode marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CALC:MARK3 ON` Switches on marker 3 or switches to marker mode.
Mode:	all

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command assigns the selected marker to the indicated measurement curve in the specified window. The corresponding trace must be active, i.e. its status must not be "BLANK".

If necessary, the corresponding marker is switched on prior to the assignment.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<m>	depends on mode marker number; For applications that do not have more than 1 marker, the suffix <m> is irrelevant.

Parameters:

<Trace>	**1 to 6** Selects trace 1 through 6.

Example: `CALC:MARK3:TRAC 2`
Assigns marker 3 to trace 2.

Mode: all

CALCulate<n>:MARKer<m>:X <Position>

This command positions the selected marker to the indicated x-value in the window specified by the suffix <n>.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Parameters:

<Position> 0 to MAX (frequency | sweep time | level)

Example: `CALC:MARK2:X 1.7MHz`
Positions marker 2 to frequency 1.7 MHz.

Mode: ALL

CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] <State>

This command switches between a limited (ON) and unlimited (OFF) search range.

If the power measurement in zero span is active, this command limits the evaluation range on the trace.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:X:SLIM ON`
Switches on search limitation.

Mode: all

CALCulate<n>:MARKer<m>:X:SLIMits:ZOOM <State>

This command sets the limits of the search range for markers and delta markers to the zoom area in the window specified by the suffix <n>.

Note: The function is only available if the search limit for marker and delta marker is switched on (see `CALCulate<n>:MARKer<m>:X:SLIMits[:STATe]` on page 156).

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.

Mode: all

CALCulate<n>:MARKer<m>:Y?

This command queries the measured value of the selected marker in the window specified by the suffix <n>. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed after the change of a parameter and before the query of the Y value. This is only possible in single sweep mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Return values:

<Result> The measured value of the selected marker is returned.
In I/Q Analyzer mode, if the result display configuration "Real/Imag (I/Q)" is selected, this query returns the Real (Q) value of the marker first, then the Imag (I) value.

Example:
`INIT:CONT OFF`
Switches to single sweep mode.
`CALC:MARK2 ON`
Switches marker 2.
`INIT;*WAI`
Starts a sweep and waits for the end.
`CALC:MARK2:Y?`
Outputs the measured value of marker 2.
In I/Q Analyzer mode, for "Real/Imag (I/Q)", for example:
`1.852719887E-011,0`

Usage: Query only

Mode: ALL

CALCulate:PSE subsystem

CALCulate<n>:PSEarch|PEAKsearch[:IMMediate]

This command determines the list of the subrange maximums from the existing sweep results.

Suffix:

<n>	irrelevant
Example:	`CALC:PSE` Starts to determine the list.
Mode:	A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:AUTO <State>

This command activates or deactivates the list evaluation.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<State>	ON | OFF *RST: ON
Example:	`CALC:ESP:PSE:AUTO OFF` Deactivates the list evaluation.
Mode:	A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:MARGin

This command sets the margin used for the limit check/peak search.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<Margin>	-200 to 200 dB *RST: 200 dB
Example:	`CALC:ESP:PSE:MARG 100` Sets the margin to 100 dB.
Mode:	A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:PSHow

This command marks all peaks with blue squares in the diagram.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CALC:ESP:PSE:PSH ON` Marks all peaks with blue squares.
Mode:	A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate<n>:PSEarch|PEAKsearch:SUBRanges <NumberPeaks>

This command sets the number of peaks per range that are stored in the list. Once the selected number of peaks has been reached, the peak search is stopped in the current range and continued in the next range.

Suffix:

<n>	irrelevant

Parameters:

<NumberPeaks>	1 to 50 *RST: 25
Example:	`CALC:PSE:SUBR 10` Sets 10 peaks per range to be stored in the list.
Mode:	A, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

CALCulate:STATistics subsystem

CALCulate<n>:STATistics:CCDF[:STATe] <State>

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF). On activating this function, the APD measurement is switched off.

Suffix:

<n>	irrelevant

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`CALC:STAT:CCDF ON` Switches on the CCDF measurement.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:NSAMples <NoMeasPoints>

This command sets the number of measurement points to be acquired for the statistical measurement functions.

Suffix:

<n> irrelevant

Parameters:

<NoMeasPoints> 100 to 1E9

*RST: 100000

Example: `CALC:STAT:NSAM 500`

Sets the number of measurement points to be acquired to 500.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:PRESet

This command resets the scaling of the X and Y axes in a statistical measurement. The following values are set:

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

Suffix:

<n> irrelevant

Example: `CALC:STAT:PRES`

Resets the scaling for statistical functions

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:RESult<Trace> <ResultType>

This command reads out the results of statistical measurements of a recorded trace.

Suffix:

<n> irrelevant

<Trace> 1...6

trace

Parameters:

<ResultType> MEAN | PEAK | CFACtor | ALL

MEAN
Average (=RMS) power in dBm measured during the measurement time.

PEAK
Peak power in dBm measured during the measurement time.

CFACtor
Determined CREST factor (= ratio of peak power to average power) in dB.

ALL
Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

The required result is selected via the following parameters:

Example: `CALC:STAT:RES2? ALL`
Reads out the three measurement results of trace 2. Example of answer string: 5.56,19.25,13.69 i.e. mean power: 5.56 dBm, peak power 19.25 dBm, CREST factor 13.69 dB

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:AUTO ONCE

This command optimizes the level setting of the instrument depending on the measured peak power, in order to obtain maximum instrument sensitivity.

To obtain maximum resolution, the level range is set as a function of the measured spacing between peak power and the minimum power for the APD measurement and of the spacing between peak power and mean power for the CCDF measurement. In addition, the probability scale for the number of test points is adapted.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Suffix:

<n> irrelevant

Example: `CALC:STAT:SCAL:AUTO ONCE;*WAI`
Adapts the level setting for statistical measurements.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:X:RANGe <Value>

This command defines the level range for the x-axis of the measurement diagram. The setting is identical to the level range setting defined with the `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` command.

Suffix:

<n> irrelevant

Parameters:

<Value>	10dB to 200dB *RST: 100dB
Example:	`CALC:STAT:SCAL:X:RANG 20dB`
Mode:	A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:X:RLEVel <Value>

This command defines the reference level for the x-axis of the measurement diagram. The setting is identical to the reference level setting using the `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` command.

With the reference level offset <> 0 the indicated value range of the reference level is modified by the offset.

The unit depends on the setting performed with `CALCulate<n>:UNIT:POWer`.

Suffix:

<n>	irrelevant

Parameters:

<Value>	-120dBm to 20dBm *RST: -20dBm
Example:	`CALC:STAT:SCAL:X:RLEV -60dBm`
Mode:	A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:Y:LOWer <Value>

This command defines the lower limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

Suffix:

<n>	selects the screen

Parameters:

<Value>	1E-9 to 0.1 *RST: 1E-6
Example:	`CALC:STAT:SCAL:Y:LOW 0.001`
Mode:	A, CDMA, EVDO, TDS, VSA, WCDMA

CALCulate<n>:STATistics:SCALe:Y:UNIT <Unit>

This command defines the scaling type of the y-axis.

Suffix:

<n>	selects the screen

Parameters:

<Unit>	PCT | ABS *RST: ABS

Example: `CALC:STAT:SCAL:Y:UNIT PCT`
Sets the percentage scale.

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

CALCulate<n>:STATistics:SCALe:Y:UPPer <Value>

This command defines the upper limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

Suffix:
<n> irrelevant

Parameters:
<Value> 1E-8 to 1.0

*RST: 1.0

Example: `CALC:STAT:Y:UPP 0.01`

Mode: A, CDMA, EVDO, TDS, WCDMA, VSA

Other Referenced CALCulate Commands

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit for power.

The unit is defined globally for all windows.

Suffix:
<n> irrelevant

Parameters:
<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere

*RST: dBm

Example: `CALC:UNIT:POW DBM`
Sets the power unit to dBm.

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

4.6.3 CONFigure:WCDPower subsystem (R&S FSV-K72)

This subsystem comprises the commands for configuring the code domain power measurements. Only the numeric suffix 1 is permissible in CONFigure.

CONFigure:WCDPower[:BTS]:MEASurement <Type>

This command selects the type of 3GPP FDD BTS base station tests.

Parameters:

<Type> ACLR | ESPectrum | WCDPower | POWer | OBANdwith | CCDF | RFCombi | TAERror

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
Measurement of occupied power bandwidth

CCDF
Measurement of complementary cumulative distribution function

RFCombi
Combined Adjacent Channel Power (Ch Power ACLR) measurement with Occupied Bandwidth and Spectrum Emission Mask

TAERror
Time Alignment Error measurement

*RST: OFF

Example: `CONF:WCDP:MEAS POW`

Mode: WCDMA

CONFigure:WCDPower[:BTS]: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[:BTS]:CTABle:SELect` on page 166.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CONF:WCDP:CTAB ON`

Mode: WCDMA

CONFigure:WCDPower[:BTS]:CTABle:COMPare <State>

This command switches between normal predefined mode and predefined channel table compare mode.

In the compare mode a predefined channel table model can be compared with the measurement in respect to power, pilot length and timing offset of the active channels.

Comparision is a submode of predefined channel table measurement. It only influences the measurement if the "Channel Search Mode" is set to *Predefined* (see "Channel Search Mode" on page 57). If the compare mode is selected, the power values, pilot lengths and timing offsets are measured and are compared with the values from the predefined channel table. The "Timing Offset" setting is disabled in this case. These results are visualized in the corresponding columns of the "CHANNEL TABLE" result display (see "Channel Table", on page 34). The following columns are displayed in the channel table:

- **PilotL** is the substraction of PilotLengthMeasured - PilotLengthPredefined
- **PwrRel** is the substraction of PowerRelMeasured - PowerRelPredefined
- **T Offs** is the substraction of TimingOffsetMeasured - TimingOffsetPredefined

For non-active channels dashes are shown.

Parameters:

<State> ON | OFF

ON
predefined channel table compare mode

OFF
normal predefined mode

*RST: OFF

Example: `CONF:WCDP:CTAB:COMP ON`

Mode: WCDMA

CONFigure:WCDPower[:BTS]:CTABle:NAME <Name>

This command selects an existing channel table or creates the name of a new channel table file.

Parameters:

<Name> <file name>

*RST: RECENT

Example: `CONF:WCDP:CTAB:NAME 'NEW_TAB'`

Mode: WCDMA

CONFigure:WCDPower[:BTS]: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 `CONFigure:WCDPower[:BTS]:CTABle[:STATe]` on page 164.

Parameters:

<FileName> <string>

*RST: RECENT

Example:

`CONF:WCDP:CTAB ON`

Switches the channel table on.

`CONF:WCDP:CTAB:SEL 'CTAB_1'`

Selects the predefined channel table 'CTAB_1'.

Mode: WCDMA

CONFigure:WCDPower[:BTS]:CTABle:DATA <TableDefinition>

This command defines the values of the selected channel table.

Each line of the table consists of 8 values.

Parameters:

<TableDefinition> Code Class | Code number | Use TFCI | Timing offset | Pilot length | Channel Type | Status | CDP relative

Code Class
2 to 9

Code number
0 to 511

Use TFCI
0: not used, 1. used

Timing offset
0 to 38400, for code class 9, the step width is 512; otherwise, 256

Pilot length
code class 9: 4
code class 8: 2,4, 8
code class 7: 4, 8
code class 5/6: 8
code class 2/3/4: 16

Channel Type
0: DPCH Dedicated Physical Channel of a standard WCDMA Frame
1: PICH Paging Indication Channel
2: SCCPCH Secondary Common Control Physical Channel
3: HS_SCCH HSDPA: High Speed Shared Control Channel
4: HS_PDSCH HSDPA: High Speed Physical Downlink Shared Channel
5: CHAN any other QPSK modulated channel without pilot symbols
10: CPRSD Dedicated Physical Channel (DPCH) in compressed mode
11: CPR-TPC DPCH in compressed mode TPC symbols are sent in the first slot of the gap.
12: CPR-SF/2 DPCH in compressed mode using half spreading factor (SF/2).
13: CPR-SF/2-TPC DPCH in compressed mode using half spreading
factor (SF/2).TPC symbols are sent in the first slot of the gap.
14: E-HICH: Enhanced HARQ Hybrid Acknowledgement Indicator Channel
E-RGCH: Enhanced Relative Grant Channel
15 EAGCH E-AGCH: Enhanced Absolute Grant Channel
16 SCPICH Secondary Common Pilot Channel

Status
0: not active, 1: active

CDP relative

for setting commands any value, for query CDP relative value

Channels PICH, CPICH and PCCPCH may only be defined once. If channel CPICH or PCCPCH 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 `CONFigure:WCDPower[:BTS]:CTABle:NAME` on page 165.

Example: `CONF:WCDP:CTAB:NAME 'NEW_TAB'`
Defines the channel table name.
`CONF:WCDP:CTAB:DATA 8,0,0,0,0,0,1,0.00,8,1,0,0,0,0,1,0.00,7,1,0, 256,8,0,1,0.00`

Mode: WCDMA

CONFigure:WCDPower[:BTS]: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 `CONFigure:WCDPower[:BTS]:CTABle:NAME` on page 165 and the values of the table have to be defined with command `CONFigure:WCDPower[:BTS]:CTABle:DATA` on page 166.

Parameters:
<Comment> <string>

Example: `CONF:WCDP:CTAB:NAME 'NEW_TAB'`
Defines the channel table name.
`CONF:WCDP:CTAB:DATA 8,0,0,0,0,0,1,0.00,8,1,0,0,0,0,1,0.00,7,1,0, 256,8,0,1,0.00`
Defines the table values.
`CONF:WCDP:CTAB:COMM 'Comment for table 1'`
Defines a comment for the table.

Mode: WCDMA

CONFigure:WCDPower[:BTS]:CTABle:COPY <FileName>

This command copies one channel table onto another one. The channel table to be copied is selected with command `CONFigure:WCDPower[:BTS]:CTABle:NAME` on page 165.

The name of the channel table may contain a maximum of 8 characters.

Parameters:
<FileName> <file_name> = name of the new channel table

Example: `CONF:WCDP:CTAB:NAME 'NEW_TAB'`
Defines the channel table name to be copied.
`CONF:WCDP:CTAB:COPY 'CTAB_2'`
Copies channel table 'NEW_TAB' to 'CTAB_2'.

Usage: Event

Mode: WCDMA

CONFigure:WCDPower[:BTS]:CTABle:DELete

This command deletes the selected channel table. The channel table to be deleted is selected with the command `CONFigure:WCDPower[:BTS]:CTABle:NAME` on page 165.

Example: `CONF:WCDP:CTAB:NAME 'NEW_TAB'`
Defines the channel table name to be deleted.
`CONF:WCDP:CTAB:DEL`
Deletes the table.

Mode: WCDMA

CONFigure:WCDPower[:BTS]:CTABle:CATalog?

This command reads out the names of all channel tables stored on the hard disk.

Return values:

<Result> <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:CTAB:CAT?`

Usage: Query only

Mode: WCDMA

CONFigure:WCDPower[:BTS]:CTABle:TOFFset <Mode>

This command specifies whether the timing offset and pilot length are measured or if the values are taken from the predefined table.

Parameters:

<Mode> PRED | MEAS

PRED
The timing offset and pilot length values from the predefined table are used.

MEAS
The timing offset and the pilot length are measured by the application. The channel configuration is specified via the predefined channel table.

Example: `CONF:WCDP:CTAB:TOFF MEAS`

Mode: WCDMA

4.6.4 DISPlay subsystem (R&S FSV-K72)

The DISPlay subsystem controls the selection and presentation of textual and graphic information as well as of measurement data on the display.

DISPlay[:WINDow<n>]:STATe <State>

Activates/deactivates the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background:

Suffix:

<n> window

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DISP:WIND3:STAT ON`
Turns on a third measurement screen.

Mode: CDMA, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command defines the type of display and the evaluation of the traces in the window specified by the suffix <n>. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]`.

The number of measurements for AVERage, MAXHold and MINHold is defined with the `[SENSe:]AVERage<n>:COUNt` or `[SENSe:]SWEep:COUNt` commands. It should be noted that synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:

<Mode> WRITe | VIEW | AVERage | MAXHold | MINHold | BLANk

*RST: WRITe for TRACe1, STATe OFF for TRACe2/3/4/5/6

For details on trace modes refer to chapter 4.3.2.4, "Trace Mode Overview", on page 22.

Example:

`INIT:CONT OFF`

Switching to single sweep mode.

`SWE:COUN 16`

Sets the number of measurements to 16.

`DISP:TRAC3:MODE MAXH`

Switches on the calculation of the maximum peak for trace 3.

`INIT;*WAI`

Starts the measurement and waits for the end of the 16 sweeps.

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command switches on or off the display of the corresponding trace in the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> trace

Parameters:

<State> ON | OFF

*RST: ON for TRACe1, OFF for TRACe2 to 6

Example: `DISP:TRAC3 ON`

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis (level axis) with logarithmic scaling (`DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 174) in the window specified by the suffix <n>.

For linear scaling, the display range is fixed and cannot be modified.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Range> 10 dB to 200 dB or value in Hz

*RST: 100dB

Example: `DISP:TRAC:Y 110dB`

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>

This command defines the scale type of the y-axis (absolute or relative) in the window specified by the suffix <n>.

When `SYSTem:DISPlay:UPDate` is set to OFF, this command has no immediate effect on the screen (see `SYSTem:DISPlay:UPDate` on page 219).

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t>	irrelevant

Parameters:

<Mode>	ABSolute | RELative *RST: ABS
Example:	`DISP:TRAC:Y:MODE REL`
Mode:	all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision <Value>

This remote command determines the grid spacing on the Y axis for all diagrams, where possible.

Suffix:

<n>	irrelevant
<t>	irrelevant

Parameters:

<Value>	numeric value; the unit depends on the result display *RST: depends on the result display
Example:	`DISP:TRAC:Y:PDIV 10` Sets the grid spacing to 10 units (for example 10 dB in the Code Domain Power result display).
Mode:	CDMA, BT, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <Value>

This command sets the reference level.

With the reference level offset <> 0, the indicated value range of the reference level is modified by the offset.

Suffix:

<n>	irrelevant.
<t>	irrelevant

Parameters:

<Value> <numeric_value>, range specified in data sheet

*RST: -10dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, VSA, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command sets the reference level offset.

Suffix:

<n> irrelevant.

<t> irrelevant

Parameters:

<Value> -200dB to 200dB

*RST: 0dB

Example: `DISP:TRAC:Y:RLEV:OFFS -10dB`

Mode: ALL

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This remote command defines the position of the reference value on the Y axis (1 – 100 %) in the window specified by the suffix <n>.

When using a tracking generator (only with option R&S FSV-B9 or -B10, requires active normalization), and in Bluetooth mode (option R&S FSV-K8) this command defines the position of the reference value for all windows.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Position> 0 to 100PCT

*RST: 100 PCT = "Spectrum" mode, AF spectrum display; 50 PCT = Tracking Generator mode or time display

Example: `DISP:TRAC:Y:RPOS 50PCT`

Mode: A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD, VSA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator (only with option R&S FSV-B9 or -B10), this command requires active normalization.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> <numeric_value>

*RST: 0 dB, coupled to reference level

Example: `DISP:TRAC:Y:RVAL -20dBm`
(Analyzer)
`DISP:TRAC:Y:RVAL 0`
Sets the power value assigned to the reference position to 0 dB (tracking generator)

Mode: A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling for the level display range in the window specified by the suffix <n>.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<ScalingType> LOGarithmic | LINear | LDB

LOGarithmic
Selects logarithmic scaling.

LINear
Selects linear scaling in %.

LDB
Selects linear scaling in dB.

*RST: LOGarithmic

Example: `DISP:TRAC:Y:SPAC LIN`

Mode: A, ADEMOD, BT, VSA

4.6.5 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> **BWCD**

3G FDD BTS Mode (R&S FSV-K72 option)

INSTrument:NSELect <Mode>

This command switches between the measurement modes by means of numbers.

Parameters:

<Mode> **8**

3G FDD BTS Mode (R&S FSV-K72 option)

4.6.6 SENSe subsystem (R&S FSV-K72)

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.

4.6.6.1 SENSe:CDPower Subsystem

This subsystem controls the parameters for the code domain mode. The numeric suffix in SENSe<source> is not significant in this subsystem.

[SENSe:]CDPower:ANTenna <Mode>

This command activates or deactivates the antenna diversity mode and selects the antenna to be used.

Parameters:

<Mode> OFF | 1 | 2

*RST: OFF

Example: `CDP:ANT 1`

Mode: WCDMA

[SENSe:]CDPower:ASEQuence

Automatically adjusts the amplitude settings to the signal

Example: `SENS:CDP:ASEQ`

Mode: WCDMA

[SENSe:]CDPower:CPB <Value>

This command selects the constellation parameter B. According to 3GPP specification, the mapping of 16QAM symbols to an assigned bit pattern depends on the constellation parameter B.

Parameters:

<Value> <numeric value>

*RST: 0

Example: `SENS:CDP:ANT 1`

Mode: WCDMA

[SENSe:]CDPower:CODE <CodeNumber>

This command sets the code number. The code number refers to code class 9 (spreading factor 512).

Parameters:

<CodeNumber> <numeric value>

*RST: 0

Example: `SENS:CDP:CODE 30`

Mode: WCDMA

[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

[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

[SENSe:]CDPower:HSDPamode <State>

This command selects if the HS-DPCCH channel is searched or not.

Parameters:

<State> ON | OFF

ON
The high speed channels can be detected. A detection of the modulation type (QPSK /16QAM) is done instead of a detection of pilot symbols.

OFF
The high speed channel can not be detected. A detection of pilot symbols is done instead a detection of the modulation type (QPSK /16QAM)

*RST: ON

Example: `SENS:CDP:HSDP OFF`

Mode: WCDMA

[SENSe:]CDPower:ICTReshold <Value>

This command sets the threshold value from which a channel is treated as active. The level entered refers to the total signal power.

Parameters:

<Value> <numeric value>

*RST: -60 dB

Example: `SENS:CDP:ICTR -100`

Mode: 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

[SENSe:]CDPower:LEVel:ADJust

This command adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the analyzer or limiting the dynamic range by an S/N ratio that is too small.

Example: `CDP:LEV:ADJ`
Adjusts the reference level.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:LCODe[:VALue] <ScramblingCode>

This command defines the scrambling code in hexadecimal format.

Parameters:

<ScramblingCode> <hex>

*RST: 0

Example: `SENS:CDP:LCOD:#H2`
Defines the scrambling code in hexadecimal format.

Mode: WCDMA

[SENSe:]CDPower:LCODe:DVALue <ScramblingCode>

This command defines the scrambling code in decimal format.

Parameters:

<ScramblingCode> <numeric value>

*RST: 0

Example: `SENS:CDP:LCOD:DVAL 3`
Defines the scrambling code in decimal format.

Mode: WCDMA

[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.

If the search is successful (PASS), the results 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

[SENSe:]CDPower:LCODe:SEARch:LIST

This command returns the automatic search sequence (see `[SENSe:]CDPower:LCODe:SEARch:[IMMediate]` on page 179).

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: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:MIMO <State>

Activates or deactivates single antenna MIMO measurement mode.

Channels that have modulation type MIMO-QPSK or MIMO-16QAM are only recongnized as active channels if this setting is `ON`.

For details see "MIMO" on page 62.

Parameters:

<State> — ON | OFF

*RST: OFF

Example: `SENS:CDP:MIMO ON`

Mode: WCDMA

[SENSe:]CDPower:NORMalize <State>

This command switches elimination of I/Q offset on or off.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `SENS:CDP:NORM ON`

Activates the elimination of the I/Q offset.

Mode: WCDMA

[SENSe:]CDPower:PCONtrol <Position>

This command determines the power control measurement position. An enhanced channel search is used to consider the properties of compressed mode channels.

Parameters:

<Position> SLOT | PILot

SLOT

The slot power is averaged from the beginning of the slot to the end of the slot.

PILot

The slot power is averaged from the beginning of the pilot symbols of the previous slot to the beginning of the pilot symbols of the current slot.

*RST: PILot

Example: `SENS:CDP:PCON SLOT`

Switch to power averaging from slot start to the end of the slot. An enhanced channel search is used to consider the properties of compressed mode channels.

`SENS:CDP:PCON PIL`

Switch to power averaging from the pilot symbols of the previous slot number to the start of the pilots of the displayed slot number. The channel search only considers standard channels.

Mode: WCDMA

[SENSe:]CDPower:PDIFf <State>

This command activates or deactivates the slot power difference calculation of the POWER VERSUS SLOT display. The slot power difference between the actual and the previous slot is displayed, if the power versus slot display is enabled

Parameters:

<State> ON | OFF

ON
The slot power difference to the previous slot is displayed (POWER VS SLOT display).

OFF
The slot power of each slot is displayed (POWER VS SLOT display)

*RST: OFF

Example: `SENS:CDP:PDIF ON`

Mode: WCDMA

[SENSe:]CDPower:PDIsplay <Mode>

This command switches between showing the absolute or relative power to the chosen reference.

Parameter only affects the display mode code domain power.

Parameters:

<Mode> ABS | REL

*RST: ABS

Example: `SENS:CDP:PDIS ABS`

Mode: WCDMA

[SENSe:]CDPower:PREFerence <Mode>

This command switches between the use of total power or CPICH power as the reference for the relative CDP measurement values.

Parameters:

<Mode> TOTal | CPICh

*RST: TOTal

Example: `SENS:CDP:PREF CPIC`

Mode: WCDMA

[SENSe:]CDPower:QINVert <State>

This command inverts the Q component of the signal.

Parameters:

ON | OFF

*RST: OFF

Example: `CDP:QINV ON`
Activates inversion of Q component.

Mode: CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower: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 | 512

*RST: 512

Example: `SENS:CDP:SFACtor 16`

Mode: WCDMA

[SENSe:]CDPower:SLOT <SlotNumber>

This command sets the slot number of the common pilot channels (CPICH).

Parameters:

<SlotNumber> <numeric value>

*RST: 0

Example: `SENS:CDP:SLOT 3`

Mode: WCDMA

[SENSe:]CDPower:STYPe <Type>

This command selects the type of synchronization. If CPICh is selected, the synchronization is carried out to CPICH. For this type of synchronization, the CPICH must be present in the transmit signal. If SCHannel is selected, the synchronization is carried out without CPICh. This type of synchronization is required for test model 4 without CPICH.

Parameters:

<Type> CPICh | SCHannel

*RST: CPICh

Example: `SENS:CDP:STYP SCH`

Mode: WCDMA

[SENSe:]CDPower:UCPich:CODE <CodeNumber>

This command sets the code number of the user defined CPICH used for signal analysis.

Parameters:

<CodeNumber>

Range: 0 to 225

*RST: 0

Example: `SENS:CDP:UCP:CODE 10`

Mode: WCDMA

[SENSe:]CDPower:UCPich:PATTern <Pattern>

This command defines which pattern is used for signal analysis for the user-defined CPICH. OFF leads to a pattern selection according to the antenna selection, 1 leads to the fixed usage of "Pattern 1" and 2 leads to the fixed usage of "Pattern 2" according to standard.

Parameters:

<Pattern> OFF | 1 | 2

*RST: OFF

Example: `SENS:CDP:UCP:PATT 1`

Mode: WCDMA

[SENSe:]CDPower:UCPich[:STATe] <State>

This command defines if the user defined CPICH settings are valid and shall be used for signal analysis.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `SENS:CDP:UCP ON`

Mode: WCDMA

4.6.6.2 Other SENSe Commands Referenced in this Manual

SENSe:ADJust Subsystem

[SENSe:]ADJust:ALL

This command activates all automatic settings:

- Level
- Scrambling code

Example: `ADJ:ALL`

Mode: WCDMA

[SENSe:]ADJust:CONFigure:LEVel:DURation <Duration>

Defines the duration of the level measurement used to determine the optimal reference level automatically (for `SENS:ADJ:LEV ON`).

Parameters:

<Duration> <numeric value> in seconds

Range: 0.001 to 16000.0
*RST: 0.001
Default unit: s

Example: `ADJ:CONF:LEV:DUR:5`

Mode: A, ADEMOD, CDMA, EVDO, TDS, VSA, WCDMA

[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE <Mode>

Defines whether the duration of the level measurement used to determine the optimal reference level (for `SENS:ADJ:LEV`) is determined automatically or if the value defined via `[SENSe:]ADJust:CONFigure:LEVel:DURation` is used.

Parameters:

<Mode> AUTO | MANual

*RST: AUTO

Example: `ADJ:CONF:LEV:DUR:MODE MAN`
Specifies manual definition of the measurement duration.
`ADJ:CONF:LEV:DUR:5`
Specifies the duration manually.

Mode: A, CDMA, EVDO, TDS, VSA, WCDMA

[SENSe:]ADJust:FREQuency

Defines the center frequency automatically by determining the highest level in the frequency span.

Example: `ADJ:FREQ`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

[SENSe:]ADJust:LEVel

This command automatically sets the optimal reference level for the current measurement.

Example: `ADJ:LEV`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

SENSe:BANDwidth subsystem

[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 4.3.2.5, "Selecting the Appropriate Filter Type", on page 24.

If the resolution bandwidth is modified, the coupling to the span is automatically switched off.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND 1 MHz`
Sets the resolution bandwidth to 1 MHz

Mode: all, except ADEMOD

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command either automatically couples the resolution bandwidth of the instrument to the span or cancels the coupling.

The automatic coupling adapts the resolution bandwidth to the currently set frequency span according to the relationship between frequency span and resolution bandwidth. The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

The ratio resolution bandwidth/span can be modified with the `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` command.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:AUTO OFF`
Switches off the coupling of the resolution bandwidth to the span.

Mode: A-F, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>

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

This command is only available when using the sweep type "FFT".

Parameters:
<FilterMode> WIDE | AUTO | NARRow

WIDE
The FFT filters with the wider partial span are used.

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

NARRow
The FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.

*RST: AUTO

Example: `BAND:TYPE FFT`
Select FFT filter.

Example: `BAND:FFT NARR`
Select narrow partial span for FFT filter.

Mode: all, except ADEMOD

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio resolution bandwidth (Hz)/span (Hz). The ratio to be entered is reciprocal to the ratio span/RBW used in manual operation.

Parameters:
<Ratio> 0.0001 to 1

*RST: 0.01

Example: `BAND:RAT 0.1`

Mode: A, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command switches the filter type for the resolution bandwidth.

For detailed information on filters see chapter 4.3.2.5, "Selecting the Appropriate Filter Type", on page 24 and chapter 4.3.2.6, "List of Available RRC and Channel Filters", on page 24.

When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.

5 Pole filters are not available when using the sweep type "FFT".

Parameters:

<FilterType>

NORMal
Gaussian filters

FFT
FFT filters

CFILter
channel filters

RRC
RRC filters

PULSe
EMI (6dB) filters

P5
5 Pole filters

*RST: NORMal

Example: `BAND:TYPE NORM`

Mode: all, except ADEMOD

[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>

This command defines the instruments video bandwidth. The available video bandwidths are specified in the data sheet.

The command is not available if FFT filtering is switched on and the set bandwidth is ≤ 30 kHz or if the quasi-peak detector is switched on.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND:VID 10 kHz`

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>

This command either automatically couples the instruments video bandwidth to the resolution bandwidth or cancels the coupling.

The ratio video bandwidth/resolution bandwidth can be modified with the `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` command.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:VID:AUTO OFF`

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>

This command defines the ratio video bandwidth (Hz)/resolution bandwidth (Hz).The ratio to be entered is reciprocal to the ratio RBW/VBW used in manual operation.

Parameters:

<Ratio> 0.01 to 1000

*RST: 3

Example: `BAND:VID:RAT 3`

Sets the coupling of video bandwidth to video bandwidth = 3*resolution bandwidth

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>

This command selects the position of the video filter in the signal path, provided that the resolution bandwidth is ≤100 kHz.

The essential difference between the two modes is the transient response at falling signal edges: If LINear is selected, the measurement with logarithmic level scaling yields a much "flatter" falling edge than LOGarithmic. This behavior is due to the conversion of linear power into logarithmic level. If the linear power is halved, the level decreases by only 3 dB.

Parameters:

<Mode> LOGarithmic | LINear

LINear
The video filter is connected ahead of the logarithmic amplifier (default).

LOGarithmic
The video filter follows the logarithmic amplifier

*RST: LIN

Example: `BAND:VID:TYPE LIN`

Video filter ahead of the logarithmic amplifier

Mode: A, CDMA, EVDO, TDS, WCDMA

SENSe:FREQuency subsystem

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency of the analyzer or the measuring frequency for span = 0.

Parameters:

<Frequency> <numeric_value>

Range: 0 to fmax
*RST: fmax/2
Default unit: Hz
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:CENT 100 MHz`

Mode: all

[SENSe:]FREQuency:CENTer:STEP[:VALue] <StepSize>

This command defines the step size of the center frequency.

Parameters:

<StepSize> <numeric_value>

Range: 1 to 1000000000
*RST: - (AUTO 0.1 × SPAN is switched on)
Default unit: Hz

Example: `FREQ:CENT:STEP 120 MHz`

Mode: all

[SENSe:]FREQuency:CENTer:STEP:AUTO <State>

This command couples the step size of the center frequency to the span (ON) or sets the value of the center frequency entered via `[SENSe:]FREQuency:CENTer` (OFF).

Parameters:

<State> ON | OFF

*RST: ON

Example: `FREQ:CENT:STEP:AUTO ON`
Activates the coupling of the step size to the span.

Mode: all

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples the step size of the center frequency to span (span >0) or to the resolution bandwidth (span = 0) or cancels the couplings.

Parameters:

<CouplingType> OFF | SPAN | RBW

SPAN
coupling to frequency display range (for span > 0)

RBW
coupling to resolution bandwidth (for span = 0)

OFF
manual input, no coupling

*RST: SPAN

Example: `FREQ:CENT:STEP:LINK SPAN`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Value>

This command couples the step size of the center frequency with a factor to the span (span >0) or to the resolution bandwidth (span = 0).

Parameters:

<Value> 1 to 100 PCT

*RST: (AUTO 0.1 × SPAN is switched on)

Example: `FREQ:CENT:STEP:LINK:FACT 20PCT`

Mode: A, ADEMOD, CDMA, EVDO, TDS, WCDMA

[SENSe:]FREQuency:OFFSet <Offset>

This command defines the frequency offset of the instrument.

Parameters:

<Offset> <numeric_value>

Range: -100 GHz to 100 GHz
*RST: 0 Hz

Example: `FREQ:OFFS 1GHZ`

Mode: all

[SENSe:]FREQuency:SPAN <Span>

This command defines the frequency span.

Parameters:

<Span> min span to fmax

*RST: fmax
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:SPAN 10MHz`

Mode: A, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]FREQuency:SPAN:FULL

This command sets the frequency span to its maximum.

Example: `FREQ:SPAN:FULL`

Mode: A, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]FREQuency:STARt <Frequency>

This command defines the start frequency of the analyzer. This command is only available with span > 0.

Parameters:

<Frequency> 0 to (fmax - min span)

*RST: 0

f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STAR 20MHz`

Mode: A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

[SENSe:]FREQuency:STOP <Frequency>

This command defines the stop frequency of the analyzer. This command is only available with span > 0.

Parameters:

<Frequency> min span to fmax

*RST: fmax

f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:STOP 2000 MHz`

Mode: A-F, CDMA, EVDO, RT, TDS, NF, PHN, WCDMA

SENSe:POWer subsystem

[SENSe:]POWer:ACHannel:ACPairs <Value>

This command sets the number of adjacent channels (upper and lower channel in pairs).The figure 0 stands for pure channel power measurement.

Parameters:

<Value> 0 to 12 (WCDMA: 0 to 3)

*RST: 1

Example: `POW:ACH:ACP 3`
Sets the number of adjacent channels to 3, i.e. the adjacent channel and alternate adjacent channels 1 and 2 are switched on.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:MODE <Mode>

This command switches between absolute and relative adjacent channel measurement. The command is only available with span > 0 and if the number of adjacent channels is greater than 0.

For the relative measurement the reference value is set to the currently measured channel power using the command `[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE`.

Parameters:

<Mode> ABSolute | RELative

ABSolute
absolute adjacent channel measurement

RELative
relative adjacent channel measurement

*RST: RELative

Example: `POW:ACH:MODE REL`
Sets the adjacent channel measurement mode to relative.

Mode: A-F, CDMA, EVDO, OFDM, OFDMA/WiBro, WCDMA, TDS

[SENSe:]POWer:ACHannel:PRESet:RLEVel

This command adapts the reference level to the measured channel power and – if required – switches on previously the adjacent channel power measurement. This ensures that the signal path of the instrument is not overloaded. Since the measurement bandwidth is significantly smaller than the signal bandwidth in channel power measurements, the signal path can be overloaded although the trace is still significantly below the reference level. If the measured channel power equals the reference level, the signal path is not overloaded.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Example: `POW:ACH:PRES:RLEV;*WAI`
Adapts the reference level to the measured channel power.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE

This command sets the reference value to the currently measured channel power for the relative measurement.

Example: `POW:ACH:REF:AUTO ONCE`

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel> <Spacing>

This command defines the spacing between the alternate adjacent channels and the TX channel (ALT1, ALT2, ...). A modification of a higher adjacent-channel spacing causes a change by the same factor (new spacing value/old spacing value) in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.

Suffix:

<channel> 1...11
the alternate adjacent channel

Parameters:

<Spacing> 100 Hz to 2000 MHz

*RST: 40 kHz (ALT1), 60 kHz (ALT2), 80 kHz (ALT3), ...

Example: `POW:ACH:SPAC:ALT1 100 kHz`
Sets the spacing between TX channel and alternate adjacent channel 1 (ALT1) from 40 kHz to 100 kHz. In consequence, the spacing between the TX channel and all higher alternate adjacent channels is increased by the factor 100/40 = 2.5: ALT2 = 150 kHz, ALT3 = 200 kHz, ALT4 = 250 kHz.

Mode: A-F, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:ACHannel: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 127).

Parameters:

<Number> 1 to 18

*RST: 1

Example: `POW:ACH:TXCH:COUN 3`

Mode: A, CDMA, EVDO, TDS, WCDMA

[SENSe:]POWer:TRACe <TraceNumber>

This command assigns the channel/adjacent channel power measurement to the indicated trace. The corresponding trace must be active, i.e. its state must be different from blank.

Note: The measurement of the occupied bandwidth (OBW) is performed on the trace on which marker 1 is positioned. To evaluate another trace, marker 1 must be positioned to another trace with `CALCulate<n>:MARKer<m>:TRACe`.

Parameters:

<TraceNumber> 1 to 6

Example: `POW:TRAC 2`
Assigns the measurement to trace 2.

Mode: A, CDMA, EVDO, TDS, WCDMA

SENSe:SWEep subsystem

[SENSe:]SWEep:COUNt <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameters:

<NumberSweeps> 0 to 32767

*RST: 0 (GSM: 200)

Example: `SWE:COUN 64`
Sets the number of sweeps to 64.
`INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, GSM, NF

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:

<Polarity> POSitive | NEGative

*RST: POSitive

Example: `SWE:EGAT:POL POS`

Mode: A, ADEMOD, BT, EVDO, TDS, WCDMA

[SENSe:]SWEep:POINts <NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

Parameters:

<NumberPoints> 101 to 32001

*RST: 691 (NF: 11)

Example: `SWE:POIN 251`

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, NF, PHN, WCDMA

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

If this command is used in analyzer mode, automatic coupling to resolution bandwidth and video bandwidth is switched off.

Parameters:

<Time> refer to data sheet

*RST: (AUTO is set to ON)

Example: `SWE:TIME 10s`

Mode: ALL

[SENSe:]SWEep:TIME:AUTO <State>

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If `[SENSe:]SWEep:TIME` is used, automatic coupling is switched off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `SWE:TIME:AUTO ON`

Activates automatic sweep time.

Mode: A, BT, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]SWEep:TYPE <Type>

Parameters:

<Type> SWE | AUTO | FFT

SWE
Sweep list

AUTO
Automatic selection of the sweep type.

FFT
FFT mode

*RST: AUTO

Sets the sweep type.

Example: `SWE:TYPE FFT`

Mode: all

Other Commands in the SENSe Subsystem

[SENSe:]AVERage<n>:COUNt <NoMeasurements>

This command defines the number of measurements which contribute to the average value in the window specified by the AVERage<n> suffix.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the `[SENSe<source>:]SWEep:COUNt` command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<NoMeasurements> 0 to 32767

*RST: 0

Example: `SWE:CONT OFF`
Switching to single sweep mode.
`AVER:COUN 16`
Sets the number of measurements to 16.
`AVER:STAT ON`
Switches on the calculation of average.
`INIT;*WAI`
Starts the measurement and waits for the end of the 16 sweeps.

Mode: all

[SENSe:]AVERage<n>[:STATe<Trace>] <State>

This command switches on or off the average calculation for the selected trace in the window specified by the AVERage<n> suffix.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<Trace> 1...6
trace

Parameters:

<State> ON | OFF

*RST: OFF

Example: `AVER OFF`
Switches off the average calculation for trace 1.
`AVER:STAT3 ON`
Switches on the average calculation for trace 3.

Mode: all

4.6.7 STATus:QUEStionable subsystem (R&S FSV-K72)

The STATus subsystem contains the commands for the status reporting system (for details refer to the description of remote control basics in the base unit). *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.

4.6.7.1 STATus:QUEStionable:SYNC subsystem (R&S FSV-K72)

This register contains information on the error situation in the code domain power analysis of the R&S FSV-K72 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.

Return values:

<Result> 0 | 1 | 2 | 3 to 4 | 5 | 6 to 14 | 15

Bit No.
Definition

0
Not used.

1
Frame Sync failed
This bit is set when synchronization is not possible within the application.
Possible reasons:
Incorrectly set frequency
Incorrectly set level
Incorrectly set scrambling code
Incorrectly set values for Q-INVERT or SIDE BAND INVERT
Invalid signal at input
Antenna 1 synchronization is not possible (Time Alignment Error measurements, R&S FSV-K72 only)

2
For Time Alignment Error measurements (R&S FSV-K72 only): bit is set if antenna 2 synchronization is not possible;
Otherwise: not used.

3 to 4
Not used.

5
Incorrect Pilot Symbol
This bit is set when one or more of the received pilot symbols are not equal to the specified pilot symbols of the 3GPP standard.
Possible reasons:
Incorrectly sent pilot symbols in the received frame.
Low signal to noise ratio (SNR) of the WCDMA signal.
One or more code channels has a significantly lower power level compared to the total power. The incorrect pilots are detected in these channels because of low channel SNR.
One or more channels are sent with high power ramping. In slots with low relative power to total power, the pilot symbols might be detected incorrectly (check the signal quality by using the symbol constellation display).

6 to 14
Not used.

15
This bit is always 0.

Example: `STAT:QUES:SYNC[:EVEN]?`

Usage: Query only

Mode: WCDMA, CDMA, EVDO

4.6.8 TRACe subsystem (R&S FSV-K72)

The TRACe subsystem controls access to the instruments internal trace memory.

4.6.8.1 Description of Channel Types

The following table describes the channel types and their abbreviations.

Channel type	Description
0 - DPCH	**D**edicated **P**hysical **Ch**annel of a standard frame
1 - PICH	**P**aging **I**ndication **Ch**annel
2 - CPICH	**C**ommon **Pi**lot **Ch**annel
3 - PSCH	**P**rimary **S**ynchronization **Ch**annel
4 - SSCH	**S**econdary **S**ynchronization **Ch**annel
5 - PCCPCH	**P**rimary **C**ommon **C**ontrol **P**hysical **Ch**annel
6 - SCCPCH	**S**econdary **C**ommon **C**ontrol **P**hysical **Ch**annel
7 - HS_SCCH	HSDPA: **H**igh **S**peed **S**hared **C**ontrol **Ch**annel
8 - HS_PDSCH	HSDPA: **H**igh **S**peed **P**hysical **D**ownlink **S**hared **Ch**annel
9 - CHAN	Channel without any pilot symbols (QPSK modulated)
10 - CPRSD	Dedicated Physical Channel in **c**om**pr**es**s**e**d** mode
11 - CPR-TPC	Dedicated Physical Channel in **c**om**pr**essed mode **TPC** symbols are sent in the first slot of the gap.
12 - CPR-SF/2	Dedicated Physical Channel in **c**om**pr**essed mode using half spreading factor (**SF/2**).
13 - CPR-SF/2-TPC	Dedicated Physical Channel in **c**om**pr**essed mode using half spreading factor (**SF/2**). **TPC** symbols are sent in the first slot of the gap.
14 - EHICH-ERGCH	HSUPA: **E**nhanced **HARQ** Hybrid Acknowledgement **I**ndicator **Ch**annel HSUPA: **E**nhanced **R**elative **G**rant **Ch**annel
15 - EAGCH	E-AGCH: **E**nhanced **A**bsolute **G**rant **Ch**annel
16 - SCPICH	**S**econdary **C**ommon **Pi**lot **Ch**annel

4.6.8.2 TRACe:DATA subsystem (R&S FSV-K72)

The `TRACe:DATA` subsystem provides commands to query the trace results depending on the selected measurement mode.

TRACe<n>[:DATA]? <MeasMode>

This command reads trace data out of the instrument. Depending on the selected measurement mode, the results vary. For a detailed description of the results, see the individual commands:

- TRACe<n>[:DATA]? ABITstream<1...4>
- TRACe<n>[:DATA]? ATRACE<1...4>
- TRACe<n>[:DATA]? CTABLe
- TRACe<n>[:DATA]? CWCDp
- TRACe<n>[:DATA]? FINAL1
- TRACe<n>[DATA]? LIST
- TRACe<n>[:DATA]? PWCDp
- TRACe<n>[:DATA]? TPVSlot
- TRACe<n>[:DATA]? TRACE<t>

Suffix:

<n> 1...4
irrelevant

Query parameters:

<MeasMode> ATRACE1 | AWCDMATRACE2 | ATRACE3 | ATRACE4| FINAL1 | TRACE1 | TRACE2 | TRACE3 | TRACE4 | ABITstream1 | ABITstream2 | ABITstream3 | ABITstream4 | PWCDp | CWCDp | CTABLe | TPVSlot | LIST

The data type defines which type of trace data is read.

Example: `TRAC:DATA ATRACE3`

Usage: Query only

Mode: WCDMA

TRACe<n>[:DATA]? <ABitstreamNo>

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 123).

The output format is identical to that of the `TRAC1:DATA? TRAC2` command for an activated Bitstream display (see `TRACe<n>[:DATA]` on page 209). 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).

If "HS-DPA/UPA" is disabled (see "Channel Detection Settings" on page 56 or `[SENSe:]CDPower:HSDPamode` on page 177), the values and number of the bits are as follows:

Unit	[]
Value range	{0, 1, 6, 9} 0 - Low state of a transmitted bit 1 - High state of a transmitted bit 6 - Bit of a symbol of a suppressed slot of a DPCH in Compressed Mode (DPCH-CPRSD) 9 - Bit of a suppressed symbol of a DPCH (e.g. TFCI off)
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},.... , $Bit_{NSymb\ 0}$, $Bit_{NSymb\ 1}$

If "HS-DPA/UPA" is enabled (see "Channel Detection Settings" on page 56 or `[SENSe:]CDPower:HSDPamode` on page 177), the values and number of the bits are as follows:

Unit	[]
Value range	{0, 1, 6, 7, 8, 9} 0 - Low state of a transmitted bit 1 - High state of a transmitted bit 6 - Bit of a symbol of a suppressed slot of a DPCH in Compressed Mode (DPCH-CPRSD) 7 - Bit of a switched-off symbol of an HS-PDSCH channel 8 - Fill value for unused bits of a lower order modulation symbol in a frame containing higher order modulation 9 - Bit of a suppressed symbol of a DPCH (e.g. TFCI off)
Bits per symbol	$N_{BitPerSymb}$ = {2, 4, 6}
Symbols per slot	$N_{Symb\_Slot} = 10*2^{(8\text{-Code Class})}$
Symbols per frame	$N_{Symb\_Frame} = 15*N_{Symb\_Slot} = 150*2^{(8\text{-Code Class})}$
Number of bits	$N_{Bit} = N_{Symb\_Frame} * N_{BitPerSymb\_MAX}$
Format (16QAM)	Bit_{00},Bit_{01},Bit_{02},Bit_{03},Bit_{10},Bit_{11},Bit_{12},Bit_{13},.... ... , $Bit_{NSymb\_Frame\ 0}$,$Bit_{NSymb\_Frame\ 1}$,$Bit_{NSymb\_Frame\ 2}$, $Bit_{NSymb\_Frame\ 3}$
Format (64QAM)	Bit_{00}, Bit_{01}, Bit_{02}, Bit_{03}, Bit_{04}, Bit_{05}, Bit_{10}, Bit_{11}, Bit_{12}, Bit_{13}, Bit_{14}, Bit_{15}, ..., $Bit_{NSymb\_Frame\ 0}$,$Bit_{NSymb\_Frame\ 1}$,$Bit_{NSymb\_Frame\ 2}$,$Bit_{NSymb\_Frame\ 3}$,$Bit_{NSymb\_Frame\ 4}$,$Bit_{NSymb\_Frame\ 5}$

The values 7 and 8 are only used in case of a varying modulation type of an HS-PDSCH channel. In this case the number of bits per symbol (NBitPerSymb) varies, as well. However, the length of the transmitted bit vector (NBit) depends only on the maximum number of bits per symbol in that frame. Thus, if the modulation type changes throughout the frame this will not influence the number of bits being transmitted.

Example 1:

Some slots of the frame are 64QAM modulated, other are 16QAM and QPSK modulated and some are switched OFF (NONE). If one or more slots of the frame are 64QAM modulated, six bits per symbol are transmitted and if the highest modulation order is 16QAM, four bits per symbol are transmitted. In any slot of the frame with lower order modulation, the first two or four of the four or six bits are marked by the number 8 and the last bits represent the transmitted Remote Control Commands symbol. If no power is transmitted in a slot, four or six entries per symbol of value 7 are transmitted.

Example 2:

Some slots of the frame are QPSK modulated and some are switched OFF. If one or more slots of the frame are QPSK modulated and no slot is 16QAM modulated, 2 bits per symbol are transmitted. If no power is transmitted in a slot, 2 entries per symbol of value 7 are transmitted.

Example 3:

Some slots of a DPCH are suppressed because of compressed mode transmittion. The bits of the suppressed slots are marked by the digit '6'. In this case, always 2 bits per symbol are transmitted.

Suffix:

<n>	1...4 irrelevant

Query parameters:

<ABitstreamNo>	**ABITstream1 | ABITstream2 | ABITstream3 | ABITstream4** Number of the active bit stream.

Example:	`CALC2:FEED "XTIM:CDP:BSTReam"`
	Sets the result display for screen B to bit stream.
	`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]? <ATRACE>

This command returns a list of absolute frequency errors vs slot for all slots. In contrast to the scope presentation and the TRACE<t> parameter return value, absolute values are returned.

Suffix:

<n>	1...4 irrelevant

Return values:

<Result>	SlotNumber 0, FreqError 0, …., SlotNumber 14, FreqError 14 Comma-separated list with 15 entries, one for each slot Default unit: Hz

Query parameters:

<ATRACE>	**ATRACE1 | ATRACE2 | ATRACE3 | ATRACE4 | ATRACE5 | ATRACE6** Trace number for which absolute values are returned.
Example:	`TRAC2:DATA? ATRACE2` Returns a list of absolute frequency errors for all slots in trace 2 (screen B).
Usage:	Query only
Mode:	WCDMA

TRACe<n>[:DATA]? CTABLe

This command returns the pilot length and the channel state (active, inactive) in addition to the values returned for "TRACE<t>".

Suffix:

<n>	1...4 irrelevant

Return values:

<Result> < class>,<channel number>,<absolute level>,<relative level>,<timing offset> or <I/Q-mapping>, <pilot length>, <active|inactive>

Comma-separated list with 7 values for each channel; the pilot length is specified in symbols.
For details on the other result information, see `TRACe<n>[:DATA]` on page 209.

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<t>" (see `TRACe<n>[:DATA]` on page 209).

Suffix:

<n> 1...4
irrelevant

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.

<pilot length>
Pilot length of the code channel. According to the 3GPP standard, the pilot length range depends on the code class. {0,2,4,8,16} [symbols]

<active flag>
Flag to indicate whether a channel is active
0 – channel not active
1 – channel active

<channel type>
Channel type indication {0 … 16}
For a description of the channel types, see chapter 4.6.8.1, "Description of Channel Types", on page 200.

<modulation type>
Modulation type of the code channel at the selected channel slot. (The channel slot can be marked by adjusting SELECT CPICH slot.) {2,4,15}
2 – QPSK: Modulation type QPSK.
4 – 16QAM: Modulation type 16QAM.
15 – NONE: There is no power in the selected channel slot [slot is switched OFF]. (According to 3GPP, the power of an HSDPA channel can be switched every 2 ms, i.e. 3 slots.)

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]? FINAL1

This command returns the peak list. For each peak the following results are given:

Suffix:

<n> 1...4
irrelevant

Return values:

<Result> <freq1>, <level1>, <delta level 1>, <freq2>, <level2>, <delta level 2>, … <freq n>, <level n>, <delta level n>

Example: `TRAC2:DATA? FINAL1`

Returns a list of peak values.

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 `CALCulate<n>:PSEarch|PEAKsearch:AUTO` on page 158).

Suffix:

<n> 1...4

irrelevant

Return values:

<Result> <No>, <Start>, <Stop>, <Rbw>, <Freq>, <Levelabs>, <Levelrel>, <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 with in the range

Levelabs [dBm]
absolute power of the peak with in the range

Levelrel [dB]
relative power of the peak with in the range related to channel power.

Delta [dB]
power difference to margin power

Limitcheck [0 | 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]? PWCDp

This command returns the pilot length in addition to the values returned for "TRACE<t>".

Suffix:

<n> 1...4
irrelevant

Return values:

<Result> < class>,<channel number>,<absolute level>,<relative level>,<timing offset> or <I/Q-mapping>, <pilot length>

Comma-separated list with six values for each channel; the pilot length is specified in symbols.
For details on the other result information, see `TRACe<n>[:DATA]` on page 209.

Example: `TRAC:DATA? PWCDp`
Returns a list of channel information, including the pilot length.

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<t> parameter return value, absolute values are returned.

Suffix:

<n> 1...4
irrelevant

Return values:

<Result> <slot number>, <level value in dBm>

Comma-separated list with 16 pairs of slots (slot number of CPICH) and level values (for 16 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 4.4.1.2, "Measurement Modes in Code Domain Analyzer", on page 32.

Suffix:

<n>	1...4 irrelevant
<t>	1...4 trace 1, 2, 3, 4

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

4.6.9 Other Commands Referenced in this Manual

The following commands are identical to those in the base unit and are included in this manual only because they are specifically referenced to here.

See also chapter 4.6.6.2, "Other SENSe Commands Referenced in this Manual", on page 184 and chapter 4.6.2.4, "Other CALCulate Commands Referenced in this Manual", on page 132

FORMat:DEXPort:DSEParator <Separator>

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

The suffix <1…4> is irrelevant, the separator is defined globally for all windows.

Parameters:

<Separator> POINt | COMMA

*RST: (factory setting is POINt; *RST does not affect setting)

Example: `FORM:DEXP:DSEP POIN`
Sets the decimal point as separator.

Mode: all

DIAGnostic<n>:SERVice:NSOurce <State>

This command switches the 28 V supply of the noise source on the front panel on or off.

Suffix:

<n>	irrelevant

Parameters:

<State>	ON | OFF *RST: OFF
Example:	`DIAG:SERV:NSO ON`
Mode:	all

INITiate<n>:CONMeas

This command continues a stopped measurement at the current position in single sweep mode. The function is useful especially for trace functions MAXHold, MINHold and AVERage, if the previous results are not to be cleared with sweep count > 0 or average count > 0 on restarting the measurement (INIT:IMMediate resets the previous results on restarting the measurement).

The single sweep mode is automatically switched on. Synchronization to the end of the indicated number of measurements can then be performed with the commands *OPC, *OPC? or *WAI. In the continuous sweep mode, synchronization to the sweep end is not possible since the overall measurement "never" ends.

Suffix:

<n>	irrelevant

Example:	`INIT:CONT OFF`
	Switches to single sweep mode.
	`DISP:WIND:TRAC:MODE AVER`
	Switches on trace averaging.
	`SWE:COUN 20`
	Setting the sweep counter to 20 sweeps.
	`INIT;*WAI`
	Starts the measurement and waits for the end of the 20 sweeps.
	`INIT:CONM;*WAI`
	Continues the measurement (next 20 sequences) and waits for the end.

Mode:	A, ADEMOD, CDMA, EVDO, VSA, WCDMA, TDS

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

In the **"Spectrum" mode**, this setting refers to the sweep sequence (switching between continuous/single sweep).

Suffix:

<n>	irrelevant

Parameters:

<State> ON | OFF

*RST: ON

Example: `INIT:CONT OFF`
Switches the sequence to single sweep.
`INIT:CONT ON`
Switches the sequence to continuous sweep.

Mode: all

INITiate<n>:ESPectrum

This command starts a Spectrum Emission Mask measurement.

Suffix:

<n> irrelevant

Example: `INIT:ESP`
Starts a Spectrum Emission Mask measurement.

Mode: A, CDMA, EVDO, TDS, WCDMA

INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

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

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<Value> <numeric_value> in dB; range specified in data sheet

*RST: 10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`
Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Mode: all

INPut:ATTenuation:AUTO <State>

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP:ATT:AUTO ON`
Couples the attenuation set on the attenuator to the reference level.

Mode: All

INPut:COUPling <CouplingType>

Toggles the RF input of the analyzer between AC and DC coupling.

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<CouplingType> AC | DC

*RST: AC

Example: `INP:COUP:DC`

Mode: A, ADEMOD, BTS, CDMA, EVDO, TDS, VSA, WCDMA

INPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital baseband input from the optional Digital Baseband interface (option R&S FSV-B17).

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

Return values:

<ConnState> Defines whether a device is connected or not.

0
No device is connected.

1
A device is connected.

<DeviceName> Device ID of the connected device

<SerialNumber> Serial number of the connected device

<PortName> Port name used by the connected device

<SampleRate> Maximum or currently used sampling rate of the connected device in Hz (depends on the used connection protocol version; indicated by <SampleRateType> parameter)

<MaxTransferRate> Maximum data transfer rate of the connected device in Hz

<ConnProtState> State of the connection protocol which is used to identify the connected device.

Not Started

Has to be Started

Started

Passed

Failed

Done

<PRBSTestState> State of the PRBS test.

Not Started

Has to be Started

Started

Passed

Failed

Done

<SampleRateType> **0**
Maximum sampling rate is displayed

1
Current sampling rate is displayed

<Placeholder> for future use; currently "0"

Example: `INP:DIQ:CDEV?`
Result:
`1,SMU200A,103634,Out A,70000000,100000000,Passed,Not Started,0,0`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:AUTO <State>

If enabled, the digital input fullscale level is automatically set to the value provided by the connected device (if available).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:DIQ:RANG:AUTO ON`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:COUPling <State>

If enabled, the reference level for digital input is adjusted to the full scale level automatically if the fullscale level changes.

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:DIQ:RANG:COUP OFF`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe[:UPPer] <Level>

Defines the level that should correspond to an I/Q sample with the magnitude "1".

It can be defined either in dBm or Volt (see "Full Scale Level" on page 79).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level> <numeric value>

Range: 70.711 nV to 7.071 V
*RST: 1 V

Example: `INP:DIQ:RANG 1V`

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

INPut:DIQ:RANGe[:UPPer]:UNIT <Unit>

Defines the unit of the full scale level (see "Level Unit" on page 79). The availability of units depends on the measurement application you are using.

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level> V | dBm | dBpW | W | dBmV | dBuV | dBuA | A

*RST: Volt

Example: `INP:DIQ:RANG:UNIT A`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:SRATe <SampleRate>

This command specifies the sample rate of the digital baseband IQ input signal (see "Input Sample Rate" on page 78).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<SampleRate>

Range: 1 Hz to 10 GHz
*RST: 32 MHz

Example: INP:DIQ:SRAT 200 MHz

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

INPut:DIQ:SRATe:AUTO <State>

If enabled, the sample rate of the digital baseband IQ input signal is set automatically by the connected device, if the currently used sample rate is provided (indicated by the <SampleRateType> parameter in the result of the `INPut:DIQ:CDEVice` command.

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (B17) description of the base unit.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:DIQ:SRAT:AUTO ON`

Mode: IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:EATT <Attenuation>

Requires option R&S FSV-B25.

Switches the electronic attenuator on (if not already active) and allows the attenuation of the electronic attenuator to be set.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

The attenuation can be varied in 1 dB steps from 0 to 25 dB. Other entries are rounded to the next lower integer value.

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

Parameters:
<Attenuation> 0...25

*RST: 0 dB (OFF)

Example: `INP1:EATT 10 dB`

Mode: all

INPut:EATT:AUTO <State>

Switches the automatic behaviour of the electronic attenuator on or off. If activated, electronic attenuation is used to reduce the operation of the mechanical attenuation whenever possible.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:
<State> ON | OFF

*RST: ON

Example: `INP1:EATT:AUTO OFF`

Mode: all

INPut:EATT:STATe <State>

Switches the electronic attenuator on or off.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:
<State> ON | OFF

*RST: OFF

Example: `INP:EATT:STAT ON`
Switches the electronic attenuator into the signal path.

Mode: all

INPut:GAIN:STATe <State>

This command switches the preamplifier on or off (only for option RF Preamplifier, R&S FSV-B22/B24).

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:GAIN:STAT ON`
Switches on 20 dB preamplification.

Mode: A, ADEMOD, BT, CDMA, EVDO, NF, PHN, WCDMA, GSM, VSA, TDS

INPut:IMPedance <Value>

This command sets the nominal input impedance of the instrument. The set impedance is taken into account in all level indications of results.

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

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<Value> 50 | 75

*RST: 50 Ω

Example: `INP:IMP 75`

Mode: all

INPut:SELect <Source>

This command selects the signal source for measurements.

Parameters:

<Source> RF | DIQ

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Baseband Digital (IQ) (only available with Digital Baseband Interface, option R&S FSV-B17)

*RST: RF

Example: INP:SEL RF

Mode: A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN

MMEMory:STORe<n>:LIST <FileName>

This command stores the current list evaluation results in a `<file name>.dat` file. The file consists of a data section containing the list evaluation results.

Suffix:

<n> irrelevant

Parameters:

<FileName> <file name>

Example: `MMEM:STOR:LIST 'test'`
Stores the current list evaluation results in the `test.dat` file.

Mode: A, ADEMOD, CDMA, EVDO, NF, TDS, WCDMA

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command stores the selected trace in the specified window in a file with ASCII format. The file format is described in chapter 4.3.2.7, "ASCII File Export Format", on page 26

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 210).

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<Trace> 1 to 6

selected measurement trace

<FileName> DOS file name
The file name includes indication of the path and the drive name.
Indication of the path complies with DOS conventions.

Example: `MMEM:STOR:TRAC 3,'TEST.ASC'`
Stores trace 3 in the file TEST.ASC.

Mode: all

SYSTem:DISPlay:UPDate <State>

In remote control mode, this command switches on or off the instrument display. If switched on, only the diagrams, traces and display fields are displayed and updated.

The best performance is obtained if the display output is switched off during remote control.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `SYST:DISP:UPD ON`

Mode: all

TRIGger<n>[:SEQuence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger source (for digital input via the Digital Baseband Interface, R&S FSV-B17).

Suffix:

<n> irrelevant

Parameters:

<Level>

Range: -50 dBm to +20 dBm

*RST: -20 DBM

Example: `TRIG:LEV:BB -30DBM`

Mode: All

TRIGger<n>[:SEQuence]:BBPower:HOLDoff <Value>

This command sets the holding time before the next BB power trigger event (for digital input via the Digital Baseband Interface, R&S FSV-B17).

Suffix:

<n> irrelevant

Parameters:

<Value> <numeric_value> in s: 150 ns to 1000 s

*RST: 150 ns

Example: `TRIG:SOUR BBP`

Sets the baseband power trigger source.

`TRIG:BBP:HOLD 200 ns`

Sets the holding time to 200 ns.

Mode: all

TRIGger<n>[:SEQuence]:IFPower:HOLDoff <Value>

This command sets the holding time before the next IF power trigger event.

Suffix:

<n> irrelevant

Parameters:

<Value> <numeric_value> in s: 150 ns to 1000 s

*RST: 150 ns

Example: `TRIG:SOUR IFP`

Sets the IF power trigger source.

`TRIG:IFP:HOLD 200 ns`

Sets the holding time to 200 ns.

Mode: A-F, ADEMOD, CDMA, EVDO, GSM, VSA, OFDM, OFDMA/WiBro, TDS, WCDMA

TRIGger<n>[:SEQuence]:IFPower:HYSTeresis <Value>

This command sets the limit that the hysteresis value for the IF power trigger has to fall below in order to trigger the next measurement.

Suffix:

<n>	irrelevant

Parameters:

<Value>	<numeric_value> in dB: 3 dB to 50 dB
	*RST: 3 dB
Example:	`TRIG:SOUR IFP`
	Sets the IF power trigger source.
	`TRIG:IFP:HYST 10DB`
	Sets the hysteresis limit value.
Mode:	ALL

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

Suffix:

<n>	irrelevant

Parameters:

<Delay>	
	Range: zero span: -sweeptime (see data sheet) to 30 s; span: 0 to 30 s
	*RST: 0 s
Example:	`TRIG:HOLD 500us`
Mode:	All

TRIGger<n>[:SEQuence]:LEVel[:EXTernal] <TriggerLevel>

This command sets the level of the external trigger source in Volt.

Suffix:

<n>	irrelevant

Parameters:

<TriggerLevel>	
	Range: 0.5 V to 3.5 V
	*RST: 1.4 V
Example:	`TRIG:LEV 2V`
Mode:	All

TRIGger<n>[:SEQuence]:SLOPe <Type>

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Suffix:

<n> irrelevant

Parameters:

<Type> POSitive | NEGative

*RST: POSitive

Example: `TRIG:SLOP NEG`

Mode: all

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source for the start of a sweep.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:

<n> irrelevant

Parameters:

<Source> IMMediate | EXTern | IFPower | TIME | VIDeo

IMMediate
Free Run

EXTern
External trigger

IFPower
Second intermediate frequency

TIME
Time interval

VIDeo
Video mode is only available in the time domain and only in Spectrum mode.

BBPower
Baseband power (for digital input via the Digital Baseband Interface, R&S FSV-B17)

*RST: IMMediate

Example: `TRIG:SOUR EXT`
Selects the external trigger input as source of the trigger signal

Mode: ALL

OUTPut:IF[:SOURce] <Source>

This command switches the source of the IF output between the demodulated signal and the IF signal.

The AF output available at the frontpanel can only be used if the IF output source is set to video.

Parameters:

<Source> IF | VIDeo

IF
intermediate frequency output

VIDeo
video output, 200 mV

*RST: IF

Example: `OUTP:IF VID`
Selects the video signal for the IF output connector.

Mode: A

OUTPut:TRIGger <PortLevel>

Sets the Trigger Out port in the Additional Interfaces (option B5 only) to low or high.Thus, you can trigger an additional device via the external trigger port, for example.

Parameters:

<PortLevel> LOW | HIGH

*RST: LOW

Example: `OUTP:TRIG HIGH`

Mode: A

4.7 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-K72 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

4.8 Glossary

CPICH	Common pilot channel (spreading code number 0 at spreading factor 128). The channel constantly contains the symbol (1,1) through out the total length of the 3GPP FDD BTS frame. For the measurements, the CPICH (Primary CPICH) is used for synchronization. For this reason, the CPICH must be contained in the signal to be measured.
Composite EVM	In accordance with the 3GPP specifications, the squared error between the real and imaginary components of the test signal and an ideal reference signal is determined (EVM referenced to the total signal) in a composite EVM measurement.
DPCH	Dedicated physical channel, data channel. The data channels, which can be sent at different transmission rates, are automatically recognized during the measurement.
Inactive channel threshold	Minimum power that a single channel must have as compared to the total signal in order to be recognized as an active channel.
PCCPCH	Primary common control physical channel (spreading code number 1 at spreading factor 128). The channel is used for synchronizing the measurements. For this reason, it must be contained in the signal to be measured.
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.

PICH	Paging indication channel. This special channel is defined in the test models to 3GPP for measurements on base station signals. Since it does not contain any pilot symbols, it cannot automatically be recognized during measurement. Therefore, this channel must be deactivated for CDP measurements.
SCH	Synchronization channel, divided into P-SCH (primary synchronization channel) and S-SCH (secondary synchronization channel). The two channels are required for synchronizing the measurement. Therefore, they must always be contained in the signal to be measured.
Timing offset	Offset between the start of the first slot of a channel and the start of the analyzed 3GPP FDD BTS frame (in multiples of 256 chips).

List of Commands

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