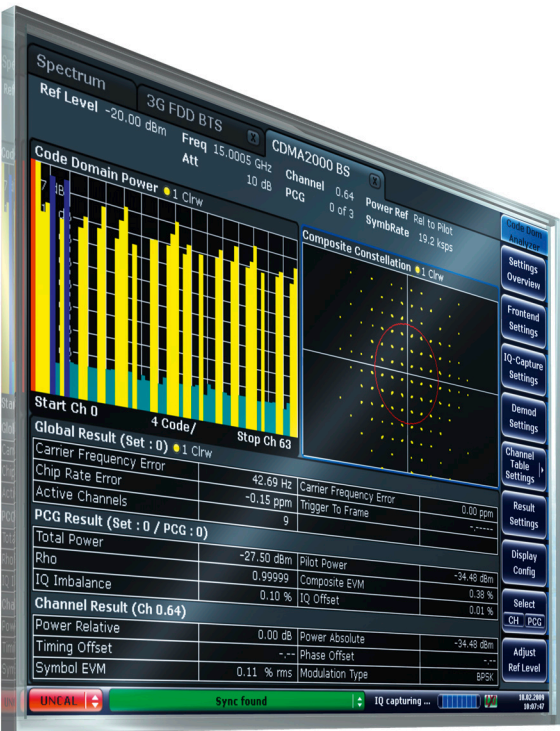# R&S® FSV-K82/-K83
CDMA2000 Analysis
Operating Manual

1176.7626.02 ─ 04

ROHDE&SCHWARZ

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

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

This manual describes the following R&S®FSV models with firmware version 2.30 and higher:

- R&S®FSV 4 (1321.3008K04)
- R&S®FSV 7 (1321.3008K07)
- R&S®FSV 13 (1321.3008K13)
- R&S®FSV 30 (1321.3008K30)
- R&S®FSV 40 (1321.3008K39)
- R&S®FSV 40 (1321.3008K40)

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

- R&S®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)

Contents

1 Preface

1.1 Documentation Overview

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

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

Quick Start Guide

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

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

Operating Manuals

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

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

In the individual option manuals, the specific instrument functions of the option are described in detail. For additional information on default settings and parameters, refer

to the data sheets. Basic information on operating the R&S FSV is not included in the option manuals.

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

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

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

Service Manual

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

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

Online Help

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

Release Notes

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

1.2 Conventions Used in the Documentation

1.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

1.2.2 Conventions for Procedure Descriptions

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

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

1.2.3 Notes on Screenshots

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

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

1.3 How to Use the Help System

Calling context-sensitive and general help

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

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

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

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

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

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

Contents of the help dialog box

The help dialog box contains four tabs:

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

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

Navigating in the table of contents

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

Navigating in the help topics

● To scroll through a page, use the rotary knob or the UP ARROW and DOWN ARROW keys.

● To jump to the linked topic, press the link text on the touchscreen.

Searching for a topic

1. Change to the "Index" tab.

2. Enter the first characters of the topic you are interested in. The entries starting with these characters are displayed.

3. Change the focus by pressing the ENTER key.

4. Select the suitable keyword by using the UP ARROW or DOWN ARROW keys or the rotary knob.

5. Press the ENTER key to display the help topic.

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

Changing the zoom

1. Change to the "Zoom" tab.

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

Closing the help window

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

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

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

● Functions that are based on the Windows7 operating system (e.g. printing or setting up networks) may have a slightly different appearance or require different settings on the Windows XP based models. For such functions, refer to the Windows documentation or the documentation originally provided with the R&S FSV instrument.

● The R&S FSV 1307.9002K03 model is restricted to a maximum frequency of 3 GHz, whereas the 1321.3008K04 model has a maximum frequency of 4 GHz.

● The bandwidth extension option R&S FSV-B160 (1311.2015.xx) is not available for the R&S FSV 1307.9002Kxx models. The maximum usable I/Q analysis bandwidth for these models is 28 MHz, or with option R&S FSV-B70, 40 MHz.

2 Introduction

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

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

This part of the documentation consists of the following chapters:

- chapter 3, "Test Setup for Base Station or Mobile Station Tests", on page 11
  Describes the measurement setup for base station or mobile station tests.
- chapter 4, "Measurement Examples for the CDMA2000 BTS Analysis (option K82)", on page 13
  Explains some basic 1xEV-DO base station tests.
- chapter 5, "Measurement Examples for the CDMA2000 MS Analysis (option K83)", on page 24
  Explains some basic 1xEV-DO mobile station tests.
- chapter 6, "Instrument Functions of the CDMA2000 Analysis", on page 35
  Describes the instrument functions of CDMA2000 Analysis.
- chapter 7, "Remote Commands of the CDMA2000 BTS Analysis", on page 178
  Describes all remote control commands defined for the code domain measurement. An alphabetic list of all remote control commands and a table of softkeys with the assignment of commands are provided at the end of this chapter.
- chapter 8, "Status Reporting System of the CDMA2000 BTS Analysis (option K82)", on page 315
  Contains device-specific error messages for R&S FSV-K82.
- chapter 9, "Glossary", on page 316
  Contains an explanation of terms and abbreviations related to the code domain analysis.
- chapter 10, "Appendix", on page 317

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

3　Test Setup for Base Station or Mobile Station Tests

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

NOTICE

Risk of instrument damage during operation

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

- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

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

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

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

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

Presettings

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

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

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

The following measurements are described:

- chapter 4.2, "Measuring the Signal Channel Power", on page 15
- chapter 4.3, "Measuring the Spectrum Emission Mask", on page 15
- chapter 4.4, "Measuring the Relative Code Domain Power and Frequency Error", on page 17
- chapter 4.5, "Measuring the Triggered Relative Code Domain Power", on page 19
- chapter 4.6, "Measuring the Composite EVM", on page 20
- chapter 4.7, "Measuring the Peak Code Domain Error and the RHO Factor", on page 22

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

General Test Setup

The measurements are performed with the following units and accessories:

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

4.1 Test Setup for Base Station Tests

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

NOTICE

Risk of damage to the instrument

Before taking the instrument into operation, make sure that

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

Failure to comply may result in damage to the instrument

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

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

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

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

Presettings

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

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

4.2 Measuring the Signal Channel Power

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

Test setup:

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

Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: CDMA2000

Procedure:

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

    a) Press the PRESET key.

2. Press the MODE key and activate the CDMA2000 BTS Analysis option.

3. Start the Power measurement

    a) Press the MEAS key.
    b) Press the "Power" softkey.

4. Set the center frequency to *878.49 MHz*.

5. Set the reference level.

    a) Press the AMPT key and enter *0 dBm*.

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

4.3 Measuring the Spectrum Emission Mask

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

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

Test setup:

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

Signal generator settings:

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

Procedure:

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

   a) Press the PRESET key.

2. Activate the CDMA2000 BTS Analysis mode.

   a) Press the MODE key and activate the CDMA2000 BTS Analysis option.

3. Start the measurement.

   a) Press the MEAS key.
   b) Press the "Spectrum Emission Mask" softkey.

4. Set the center frequency.

   a) Press the FREQ key and enter 878.*49 MHz*.

5. Set the reference level.

   a) Press the AMPT key and enter *0 dBm*.

6. Select a bandclass

   a) Press the "Bandclass" softkey and select "BandClass 0: 800 MHz Cellular Band" from the list.

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

4.4 Measuring the Relative Code Domain Power and Frequency Error

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

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

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

Test setup:

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

Signal generator settings:

Frequency: 878.49 MHz

Level: 0 dBm

Standard: CDMA2000

Procedure:

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

   a) Press the PRESET key.

2. Activate the "CDMA2000 BS Analysis" Mode.

   a) Press the MODE key and select "CDMA2000 BS Analysis".

3. Enter the Code Domain Analyzer.

   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.

4. Start the measurement

   a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
   b) Select the "Code Domain Power" measurement.

5. Set the center frequency and the reference level.

   a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.

b) In the "Center Frequency" field enter 878.49 MHz.

c) In the "Ref Level" field enter 10 dBm.

d) Close the "Frontend Settings" dialog box.

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

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

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

For more information on the display concept refer to the Display Config softkey.

Synchronization of the reference frequencies

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

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

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

Behavior with deviating center frequency setting

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

1. On the signal generator, change the center frequency in steps of 0.1 kHz and observe the analyzer screen.
   Up to a frequency error of approximately 1.0 kHz, a Code Domain Power measurement on the R&S FSV is still possible. A frequency error within this range causes no apparent difference in the accuracy of the Code Domain Power measurement. In case of a frequency error of more than 1.0 kHz, the probability of incorrect synchronization increases. This is indicated by the "SYNC FAILED" error message. If the frequency error exceeds approximately 1.5 kHz, a Code Domain Power measurement cannot be performed. This is also indicated by the "SYNC FAILED" error message.

2. Reset the center frequency of the signal generator to *878.49 MHz*.

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

4.5 Measuring the Triggered Relative Code Domain Power

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

Test setup:

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

Signal generator settings:

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

Procedure:

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

    a) Press the PRESET key.

2. Activate the CDMA2000 BTS Analysis Mode.

    a) Press the MODE key and select *CDMA2000 BS Analysis*.

3. Enter the Code Domain Analyzer.

    a) Press the MEAS key
    b) Press the "Code Domain Analyzer" softkey.

4. Start the measurement.

    a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
    b) Select the tab for Screen A.
    c) Select the "Code Domain Power" measurement.

5. Set the center frequency and the reference level.

    a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.
    b) In the "Center Frequency" field enter *878.49 MHz*.
    c) In the "Ref Level" field enter *10 dBm*.

d) Close the "Frontend Settings" dialog box.

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

4.5.1 Adjusting the Trigger Offset

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

Set an external trigger source and the trigger offset.

1. Open the "IQ Capture" dialog box.

2. Set the "Trigger Source" option to "External".

3. Set the "Trigger Offset" to *100µs* to compensate analog delays of the trigger event.

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

4.5.2 Behaviour With the Wrong PN Offset

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

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

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

► In the "PN Offset" field enter *0:*

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

4.6 Measuring the Composite EVM

The Error Vector Magnitude (EVM) describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSV. In the I-Q plane, the

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

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

Test Setup:

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

Signal generator settings:

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

Procedure:

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

    a) Press the PRESET key.

2. Activate the CDMA2000 BTS Analysis Mode.

    a) Press the MODE key and select CDMA2000 BTS Analysis.

3. Enter the Code Domain Analyzer.

    a) Press the MEAS key
    b) Press the "Code Domain Analyzer" softkey.

4. Start the measurement.

    a) Press the "Display Config" softkey.
    b) Select the tab for Screen A.
    c) Select the "Composite EVM" measurement.

5. Set the center frequency and the reference level.

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

6. Set an external trigger source.

    a) Open the "IQ Capture Settings" dialog box.
    b) Set the "Trigger Source" option to "External".

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

4.7 Measuring the Peak Code Domain Error and the RHO Factor

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSV. In the I-Q plane, the error vector represents the difference of the measured signal and the ideal signal. The Code Domain Error is the difference in power on symbol level of the measured and the reference signal projected to the class of of the base spreading factor. The unit of the result is dB.

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

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

Test setup:

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

Signal generator settings:

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

Procedure:

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

   a) Press the PRESET key.

2. Activate the CDMA2000 BTS Analysis Mode.

   a) Press the MODE key and activate the CDMA2000 BTS Analysis option.

3. Enter the Code Domain Analyzer.

   a) Press the MEAS key.
   b) Press the "Code Domain Analyzer" softkey.

4. Start the Peak Code Domain Error measurement.

   a) Press the "Display Config" softkey
   b) Select the tab for Screen A.
   c) Select the "Peak Code Domain Error" softkey and start the measurement.

5. Set the center frequency and the reference level.

   a) Open the "Frontend Settings" dialog box.
   b) In the "Center Frequency" field enter *878.49 MHz*.
   c) In the "Ref Level" field enter *0 dBm*.
   d) Close the "Frontend Settings" dialog box.

6. Set an external trigger source.

   a) Open the "IQ Capture Settings" dialog box.
   b) Set the "Trigger Source" option to "External".

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

Displaying RHO

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

No specific measurement is required to get the value for RHO. The R&S FSV always calculates this value automatically regardless of the code domain measurement per-formed. Besides the results of the code domain measurements, the numeric result of the RHO measurement is shown in the result summary, by default shown in screen B.

5 Measurement Examples for the CDMA2000 MS Analysis (option K83)

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

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

General Test Setup

The measurements are performed with the following units and accessories:

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

5.1 Test Setup for Base Station or Mobile Station Tests

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

NOTICE

Risk of instrument damage during operation

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

- All fan openings are unobstructed and the airflow perforations are unimpeded. The minimum distance from the wall is 10 cm.
- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

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

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

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

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

Presettings

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

5.2 Measuring the Signal Channel Power

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

Test setup:

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

Signal generator settings:

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

Procedure:

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

    a) Press the MEAS key.

    b) Press the "Power" softkey.

4. Set the center frequency to *833.49 MHz*.

5. Set the reference level.

    a) Press the AMPT key and enter *0 dBm*.

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

5.3 Measuring the Spectrum Emission Mask

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

Test setup:

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

Signal generator settings:

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

Procedure:

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

    a) Press the PRESET key.

2. Activate the "CDMA2000 MS Analysis" mode.

    a) Press the MODE key and activate the "CDMA2000 MS Analysis" option.

3. Start the measurement.

    a) Press the MEAS key.

    b) Press the "Spectrum Emission Mask" softkey.

4. Set the center frequency.

    a) Press the FREQ key and enter *878.49 MHz*.

5. Set the reference level.

    a) Press the AMPT key and enter *0 dBm*.

6. Select a bandclass

    a) Press the "Bandclass" softkey and select *BandClass 0: 800 MHz Cellular Band* from the list.

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

5.4 Measuring the Relative Code Domain Power and Frequency Error

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

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

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

Test setup:

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

Signal generator settings:

Frequency: 833.49 MHz

Level: 0 dBm

Standard: CDMA2000

Procedure:

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

    a) Press the PRESET key.

2. Activate the "CDMA2000 BS Analysis" Mode.

a) Press the MODE key and select "CDMA2000 BS Analysis".

3. Enter the Code Domain Analyzer.

   a) Press the MEAS key
   b) Press the "Code Domain Analyzer" softkey.

4. Start the measurement

   a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
   b) Select the "Code Domain Power" measurement.

5. Set the center frequency and the reference level.

   a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.
   b) In the "Center Frequency" field enter 833.49 MHz.
   c) In the "Ref Level" field enter 10 dBm.
   d) Close the "Frontend Settings" dialog box.

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

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

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

For more information on the display concept refer to chapter 6.1.1, "Display Concept", on page 36.

Synchronization of the reference frequencies

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

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

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

Behavior with deviating center frequency setting

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

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

Up to a frequency error of approximately 1.0 kHz, a Code Domain Power measurement on the R&S FSV is still possible. A frequency error within this range causes no apparent difference in the accuracy of the Code Domain Power measurement. In case of a frequency error of more than 1.0 kHz, the probability of incorrect synchronization increases. This is indicated by the "SYNC FAILED" error message. If the frequency error exceeds approximately 1.5 kHz, a Code Domain Power measurement cannot be performed. This is also indicated by the "SYNC FAILED" error message.

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

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

5.5 Measuring the Triggered Relative Code Domain Power

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

Test setup:

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

Signal generator settings:

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

Procedure:

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

2. Activate the "CDMA2000 MS Analysis" Mode.

    a) Press the MODE key and select *CDMA2000 BS Analysis*.

3. Enter the Code Domain Analyzer.

    a) Press the MEAS key
    b) Press the "Code Domain Analyzer" softkey.

4. Start the measurement.

    a) In the "Code Domain Analyzer" menu, press the "Display Config" softkey.
    b) Select the tab for Screen A.
    c) Select the "Code Domain Power" measurement.

5. Set the center frequency and the reference level.

    a) In the "Code Domain Analyzer" menu, press the "Frontend Settings" softkey.
    b) In the "Center Frequency" field enter *833.49 MHz*.
    c) In the "Ref Level" field enter *10 dBm*.
    d) Close the "Frontend Settings" dialog box.

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

5.5.1 Adjusting the Trigger Offset

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

Set an external trigger source and the trigger offset.

1. Open the "IQ Capture" dialog box.

2. Set the "Trigger Source" option to "External".

3. Set the "Trigger Offset" to *100µs* to compensate analog delays of the trigger event.

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

5.6 Measuring the Composite EVM

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

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

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

Test Setup:

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

Signal generator settings:

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

Procedure:

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

    a) Press the PRESET key.

2. Activate the "CDMA2000 MS Analysis" Mode.

    a) Press the MODE key and select "CDMA2000 MS Analysis".

3. Enter the Code Domain Analyzer.

    a) Press the MEAS key
    b) Press the "Code Domain Analyzer" softkey.

4. Start the measurement.

    a) Press the "Display Config" softkey.
    b) Select the tab for Screen A.
    c) Select the "Composite EVM" measurement.

5. Set the center frequency and the reference level.

    a) Open the "Frontend Settings" dialog box.
    b) In the "Center Frequency" field enter 833.49 MHz.
    c) In the "Ref Level" field enter 10 dBm.
    d) Close the "Frontend Settings" dialog box.

6. Set an external trigger source.

    a) Open the "IQ Capture Settings" dialog box.
    b) Set the "Trigger Source" option to "External".

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

5.7 Measuring the Peak Code Domain Error and the RHO Factor

The Code Domain Error Power describes the quality of the measured signal compared to an ideal reference signal generated by the R&S FSV. In the I-Q plane, the error vector represents the difference of the measured signal and the ideal signal. The Code Domain Error is the difference in power on symbol level of the measured and the reference signal projected to the class of of the base spreading factor. The unit of the result is dB.

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

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

Test setup:

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

Signal generator settings:

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

Procedure:

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

    a) Press the PRESET key.

2. Activate the "CDMA2000 MS Analysis" Mode.

    a) Press the MODE key and activate the "CDMA2000 MS Analysis" option.

3. Enter the Code Domain Analyzer.

    a) Press the MEAS key.
    b) Press the "Code Domain Analyzer" softkey.

4. Start the Peak Code Domain Error measurement.

    a) Press the "Display Config" softkey
    b) Select the tab for Screen A.
    c) Select the "Peak Code Domain Error" option and start the measurement.

5. Set the center frequency and the reference level.

    a) Open the "Frontend Settings" dialog box.
    b) In the "Center Frequency" field enter *833.49 MHz*.
    c) In the "Ref Level" field enter *0 dBm*.
    d) Close the "Frontend Settings" dialog box.

6. Set an external trigger source.

    a) Open the "IQ Capture Settings" dialog box.
    b) Set the "Trigger Source" option to "External".

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

Displaying RHO

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

No specific measurement is required to get the value for RHO. The R&S FSV always calculates this value automatically regardless of the code domain measurement performed. Besides the results of the code domain measurements, the numeric result of the RHO measurement is shown in the result summary, by default shown in screen B.

6 Instrument Functions of the CDMA2000 Analysis

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

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

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

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

To open the CDMA2000 settings menu

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

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

For details on the measurement types, see chapter 6.1, "Measurements and Result Displays", on page 35.

6.1 Measurements and Result Displays

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

6.1.1 Display Concept

Measurement results

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

The available measurement results are described in the following sections.

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

Measurement settings

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

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

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

Overview of all measurement settings

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

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

Screen focus

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

6.1.2 Configuring the Display

1. Select the "Display Config" softkey in the "Code Domain Analyzer" menu.

2. Select the tab for the screen you want to configure (A-D).

3. Select the "Screen X active" option to display the selected screen.

   Tip: SCPI command: `DISPlay[:WINDow<n>]:STATe` on page 236

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

   Tip: SCPI command: `CALCulate<n>:FEED` on page 182

5. Press "Close".

To select a predefined display configuration

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

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

   The previously stored and default configurations are listed. The current configuration is displayed at the top of the dialog box.

2. Select the required set of screen configurations.

3. Press "Apply".

To store the current display configuration

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

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

2. Click "Add".

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

To remove a predefined display configuration

You can remove one of the stored display configurations.

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

2. Click "Remove".

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

To restore the default display configurations

You can restore the default set of predefined display configurations.

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

6.1.3 Code Domain Analysis Results

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

6.1.3.1 Code Domain Power

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

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

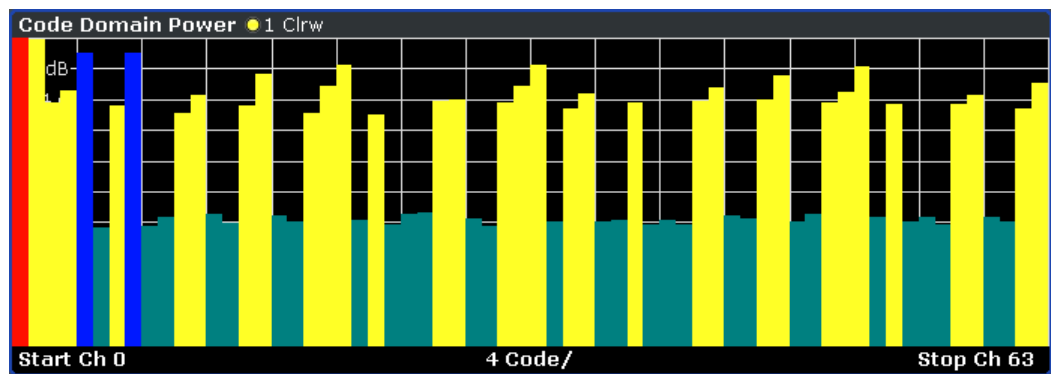MS mode: the power is calculated only for the selected branch (I or Q).

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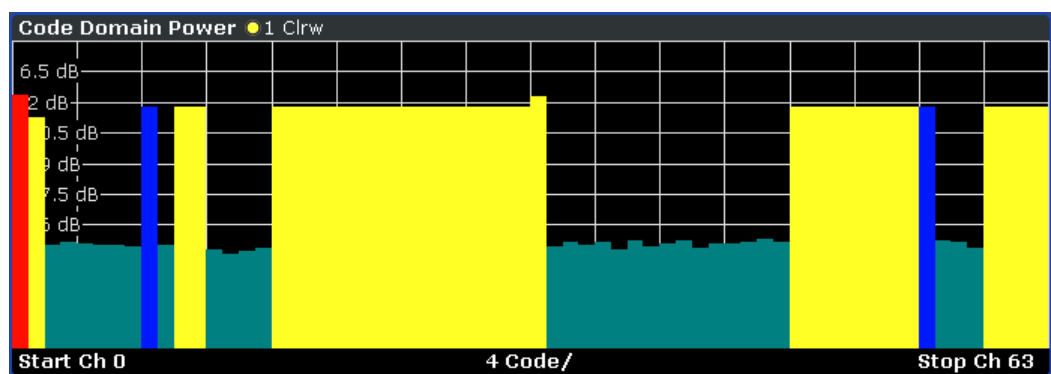

Fig. 6-2: Code Domain Power Result Display in Hadamard code sorting order

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

The following colors are defined:

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

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

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

Remote control

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

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

6.1.3.2 Channel Table

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

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

The measurement evaluates the total signal over a single PCG.

Channel Table ● 1 Clrw								
Channel Type	Walsh Ch.SF	SymRate /ksps	RC	State	Power /dBm	Power /dB	T Offs /ns	P Offs /mrad
F-PICH	0.64	19	---	ON	-34.47	0.00	-.--	-.--
F-SYNC	32.64	19	---	ON	-40.78	-6.31	-.--	-.--
F-PCH	1.64	19	---	ON	-34.77	-0.30	-.--	-.--
CHAN	2.4	307	3	ON	-37.75	-3.28	-.--	-.--
CHAN	3.8	154	3	ON	-37.76	-3.29	-.--	-.--
CHAN	15.16	77	3	ON	-37.78	-3.30	-.--	-.--
CHAN	20.32	38	3	ON	-37.75	-3.28	-.--	-.--
CHAN	68.128	10	3	ON	-37.79	-3.31	-.--	-.--
CHAN	71.128	10	3	ON	-37.77	-3.30	-.--	-.--

Fig. 6-3: Channel Table result display

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

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

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

Remote control

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

6.1.3.3   Power vs PCG

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

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

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

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

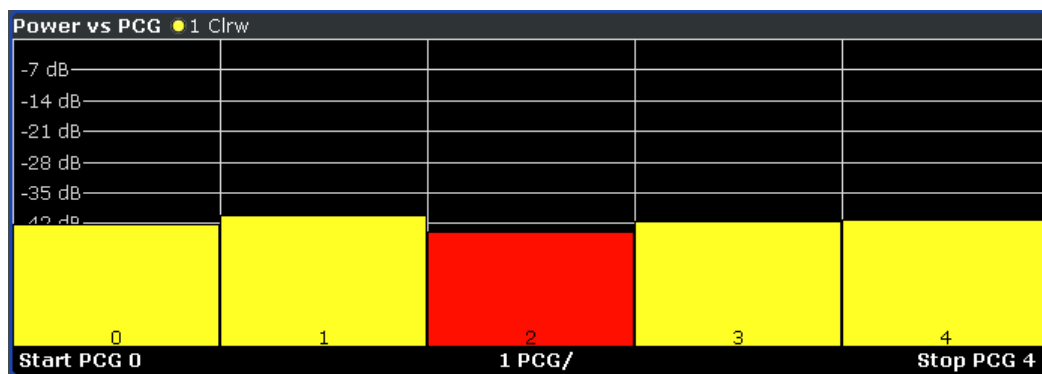You can set the number of PCGs by means of the "Capture Length" on page 64 field.

Fig. 6-4: Power vs PCG result display

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

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

Remote control

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

6.1.3.4 Result Summary

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

The table is divided as follows:

- Global results
- PCG results
- Channel results

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

Fig. 6-5: Result Summary result display

Remote control

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

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

Global Results

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

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

synchronized. For further information on correcting the frequency error refer to chapter 4.4, "Measuring the Relative Code Domain Power and Frequency Error", on page 17 .
The frequency error is available in the units both Hz and ppm referred to the carrier frequency.

- Chip Rate Error
  Shows the chip rate error (1.2288 Mcps) in ppm. A large chip rate error results in symbol errors and, therefore, in possible synchronization errors for Code Domain Power measurements. This measurement result is also valid if the R&S FSV could not synchronize to the CDMA2000 signal.

- Trigger to Frame
  Reflects the time offset from the beginning of the recorded signal section to the start of the first PCG. In case of triggered data recording, this corresponds to the timing offset:
  frame trigger (+ trigger offset) – start of first PCG
  If it was not possible to synchronize the R&S FSV to the CDMA2000 signal, this measurement result is meaningless. For the Free Run trigger mode, dashes are displayed.

- Active Channels
  Specifies the number of active channels found in the signal. Detected data channels as well as special channels are regarded as active. With transmit diversity, the result applies to the selected "Antenna Diversity" on page 72. No value is displayed in both the Min and Max columns.

PCG Results

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

- Total Power
  Shows the total power of the signal.

- Pilot Power
  Shows the power of the pilot channel. If antenna 2 is selected, the power of the F-TDPICH is displayed, in all other cases that of the F-PICH. For details on antenna selection refer to "Antenna Diversity" on page 72.

- RHO
  Shows the quality parameter RHO. According to the CDMA2000 standard, RHO is the normalized, correlated power between the measured and the ideally generated reference signal. When RHO is measured, the CDMA2000 standard requires that only the pilot channel be supplied.

- Composite EVM
  The composite EVM is the difference between the test signal and the ideal reference signal. For further details refer to the chapter 6.1.3.6, "Composite EVM (RMS)", on page 45 result display.

- IQ Imbalance/Offset
  Shows the IQ imbalance and the DC offset of the signal in %.

Channel results

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

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

6.1.3.5 Code Domain Error Power

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

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

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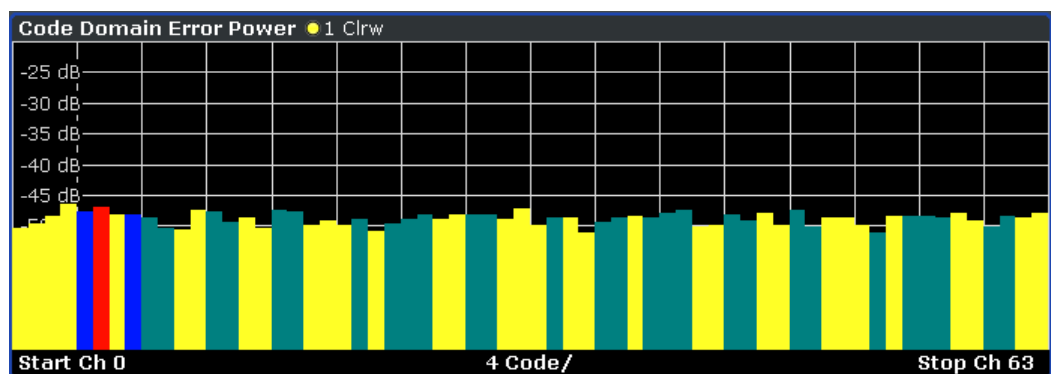

Fig. 6-6: Code Domain Error Power result display in Hadamard code sorting order
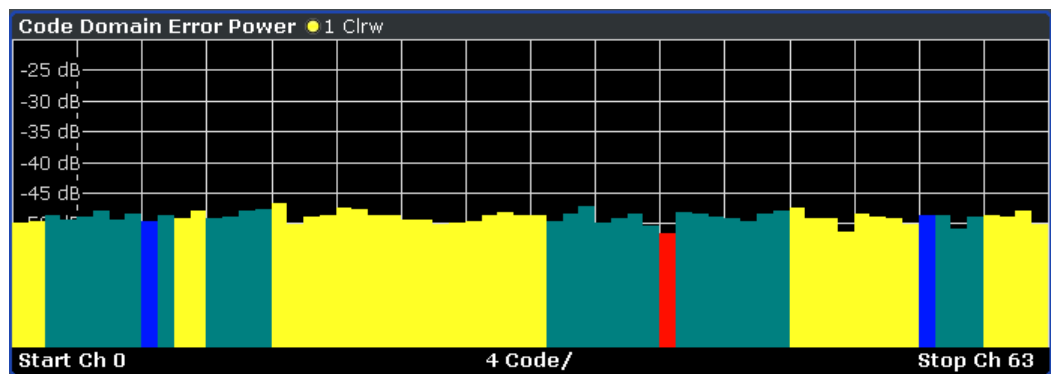
Fig. 6-7: Code Domain Error Power result display in BitReverse code sorting order

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

The following colors are defined:

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

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

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

Remote control

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

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

6.1.3.6 Composite EVM (RMS)

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

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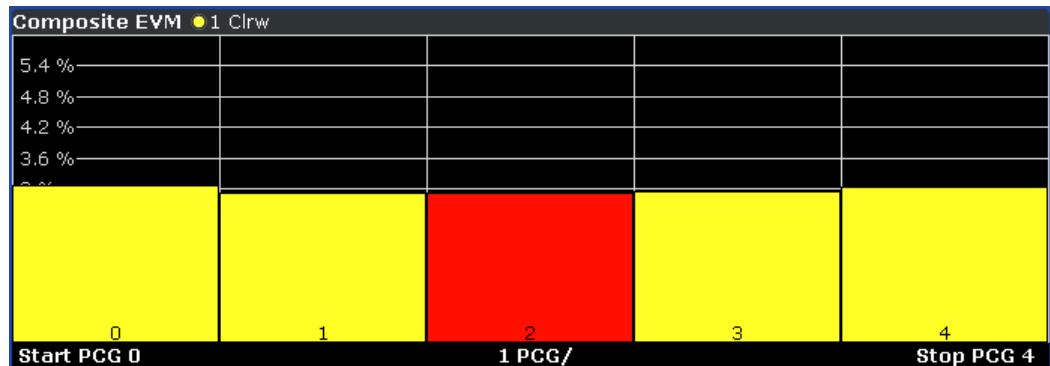

Fig. 6-8: Composite EVM result display

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

Remote control

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

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

6.1.3.7 Peak Code Domain Error

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

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

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

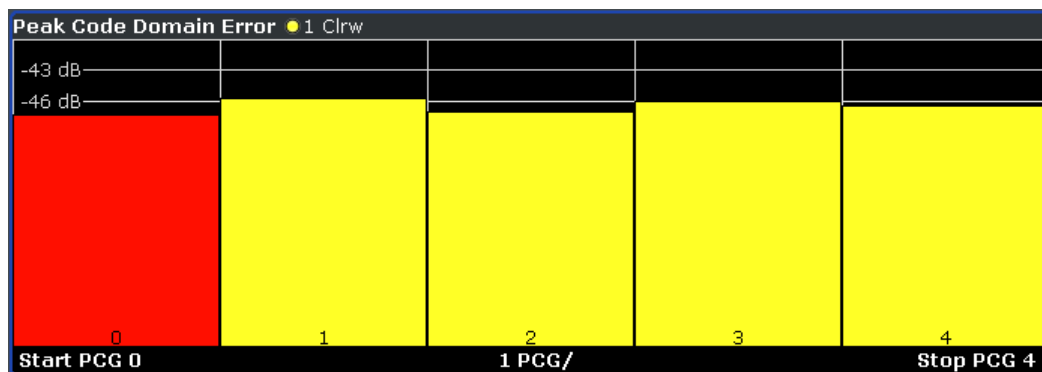MS mode: the error is calculated only for the selected branch (I or Q).

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

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

Remote control

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

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

6.1.3.8 Channel Constellation

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

The measurement evaluates a single channel over a single PCG.

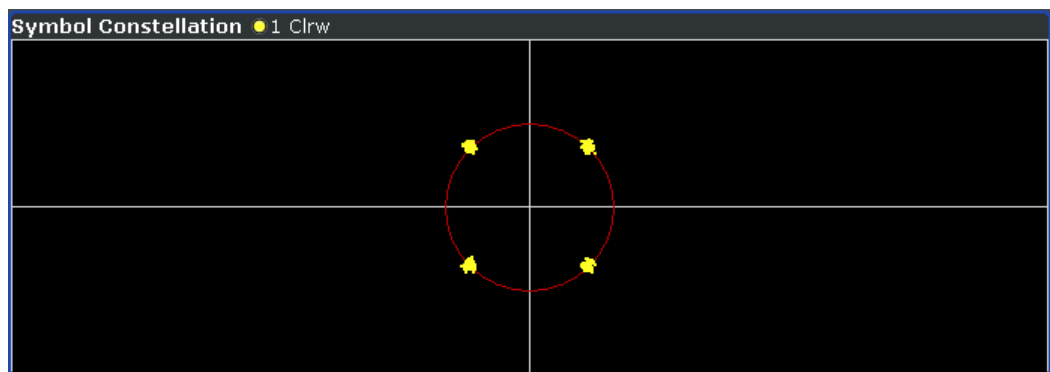You can select a specific channel and PCG with the Select softkey.

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

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

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

Remote control

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

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

6.1.3.9 EVM vs Symbol

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

The measurement evaluates a single channel over a single PCG.

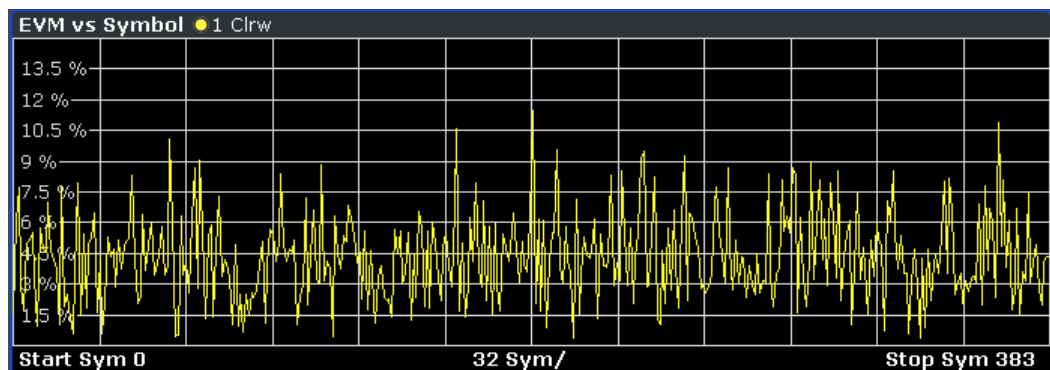You can select a specific channel and PCG with the "Select" on page 79 softkey.

Fig. 6-11: EVM vs Symbol result display

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

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

"Number of chips in one PCG = 1536"

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

"K = 1 for Antenna Diversity = OFF"

"K = 2 for Antenna Diversity = OFF"

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

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

Remote control

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

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

6.1.3.10 Composite Constellation

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

The measurement evaluates the total signal over a single PCG.

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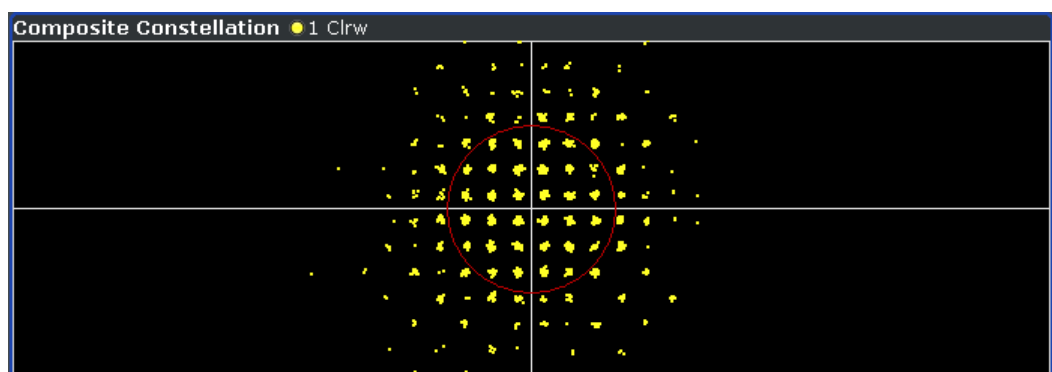

Fig. 6-12: Composite Constellation result display

Remote control

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

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

6.1.3.11 Power vs Symbol

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

The measurement evaluates a single channel over a single PCG.

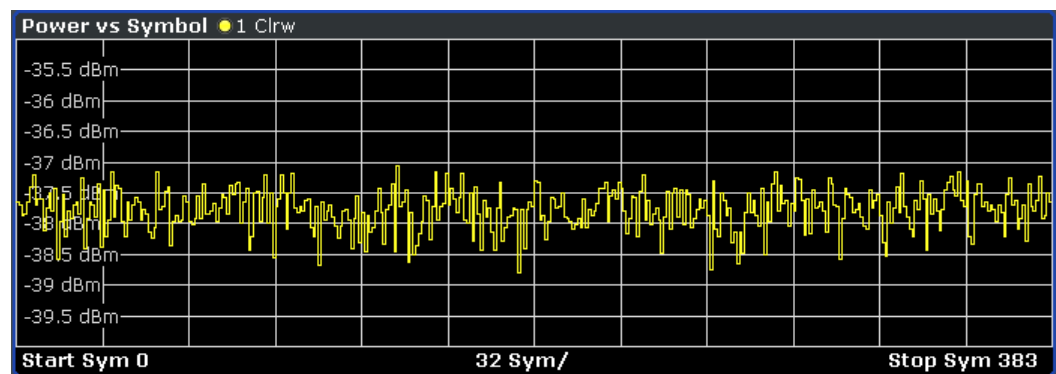You can select a specific channel and PCG with the "Select" on page 79 softkey.

Fig. 6-13: Power vs Symbol result display

Remote control

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

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

6.1.3.12 Channel Bitstream

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

The measurement evaluates a single channel over a single PCG.

You can select a specific channel and PCG with the Select softkey.

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

Fig. 6-14: Bitstream result display

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

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

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

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

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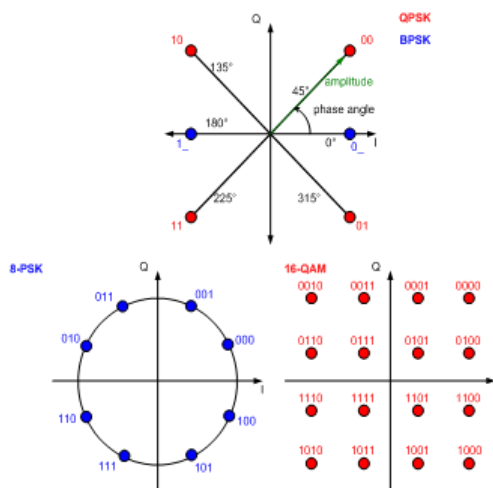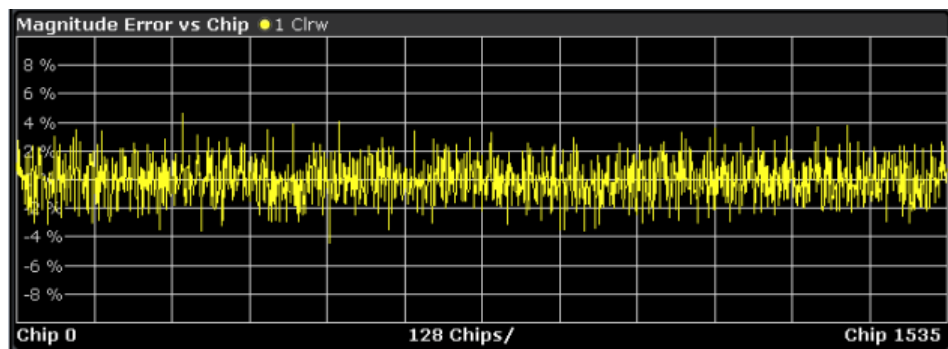
Remote control

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

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

6.1.3.13   Mag Error vs Chip

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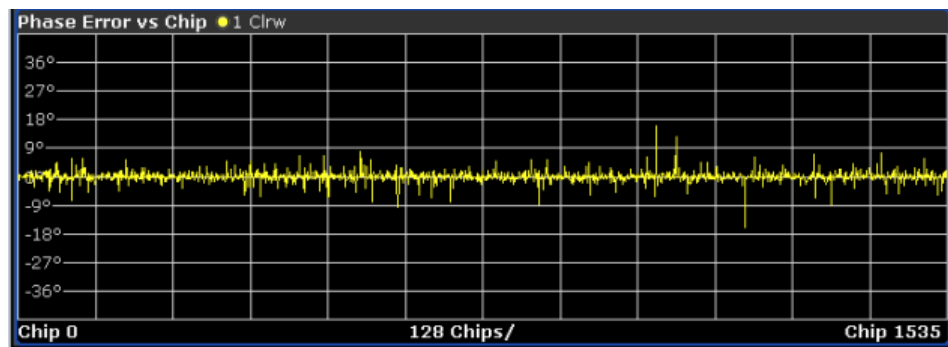

Remote control

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

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

6.1.3.14   Phase Error vs Chip

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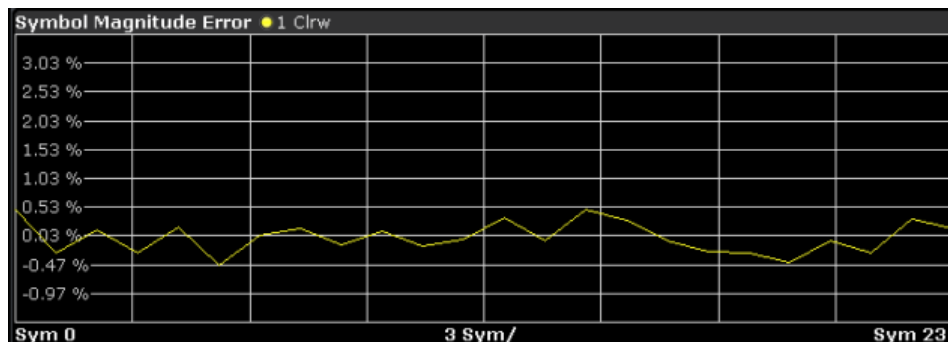
Remote control

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

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

6.1.3.15 Symbol Magnitude Error

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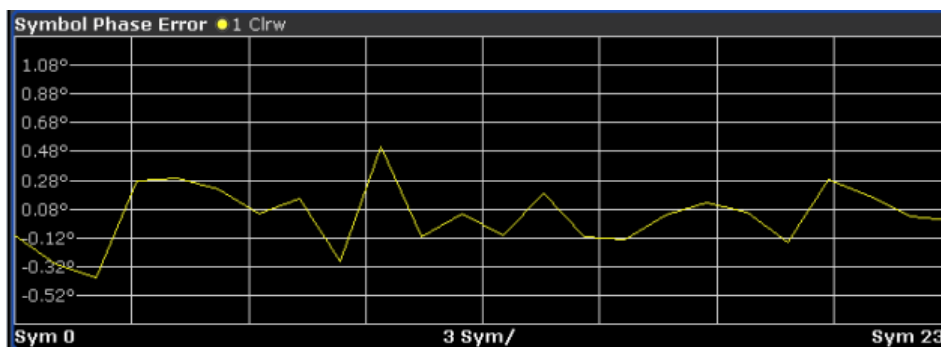

Remote control

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

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

6.1.3.16 Symbol Phase Error

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

Remote control

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

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

6.1.4 RF Measurement Results

6.1.4.1 Signal Channel Power

The Signal Channel Power measurement analyses the RF signal power of a single channel with 1.2288 MHz bandwidth over a single trace. The displayed results are based on the root mean square. The configuration is according to the CDMA2000 requirements. Beneath the measurement screen the bandwidth and the associated channel power are displayed. The other screen elements match that of the screen of the Spectrum Analyzer mode. The default settings are in accordance with the 3GPP2 specifications.

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

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

For details on the softkeys of the Signal Channel Power measurement refer to the Power softkey in the "Measurement" menu.

6.1.4.2 Adjacent Channel Power

The Adjacent Channel Power measurement analyses the power of the TX channel and the power of adjacent and alternate channels on the left and right side of the TX channel. The number of TX channels and adjacent channels can be modified as well as the band class. Beneath the measurement screens the bandwidth and power of the TX channel and the bandwidth, spacing and power of the adjacent and alternate channels are displayed.

The default settings are in accordance with the 3GPP2 specifications.

Setting	Default value
Adjacent Channel Power	On
ACP Standard	1xEV-DO0 MC1
Number of adjacent channels	2

For details on the softkeys of the Adjacent Channel Power measurement refer to the Ch Power ACLR softkey in the "Measurement" menu.

6.1.4.3 Spectrum Emission Mask

The Spectrum Emission Mask measurement shows the quality of the measured signal by comparing the power values in the frequency range near the carrier against a spectral mask that is defined by the 3GPP2 specifications. The limits depend on the selected bandclass. In this way, the performance of the DUT can be tested and the emissions and their distance to the limit be identified.

Note that the 3GPP2 standard does not distinguish between spurious and spectral emissions.

Beneath the measurement screen a table showing the peak list. In the peak list the values for the worst spectral emissions are displayed including their frequency and power.

The default settings of the Spectrum Emission Mask measurement are listed in the table below.

Setting	Default value
Frequency Span	8 MHz
Sweep Time	100 ms
Detector	RMS

For details on the softkeys of the Spectrum Emission Mask measurement refer to the Spectrum Emission Mask softkey in the "Measurement" menu.

6.1.4.4 Occupied Bandwidth

The Occupied Bandwidth measurement determines the bandwidth in which the signal power can be found. By default the bandwidth is displayed in which 99 % of the signal is found. The percentage of the signal power included in the measurement can be modified. In the top right corner of the screen, the bandwidth and frequency markers are displayed.

The default settings of the Occupied Bandwidth measurement are listed in the table below.

Setting	Default value
Occupied Bandwidth	ON
Frequency Span	4.2 MHz
Sweep Time	100 ms
RBW	30 kHz
VBW	300 kHz
Detector	RMS

For details on the softkeys of the Occupied Bandwidth measurement see Occupied Bandwidth in the "Measurement" menu.

6.1.4.5 Complementary Cumulative Distribution Function (CCDF)

The CCDF measurement displays the CCDF and the Crest factor. The CCDF shows distribution of the signal amplitudes. For the measurement, a signal section of settable length is recorded continuously in a zero span. The measurement is useful to determine errors of linear amplifiers. The Crest factor is defined as the ratio of the peak power and the mean power. Beneath the measurement screen a table containing the number of included samples, mean and peak power and the Crest factor is displayed.

The default settings of the CCDF measurement are listed in the table below.

Setting	Default value
CCDF	ON
RBW	10 MHz
Detector	Sample

For details on the softkeys of the CCDF measurement see CCDF in the "Measure-ment" menu.

6.2 Menu and Softkey Description for CDA Measurements

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

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

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

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

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

Importing and Exporting I/Q Data

As of firmware version 1.60, I/Q data can be imported from a file for processing in R&S FSV-K82/-K83, and captured I/Q data can be stored to a file ("IQ Import"/"IQ Export" softkeys in the "Save/Rcl" menu). For details see the base unit description.

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

6.2.1 Softkeys of the Code Domain Analyzer Menu

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

Settings Overview

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

To reset all values to their default state, press the "Set to Default" button.
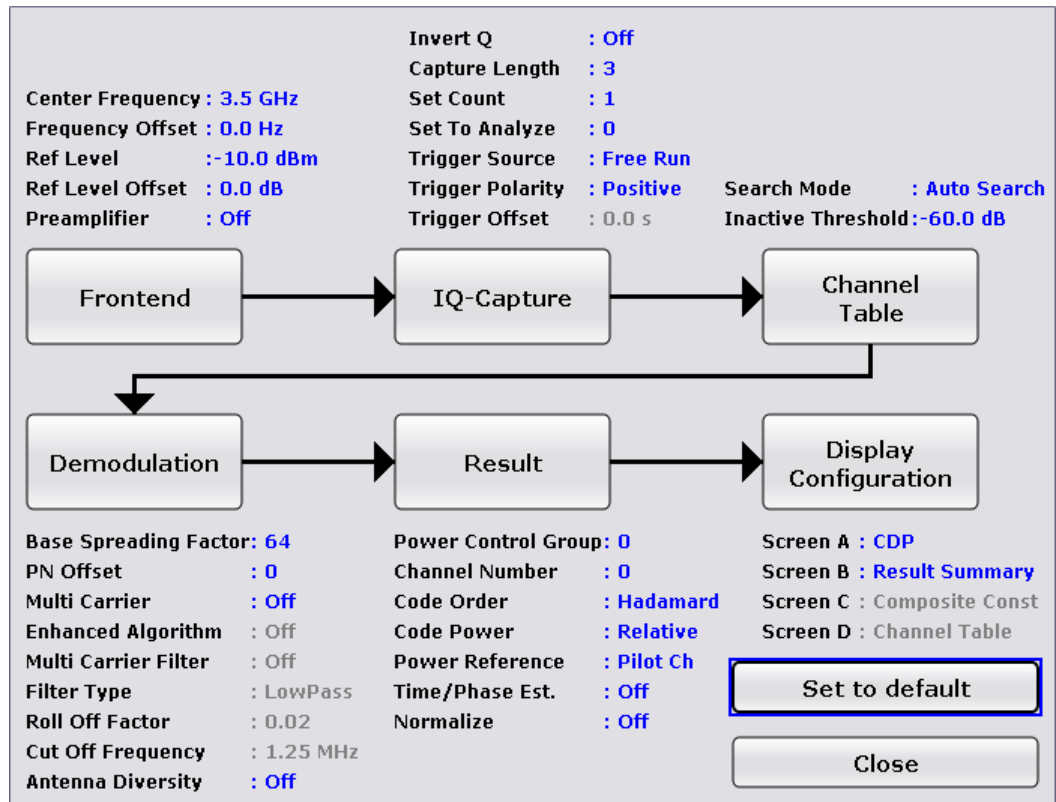
Fig. 6-15: Settings overview in CDMA2000 BTS mode (K82)
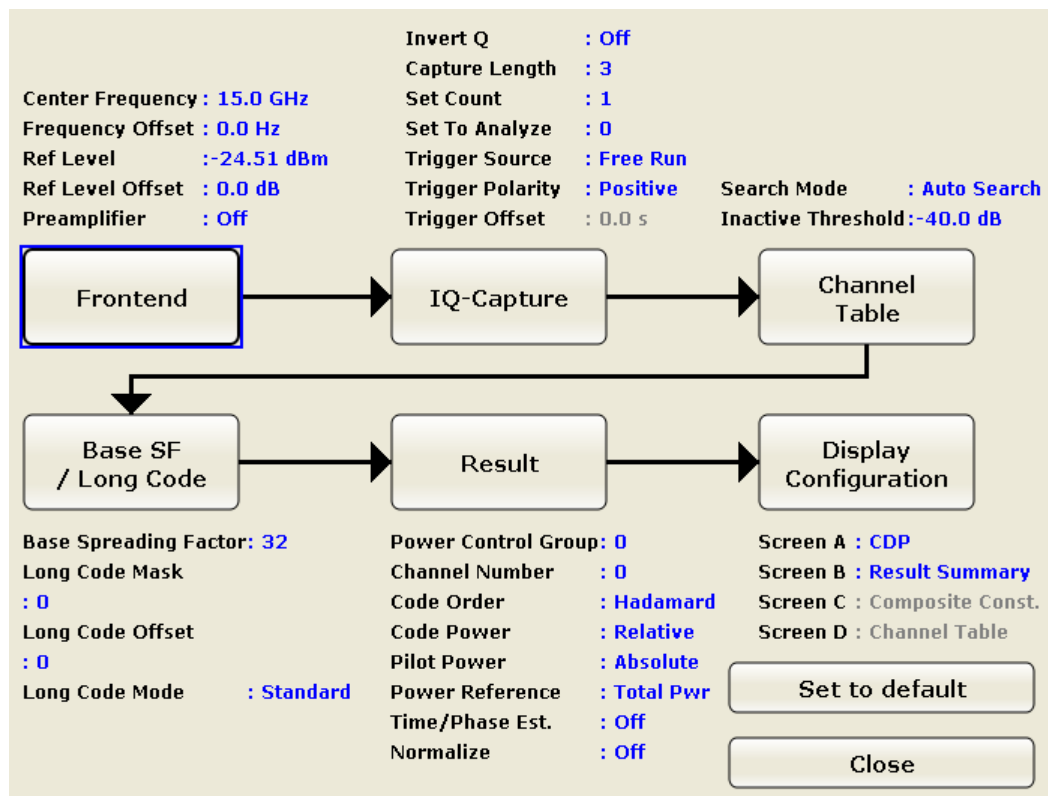
Fig. 6-16: Settings overview in CDMA2000 MS mode (K83)

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

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

When using the rotary knob or the cursor keys, press the ENTER key to open the corresponding dialog box. The "Settings Overview" dialog box always remains open while settings are modified.

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

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

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

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

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

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

Remote command:
[SENSe:]FREQuency:CENTer on page 270

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

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

Remote command:
[SENSe:]FREQuency:OFFSet on page 272

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

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

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 239

Ref Level Offset ← Frontend Settings

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

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

Preamp On/Off ← Frontend Settings

Switches the preamplifier on and off.

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

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

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

Remote command:
INPut:GAIN:STATe on page 306

Adjust Ref Lvl ← Frontend Settings

Defines the optimal reference level for the current measurement automatically.

Remote command:
[SENSe:]ADJust:LEVel on page 254

IQ Capture Settings

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

Invert Q ← IQ Capture Settings

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

Remote command:
[SENSe:]CDPower:QINVert on page 249

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

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

The default value is 3.

Remote command:
[SENSe:]CDPower:IQLength on page 245

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

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

Remote command:
[SENSe:]CDPower:SET:COUNt on page 250

Set to Analyze ← IQ Capture Settings
Selects a specific set for further analysis. The value range depends on the "Set Count" and is between 0 and "Set Count" – 1.

Remote command:
[SENSe:]CDPower:SET on page 250

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

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

Remote command:
TRIG:SOUR IMM, see TRIGger<n>[:SEQuence]:SOURce on page 309

Trigger Source External ← IQ Capture Settings
Defines triggering via a TTL signal at the "EXT TRIG/GATE IN" input connector on the rear panel.

An edit dialog box is displayed to define the external trigger level.

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

Remote command:
TRIG:SOUR EXT, see TRIGger<n>[:SEQuence]:SOURce on page 309

Trigger Polarity ← IQ Capture Settings
Sets the polarity of the trigger source.

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

This softkey is available for code domain measurements.

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

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

Remote command:
TRIGger<n>[:SEQuence]:SLOPe on page 309
[SENSe:]SWEep:EGATe:POLarity on page 285

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

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

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

Remote command:
TRIGger<n>[:SEQuence]:HOLDoff[:TIME] on page 308

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

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

Channel Search Mode ← Channel Table Settings
Defines the kind of channel table used for the measurement.

"Auto"   The Auto Search mode scans the whole code domain, including all permissible symbol rates and channel numbers, for active channels. The automatic search provides an overview of the channels contained in the signal. If channels are not detected as being active, change the threshold (see "Inactive Channel Threshold" on page 66) or select the Predefined channel search type.

"Predef"   Performs the code domain measurement on the basis of the active predefined channel table. All channels of a channel table are assumed to be active. For further details also refer to the "Channel Tables" on page 67 field and the chapter 6.4.1, "Predefined Channel Tables", on page 151 .

Remote command:
CONFigure:CDPower[:BTS]:CTABle[:STATe] on page 227
CONFigure:CDPower[:BTS]:CTABle:SELect on page 231

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

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

Remote command:
[SENSe:]CDPower:ICThreshold on page 245

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

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

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

The following channel tables are available by default:

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

Remote command:
CONFigure:CDPower[:BTS]:CTABle:CATalog? on page 227

New / Copy / Edit ← Channel Table Settings
All three softkeys open a dialog box with the same layout and the same corresponding submenu.

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

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

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

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

The dialog box contains the following items. You can modify the white fields as you like. The grey fields can not be modified; these are automatically calculated by the R&S FSV:

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

Channel Table Settings

Name: BPC_RC4

Description: Both Paths, 6 Channels, RC4

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

Save   Cancel

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

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

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

Remote command:
CONFigure:CDPower[:BTS]:CTABle:DATA on page 228

Delete Channel ← New / Copy / Edit ← Channel Table Settings
Deletes the selected channel without further notice.

Meas ← New / Copy / Edit ← Channel Table Settings
Initiates a measurement in "Auto Search" mode (see "Channel Search Mode" on page 66). The measurement results are applied to the active channel table. The active channel table is overwritten without further notice.

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

Sort ← New / Copy / Edit ← Channel Table Settings
Sorts the table according to the following criteria (in the specified order):
- Channel state (active channels first, then inactive channels)
- Channel type (special channels like F-PICH or F-SYNC first, then data channels)
- Spreading factor (in ascending order)
- Code number (in ascending order)

Save ← New / Copy / Edit ← Channel Table Settings
Saves the table under its specified name in the xml-format. If you edit a channel table and want to keep the original channel table, change the name of the edited channel table before saving it.

Cancel ← New / Copy / Edit ← Channel Table Settings
Closes the dialog box and returns to the "Channel Table Settings" dialog box. Changes applied to the channel table are lost.

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

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

Delete ← Channel Table Settings
Deletes the selected channel table. The currently active channel table cannot be deleted.

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

Demod Settings (BTS mode)
This softkey opens the "Demodulation Settings" dialog box.

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

Remote command:
[SENSe:]CDPower:SFACtor on page 250

PN Offset ← **Demod Settings (BTS mode)**
Specifies the Pseudo Noise (PN) offset of the base station. In a CDMA2000 system, the PN offset is used to distinguish the base stations.

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

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

Remote command:
[SENSe:]CDPower:PNOFfset on page 248

Multi Carrier ← **Demod Settings (BTS mode)**
Activates or deactivates the Multi Carrier mode. The mode improves the processing of multi carrier signals. It allows the measurement on one carrier out of a multi carrier signal.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier [:STATe] on page 231

Enhanced Algorithm ← **Demod Settings (BTS mode)**
Activates or deactivates the enhanced algorithm that is used for signal detection on multi-carrier signals. This algorithm slightly increases the calculation time.

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

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:MALGo on page 233

Multi Carrier Filter ← **Demod Settings (BTS mode)**
Activates or deactivates the usage of a filter for signal detection on multi-carrier signals.

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

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:FILTer [:STATe] on page 232

Filter Type ← **Demod Settings (BTS mode)**
Selects the filter type if "Multi Carrier Filter" on page 71 is activated.

Two filter types are available for selection: a low-pass filter and a RRC filter.

By default, the low-pass filter is active. The low-pass filter affects the quality of the measured signal compared to a measurement without a filter. The frequency response of the low-pass filter is shown below.

Frequency response of low pass filter (Multi Carrier = On)
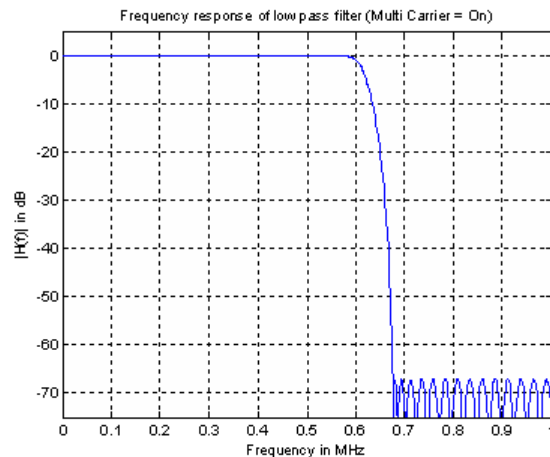
The RRC filter comes with an integrated Hamming window. If selected, two more settings become available for configuration: the "Roll-Off Factor" on page 72 and the "Cut Off Frequency" on page 72.

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

Roll-Off Factor ← Demod Settings (BTS mode)
Defines the roll-off factor of the RRC filter. The roll-off factor defines the slope of the filter curve and therefore the excess bandwidth of the filter. Possible values are between 0.01 and 0.99 in 0.01 steps. The default value is 0.02.

This parameter is available for the RRC filter.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE on page 233
CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF on page 232

Cut Off Frequency ← Demod Settings (BTS mode)
Defines the cut-off frequency of the RRC filter. The cutoff frequency is the frequency at which the passband of the filter begins. Possible values are between 0.1 MHz and 2.4 MHz in 1 Hz steps. The default value is 1.25 MHz

This parameter is available for the RRC filter.

Remote command:
CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE on page 233
CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency on page 232

Antenna Diversity ← Demod Settings (BTS mode)
Activates or deactivates the orthogonal transmit diversity (two-antenna system) and defines the antenna for which the results are displayed.

"Antenna 1"   The signal of antenna 1 is fed in.
               The pilot channel (F-PICH) with channel number 0 and spreading fac-
               tor 64 (0.64) is required.
               If a channel table is used in the measurement (see Channel Table), it
               must contain the pilot channel (F-PICH), but must not contain the
               transmit diversity pilot channel (F-TDPICH).
               As reference for the code power (Power Reference), PICH is used.

"Antenna 2"   The signal of antenna 2 is fed in.
               The transmit diversity pilot channel (F-TDPICH) with channel number
               16 and spreading factor 128 (16.128) is required.
               If a channel table is used in the measurement (see Channel Table), it
               must contain the transmit diversity pilot channel (F-TDPICH), but
               must not contain the pilot channel (F-PICH).
               As reference for the code power (Power Reference), F-TDPICH is
               used.

"Off"   The aggregate signal from both antennas is fed in.
               The pilot channels of both antennas are required.
               If a channel table is used in the measurement (see Channel Table), it
               must contain both the transmit diversity pilot channel (F-TDPICH) and
               the pilot channel (F-PICH).
               As reference for the code power (Power Reference), F-PICH is used.

Remote command:
[SENSe:]CDPower:ANTenna on page 244

Base SF/Long Code (MS mode)
This softkey opens the "Base SF/Long Code" dialog box. These settings are used to
identify the base stations during mobile measurements.
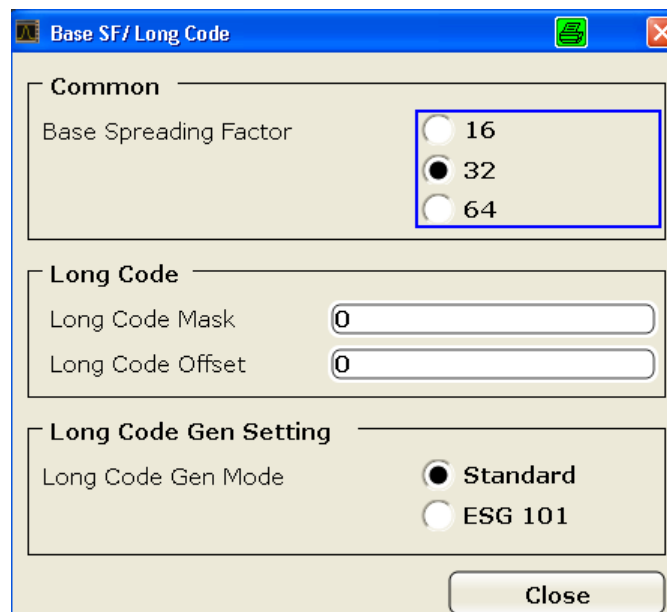
Base Spreading Factor ← Base SF/Long Code (MS mode)
Sets the base spreading factor. Possible values are 16, 32, 64.

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

Remote command:
[SENSe:]CDPower:SFACtor on page 250

Long Code Mask ← Base SF/Long Code (MS mode)
Defines the long code mask of the mobile in hexadecimal form. The value range is from 0 to 4FFFFFFFFFFF.

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

Remote command:
[SENSe:]CDPower:LCODe:MASK on page 246

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

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

The chips offset is calculated as follows:

tSinceStartGPS * 1.2288 MChips/s

where tSinceStartGPS is defined in seconds

Remote command:
[SENSe:]CDPower:LCODe:OFFSet on page 246

Long Code Gen Mode ← Base SF/Long Code (MS mode)
Selects the mode of the long code generation.

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

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

Remote command:
[SENSe:]CDPower:LCODe:MODE on page 247

Result Settings
This softkey opens the "Result Settings" dialog box to modify the following parameters:
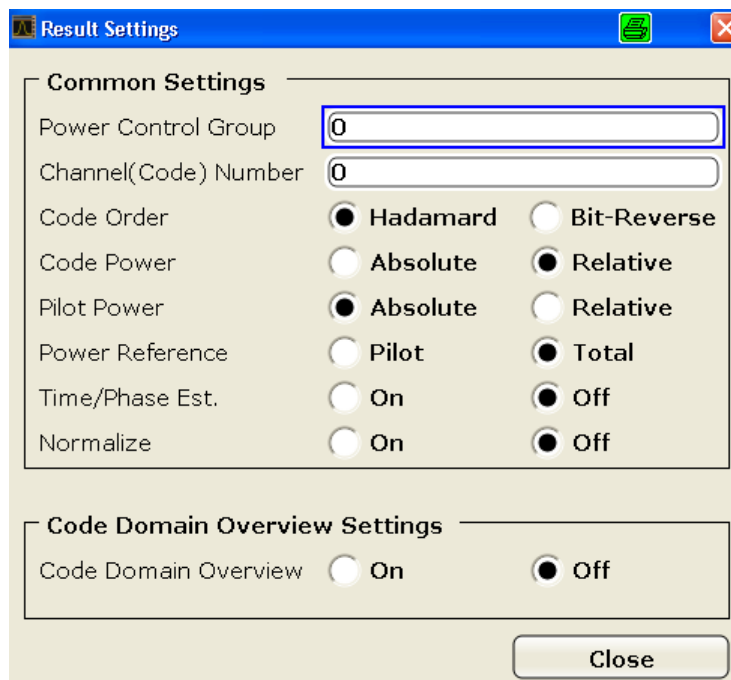
Power Control Group ← Result Settings
In some measurements it is possible to highlight the data of a specific PCG. Select the PCG on which to put the focus on in this field. The range of the value depends on the "Capture Length" on page 64 defined in the IQ Capture Settings dialog box. Therefore the range is (0 to Capture Length-1).

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

Remote command:
[SENSe:]CDPower:SLOT on page 251

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

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

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

- in the Code Domain Power and Code Domain Error result displays, the rotary knob always selects the adjacent channel. The position of the adjacent channel in the diagram depends on the "Code Order" on page 76.

- in the Channel Table result display, the rotary knob is used to scroll through the list.

Remote command:
[SENSe:]CDPower:CODE on page 244

Code Order ← Result Settings
Sets the sorting of the channels for the Code Domain Power and Code Domain Error result displays.

Hadamard order:	By default, the codes are sorted in Hadamard order, i.e. in ascending order.
	You can see the power of each code in this way; there is no distinction between channels apparent. If there is a channel covering several codes, the display shows the individual power of each code.
	Example (for base spreading factor of 64):
	0.64, 1.64, 2.64, …, 63.64.
Bit-Reverse order:	Bundles the channels with concentrated codes, i.e. all codes of a channel are next to one another. In this way you can see the total power of a con-centrated channel.
	Example (for base spreading factor of 64):
	0.64, 32.64, 16.64, 48.64, 8.64, 40.64, …, 15.64, 47.64,31.64, 63.64

For further details on the code order refer to the Hadamard and BitReverse Code Tables in the Appendix on page.

Remote command:
[SENSe:]CDPower:ORDer on page 247

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

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

Remote command:
CALCulate<n>:FEED on page 182

Pilot Power (MS mode only) ← Result Settings
Displays the pilot power in absolute or relative values.

Remote command:
[SENSe:]CDPower:PPReference on page 249

Power Reference ← Result Settings
Determines the reference power for relative power measurements.

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

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

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

Example (theoretical):

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

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

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

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

Remote command:
[SENSe:]CDPower:PREFerence on page 249

Time/Phase Estimation ← **Result Settings**
Actives or deactivates the timing and phase offset calculation of the channels as to the pilot channel. If deactivated or more than 50 active channels are in the signal, the calculation does not take place and dashes instead of values are displayed as results.

Remote command:
[SENSe:]CDPower:TPMeas on page 251

Normalize ← **Result Settings**
Activate this parameter to eliminate the DC offset from the signal. By default, the parameter is deactivated.

Remote command:
[SENSe:]CDPower:TPMeas on page 251

Code Domain Overview (MS mode only) ← **Result Settings**
If enabled, both branches are displayed at once for a code domain power measurement (see chapter 6.1, "Measurements and Result Displays", on page 35). Otherwise, only the selected branch and the result summary are displayed.

Remote command:
[SENSe:]CDPower:OVERview on page 248

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

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

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

For details on the displayed results and default settings refer to chapter 6.1.3, "Code Domain Analysis Results", on page 38.

You can configure the result displays via the "Result Settings" on page 74 dialog box.
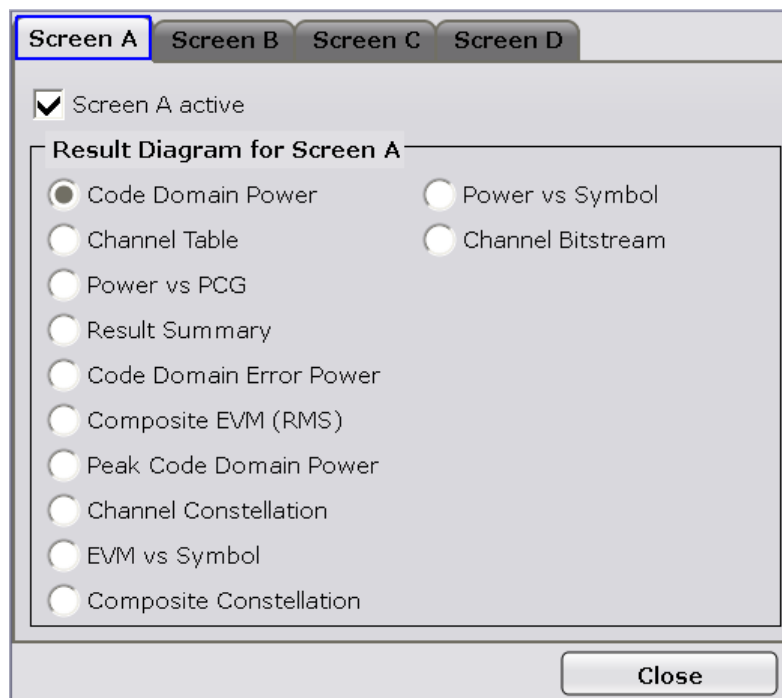
The code domain analyzer can show up to four result diagrams in four different screens (windows) at one time. For each screen, you can define which type of result diagram is to be displayed, or deactivate the screen temporarily.

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

For details see chapter 6.1.2, " Configuring the Display", on page 37.

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

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

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

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

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

- chapter 6.1.3.3, "Power vs PCG", on page 41
- chapter 6.1.3.4, "Result Summary", on page 42
- chapter 6.1.3.8, "Channel Constellation", on page 47

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

Remote command:

[SENSe:]CDPower:CODE on page 244

[SENSe:]CDPower:SLOT on page 251

[SENSe:]CDPower:MAPPing on page 245

6.2.2 Softkeys of the Frequency Menu

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

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

Center

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.

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

Remote command:

[SENSe:]FREQuency:CENTer on page 270

CF Stepsize

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

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

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

Remote command:

[SENSe:]FREQuency:CENTer:STEP on page 270

Frequency Offset

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

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

Remote command:

[SENSe:]FREQuency:OFFSet on page 272

6.2.3 Softkeys of the Amplitude Menu

The following chapter describes all softkeys available in the "Amplitude" menu in "CDMA2000 BTS Analysis" mode for CDA measurements. For RF measurements, see chapter 6.3.4, "Softkeys of the Amplitude Menu", on page 131.

Ref Level

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

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

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 239

Scale

Opens a submenu to define the amplitude scaling type.

This softkey and its submenu is available for code domain measurements in BTS mode (K82).

Auto Scale Once ← **Scale**

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

The softkey is available for code domain measurements.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO on page 238

Y-Axis Maximum ← **Scale**

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

The softkey is available for code domain measurements.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MAXimum on page 241

Y-Axis Minimum ← Scale

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

The softkey is available for code domain measurements.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MINimum on page 242

Ref Level Offset

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

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

Preamp On/Off

Switches the preamplifier on and off.

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

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

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

Remote command:
INPut:GAIN:STATe   on page 306

RF Atten Manual/Mech Att Manual

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

The mechanical attenuation can be set in 10 dB steps.

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

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

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

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

Note: As of firmware version 1.61, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display. The increased mixer level allows for an improved signal, but also increases the risk of overloading the instrument!

Remote command:
INPut:ATTenuation on page 300

RF Atten Auto/Mech Att Auto

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

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

Remote command:
INPut:ATTenuation:AUTO on page 300

El Atten On/Off

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

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

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

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

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

Remote command:
INPut:EATT:AUTO on page 305

El Atten Mode (Auto/Man)

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

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

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

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

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

Remote command:
INPut:EATT:AUTO on page 305
INPut:EATT on page 305

Input (AC/DC)

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

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

Remote command:
INPut:COUPling on page 301

6.2.4 Softkeys of the Sweep Menu

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

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 84).

Remote command:
INIT:CONT ON, see INITiate<n>:CONTinuous on page 311

Single Sweep

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

Remote command:
INIT:CONT OFF, see INITiate<n>:CONTinuous on page 311

Continue Single Sweep

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

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

Remote command:
INITiate<n>:CONMeas on page 310

Sweep Count

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

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

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

Remote command:
[SENSe:]SWEep:COUNt on page 284

6.2.5 Softkeys of the Trigger Menu for CDA measurements

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

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

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

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

Remote command:
TRIG:SOUR IMM, see TRIGger<n>[:SEQuence]:SOURce on page 309

Trigger Source External
Defines triggering via a TTL signal at the "EXT TRIG/GATE IN" input connector on the rear panel.

An edit dialog box is displayed to define the external trigger level.

For further details refer to the "Trigger Source" field in the "IQ Capture Settings" dialog box.

This softkey is available for code domain measurements.

Remote command:
TRIG:SOUR EXT, see TRIGger<n>[:SEQuence]:SOURce on page 309

Trigger Polarity
Sets the polarity of the trigger source.

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

This softkey is available for code domain measurements.

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

Remote command:
TRIGger<n>[:SEQuence]:SLOPe on page 309

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

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

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

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

Remote command:
TRIGger<n>[:SEQuence]:HOLDoff[:TIME] on page 308

6.2.6 Softkeys of the Trace Menu for CDA Measurements

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

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

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

All available detectors can be selected.

Remote command:
DISP:TRAC:MODE WRIT, see DISPlay[:WINDow<n>]:TRACe<t>:MODE
on page 236

Max Hold

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

The detector is automatically set to "Positive Peak".

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

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE MAXH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE
on page 236

Min Hold

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

The detector is automatically set to "Negative Peak".

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

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE MINH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE
on page 236

Average

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

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 6.4.3, "Detector Overview", on page 156).

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE AVER, see DISPlay[:WINDow<n>]:TRACe<t>:MODE
on page 236

View

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

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that

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

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

Remote command:
`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 236

6.2.7 Softkeys of the Marker Menu for CDA Measurements

The following chapter describes all softkeys available in the "Marker" menu in "CDMA2000 BTS Analysis" mode for CDA measurements. For RF measurements, see chapter 6.3.7, "Softkeys of the Marker Menu for RF Measurements", on page 147.

Marker 1/2/3/4
Selects the corresponding marker and activates it.

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

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

Remote command:
`CALCulate<n>:MARKer<m>[:STATe]` on page 214
`CALCulate<n>:MARKer<m>:X` on page 215
`CALCulate<n>:MARKer<m>:Y?` on page 217
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 197
`CALCulate<n>:DELTamarker<m>:X` on page 198
`CALCulate<n>:DELTamarker<m>:X:RELative?` on page 198
`CALCulate<n>:DELTamarker<m>:Y?` on page 198

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

Remote command:
`CALCulate<n>:MARKer<m>[:STATe]` on page 214
`CALCulate<n>:DELTamarker<m>[:STATe]` on page 197

All Marker Off

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

Remote command:

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

6.2.8 Softkeys of the Marker To Menu

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

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

Select 1/2/3/4/∆

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

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

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

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

Peak

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

Remote command:

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

Next Peak

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

Remote command:

CALCulate<n>:MARKer<m>:MAXimum:NEXT on page 212

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT on page 194

Next Peak Mode

Selects the mode of the Next Peak softkey.

This softkey is available for code domain measurements.

Three settings are available:

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

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

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

Remote command:
CALC:MARK:MAX:LEFT (<): CALCulate<n>:MARKer<m>:MAXimum:LEFT on page 211
CALCulate<n>:DELTamarker<m>:MAXimum:LEFT on page 194

CALC:MARK:MAX:RIGH (>): CALCulate<n>:MARKer<m>:MAXimum:RIGHt on page 212
CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt on page 195

CALC:DELT:MAX:NEXT (abs): CALCulate<n>:MARKer<m>:MAXimum:NEXT on page 212
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT on page 194

F-PICH (BTS mode only)

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

This softkey is available for code domain measurements.

CALCulate<n>:MARKer<m>:FUNCtion:PICH on page 186

F-TDPICH (BTS mode only)

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

This softkey is available for code domain measurements.

CALCulate<n>:MARKer<m>:FUNCtion:TDPIch on page 190

PICH (MS mode only)

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

This softkey is available for code domain measurements.

CALCulate<n>:MARKer<m>:FUNCtion:PICH on page 186

Min

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

Remote command:
CALCulate<n>:MARKer<m>:MINimum[:PEAK] on page 214

Next Min

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

Remote command:
CALCulate<n>:MARKer<m>:MINimum:NEXT on page 213
CALCulate<n>:DELTamarker<m>:MINimum:NEXT on page 196

Next Min Mode

Sets the mode for the Next Min softkey.

This softkey is available for code domain measurements.

Three settings are available:

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

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

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

Remote command:
CALC:MARK:MIN:LEFT (>): `CALCulate<n>:MARKer<m>:MINimum:LEFT` on page 213
`CALCulate<n>:DELTamarker<m>:MINimum:LEFT` on page 195
CALC:MARK:MIN:RIGH (>): `CALCulate<n>:MARKer<m>:MINimum:RIGHt` on page 214
`CALCulate<n>:DELTamarker<m>:MINimum:RIGHt` on page 196
CALC:MARK:MIN:NEXT (abs): `CALCulate<n>:MARKer<m>:MINimum:NEXT` on page 213
`CALCulate<n>:DELTamarker<m>:MINimum:NEXT` on page 196

Center =Mkr Freq (span > 0)

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

This softkey is available for RF measurements.

Remote command:
`CALCulate<n>:MARKer<m>:FUNCtion:CENTer` on page 186

6.2.9 Softkeys of the Auto Set Menu

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

Auto All

Performs all automatic settings.

● "Auto Freq" on page 92

- "Auto Level" on page 92

Remote command:
[SENSe:]ADJust:ALL on page 252

Auto Freq

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

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

Remote command:
[SENSe:]ADJust:FREQuency on page 254

Auto Level

Defines the optimal reference level for the current measurement automatically.

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

Remote command:
[SENSe:]ADJust:LEVel on page 254

Settings

Opens a submenu to define settings for automatic leveling.

Possible settings are:

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

Meas Time Manual ← Settings

Opens an edit dialog box to enter the duration of the level measurement in seconds. The level measurement is used to determine the optimal reference level automatically (see the "Auto Level" softkey, "Auto Level" on page 92). The default value is 1 ms.

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

Meas Time Auto ← Settings

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

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

Upper Level Hysteresis ← Settings

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

Remote command:
[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer on page 253

Lower Level Hysteresis ← Settings

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

Remote command:
[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer on page 252

6.2.10 Softkeys of the Input/Output Menu for CDA Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for CDA measurements. For RF measurements, see chapter 6.3.8, "Softkeys of the Input/ Output Menu for RF Measurements", on page 150.

Input (AC/DC)

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

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

Remote command:
INPut:COUPling on page 301

Noise Source

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

Remote command:
DIAGnostic<n>:SERVice:NSOurce on page 310

Signal Source

Opens a dialog box to select the signal source.

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

Input Path ← Signal Source

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

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

Remote command:
INPut:SELect on page 306

Connected Device ← Signal Source

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

The device name is unknown.

Remote command:
INPut:DIQ:CDEVice on page 301

Input Sample Rate ← Signal Source

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

Remote command:
INPut:DIQ:SRATe on page 304

Full Scale Level ← Signal Source

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

The level can be defined either in dBm or Volt.

Remote command:
INPut:DIQ:RANGe[:UPPer] on page 303

Level Unit ← Signal Source

Defines the unit used for the full scale level.

Remote command:
INPut:DIQ:RANGe[:UPPer]:UNIT on page 303

Adjust Reference Level to Full Scale Level ← Signal Source

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

Remote command:
INPut:DIQ:RANGe:COUPling on page 303

Digital IQ Info

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

- Device identification
- Used port

- (Maximum) digital input/output sample rates and maximum digital input/output transfer rates
- Status of the connection protocol
- Status of the PRBS descewing test
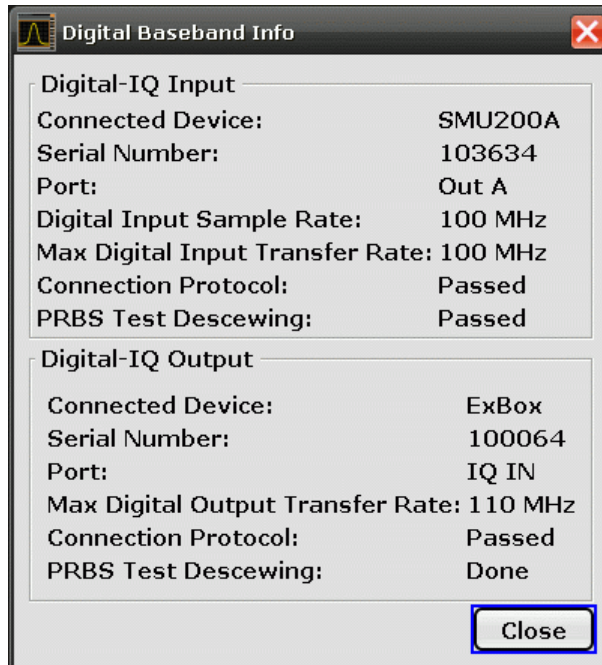
For details see "Interface Status Information" in "Instrument Functions - R&S Digital I/Q Interface (Option R&S FSV-B17)" in the description of the base unit.

Remote command:
INPut:DIQ:CDEVice on page 301

EXIQ

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

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

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

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

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

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

TX Settings ← EXIQ

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

RX Settings ← EXIQ

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

Send To ← EXIQ

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

Firmware Update ← EXIQ

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

R&S Support ← EXIQ

Stores useful information for troubleshooting in case of errors.

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

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

DigIConf ← EXIQ

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

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

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

Note: If you close the R&S DigIConf window using the "Close" icon, the window is minimized, not closed.

If you select the "File > Exit" menu item in the R&S DigIConf window, the application is closed. Note that in this case the settings are lost and the EX-IQ-BOX functionality is no longer available until you restart the application using the "DigIConf" softkey in the R&S FSV once again.

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

6.3 Softkeys and Menus for RF Measurements (K82)

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

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

6.3.1 Softkeys of the Measurement Menu

The following chapter describes all softkeys available in the "Measurement" menu in "CDMA2000 Analysis" or "1xEV-DO Analysis" mode. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special

option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Code Domain Analyzer

Starts the Code Domain Analyzer and opens the "Code Domain Analyzer" menu. Select the desired result display via this menu.

For details refer to chapter 6.2.1, "Softkeys of the Code Domain Analyzer Menu", on page 58. For details on the measurements in the code domain, initial configuration and screen layout refer to chapter 6.1, "Measurements and Result Displays", on page 35.

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 234

Power

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

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 234
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? on page 187

Adjust Ref Lvl ← Power

Adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSV or limiting the dynamic range by a too small S/N ratio.

For details on manual settings see "Settings of CP/ACLR test parameters" in the description of the base unit.

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

Remote command:
[SENSe:]POWer:ACHannel:PRESet:RLEVel on page 279

Ch Power ACLR

Activates the Adjacent Channel Power measurement.

In this measurement the power of the carrier and its adjacent and alternate channels is determined.

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 234
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? on page 187

Bandclass ← Ch Power ACLR
Opens a dialog box to select the bandclass. The following bandclasses are available:

Band Class 0	800 MHz Cellular Band
Band Class 1	1.9 GHz PCS Band
Band Class 2	TACS Band
Band Class 3A	JTACS Band: >832 MHz and ≤ 834 MHz >838 MHz and ≤ 846 MHz >860 MHz and ≤ 895 MHz
Band Class 3B	JTACS Band: >810 MHz and ≤ 860 MHz except: >832 MHz and ≤ 834 MHz >838 MHz and ≤ 846 MHz
Band Class 3C	JTACS Band: ≤810 MHz and >895 MHz
Band Class 4	Korean PCS Band
Band Class 5	450 MHz NMT Band
Band Class 6	2 GHz IMT-2000 Band
Band Class 7	700 MHz Band
Band Class 8	1800 MHz Band
Band Class 9	900 MHz Band
Band Class 10	Secondary 800 MHz
Band Class 11	400 MHz European PAMR Band
Band Class 12	800 MHz PAMR Band
Band Class 13	2.5 GHz IMT-2000 Extension Band
Band Class 14	US PCS 1.9 GHz Band
Band Class 15	AWS Band
Band Class 16	US 2.5 GHz Band
Band Class 17	US 2.5 GHz Forward Link Only Band

Remote command:
CONFigure:CDPower[:BTS]:BCLass|BANDclass on page 225

CP/ACLR Settings ← Ch Power ACLR
Opens a submenu to configure the channel power and adjacent channel power measurement independently of the predefined standards (for details see also chapter 6.4.13, "Predefined CP/ACLR Standards", on page 174 and chapter 6.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 175).

# of TX Chan ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the number of carrier signals to be taken into account in channel and adjacent-channel power measurements. Values from 1 to 18 are allowed.

Remote command:
[SENSe:]POWer:ACHannel:TXCHannel:COUNt

# of Adj Chan ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the number of adjacent channels to be considered in the adjacent-channel power measurement. Values from 0 to 12 are allowed.

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

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

Remote command:
[SENSe:]POWer:ACHannel:ACPairs

Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Opens a dialog to define the channel settings for all channels, independant of the defined number of *used* TX or adjacent channels.
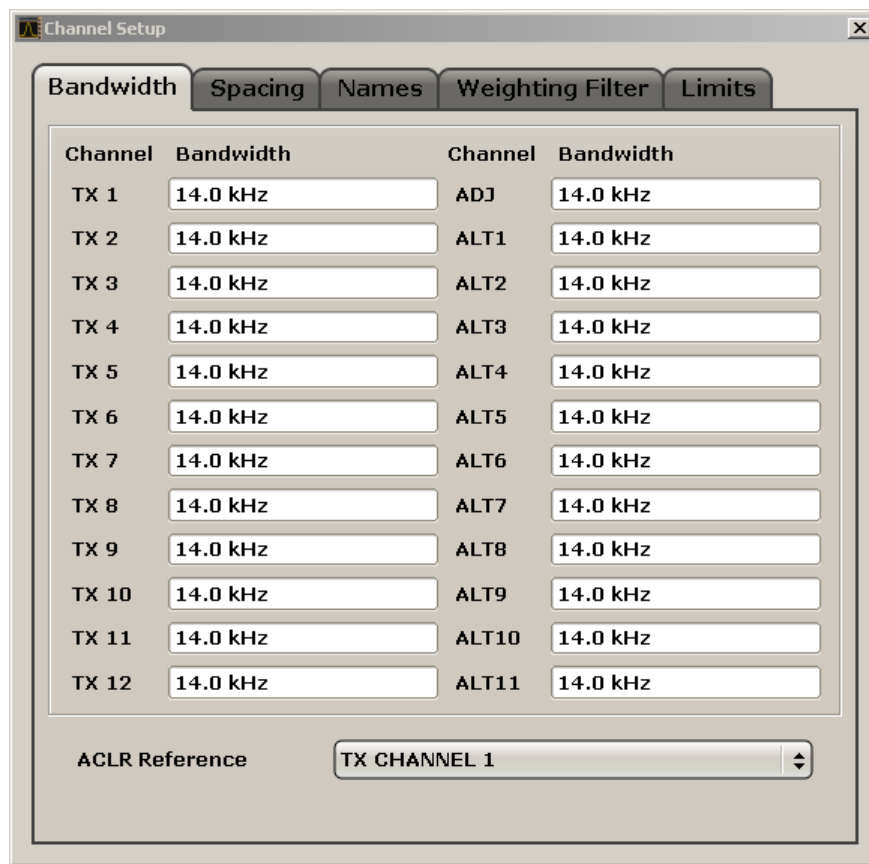
The dialog contains the following tabs:

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

Bandwidth ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define the channel bandwidths for the transmission channels and the adjacent channels. "TX" is only available for the multi-carrier ACLR measurement. When you change the bandwidth for one channel, the value is automatically also defined for all subsequent channels of the same type.

The transmission-channel bandwidth is normally defined by the transmission standard. The correct bandwidth is set automatically for the selected standard (see chapter 6.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 175).

- Measurements in zero span (see Fast ACLR (On/Off) softkey) are performed in the zero span mode. The channel limits are indicated by vertical lines. For measurements requiring channel bandwidths deviating from those defined in the selected standard the IBW method is to be used.
- With the IBW method (see Fast ACLR (On/Off) softkey), the channel bandwidth limits are marked by two vertical lines right and left of the channel center frequency. Thus you can visually check whether the entire power of the signal under test is within the selected channel bandwidth.

If measuring according to the IBW method ("Fast ACLR Off"), the bandwidths of the different adjacent channels are to be entered numerically. Since all adjacent channels often have the same bandwidth, the other alternate channels are set to the bandwidth of the adjacent channel when it is changed. Thus, only one value needs to be entered in case of equal adjacent channel bandwidths.

For details on available channel filters see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 159.

Remote command:
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>]
on page 274
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel on page 274
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>
on page 275

ACLR Reference ← Bandwidth ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Select the transmission channel to which the relative adjacent-channel power values should be referenced.

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

Remote command:
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual on page 280
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO on page 279

Spacing ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define the channel spacings for the TX channels and for the adjacent channels.

- TX channels (left column)

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

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

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

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

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

  Example:
  In the default setting, the adjacent channels have the following spacing: 20 kHz ("ADJ"), 40 kHz ("ALT1"), 60 kHz ("ALT2"), 80 kHz ("ALT3"), 100 kHz ("ALT4"), …
  If the spacing of the first adjacent channel ("ADJ") is set to 40 kHz, the spacing of all other adjacent channels is multiplied by factor 2 to result in 80 kHz ("ALT1"), 120 kHz ("ALT2"), 160 kHz ("ALT3"), …
  If, starting from the default setting, the spacing of the 5th adjacent channel ("ALT4") is set to 150 kHz, the spacing of all higher adjacent channels is multiplied by factor 1.5 to result in 180 kHz ("ALT5"), 210 kHz ("ALT6"), 240 kHz ("ALT7"), …
  If a ACLR or MC-ACLR measurement is started, all settings according to the standard including the channel bandwidths and channel spacings are set and can be adjusted afterwards.

Remote command:
[SENSe:]POWer:ACHannel:SPACing:CHANnel<channel> on page 281
[SENSe:]POWer:ACHannel:SPACing[:ACHannel] on page 280
[SENSe:]POWer:ACHannel:SPACing:ALTernate<channel> on page 281

Names ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define user-specific channel names for each channel. The names defined here are displayed in the result diagram and result table.

Remote command:
[SENSe:]POWer:ACHannel:NAME:ACHannel on page 277
[SENSe:]POWer:ACHannel:NAME:ALTernate<channel> on page 278
[SENSe:]POWer:ACHannel:NAME:CHANnel<channel> on page 278

Weighting Filter ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Define weighting filters for all channels. Weighting filters are not available for all supported standards and cannot always be defined manually where they are available.

The dialog contains the following fields:

Field	Description
Channel	- TX 1-18: TX channels - ADJ: Adjacent channel - ALT1-11: Alternate channels
Active	Activates/Deactivates the weighting filter for the selected and any subsequent channels of the same type
Alpha	Defines the alpha value for the weighting filter for the selected and any subsequent channels of the same type

Remote command:

`POW:ACH:FILT:CHAN1 ON`, see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel>` on page 276

Activates the weighting filter for TX channel 1.

`POW:ACH:FILT:ALPH:CHAN1 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel>` on page 276

Sets the alpha value for the weighting filter for TX channel 1 to 0,35.

`POW:ACH:FILT:ACH ON` see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel` on page 276

Activates the weighting filter for the adjacent channel.

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

Sets the alpha value for the weighting filter for the adjacent channel to 0,35.

`POW:ACH:FILT:ALT1 ON` see `[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTernate<channel>` on page 276

Activates the alpha value for the weighting filter for the alternate channel 1.

`POW:ACH:FILT:ALPH:ALT1 0,35` see `[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel>` on page 275

Sets the alpha value for the weighting filter for the alternate channel 1 to 0,35.

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

Activate and define the limits for the ACLR measurement.

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

Activate or deactivate limit checking for the ACLR measurement.

The following rules apply for the limits:

- A separate limit can be defined for each adjacent channel. The limit applies to both the upper and the lower adjacent channel.
- A relative and/or absolute limit can be defined. The check of both limit values can be activated independently.
- The R&S FSV checks adherence to the limits irrespective of whether the limits are absolute or relative or whether the measurement is carried out with absolute or rel-

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

Remote command:
CALCulate<n>:LIMit<k>:ACPower[:STATe] on page 205
CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult on page 201
CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]
on page 204

Relative Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Defines a limit relative to the carrier signal.

Remote command:
CALC:LIM:ACP ON, see CALCulate<n>:LIMit<k>:ACPower[:STATe]
on page 205
CALC:LIM:ACP:<adjacent-channel> 0dBc,0dBc
CALC:LIM:ACP:<adjacent-channel>:STAT ON

Absolute Limit ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Defines an absolute limit.

Remote command:
CALC:LIM:ACP ON, see CALCulate<n>:LIMit<k>:ACPower[:STATe]
on page 205
CALC:LIM:ACP:<adjacent-channel>:ABS -10dBm,-10dBm
CALC:LIM:ACP:<adjacent-channel>:ABS:STAT ON, see CALCulate<n>:
LIMit<k>:ACPower:ACHannel:ABSolute:STATe on page 200

Check ← Limits ← Channel Setup ← CP/ACLR Settings ← Ch Power ACLR
Activate or deactivate the limit to be considered during a limit check. The check of both limit values can be activated independently.

Chan Pwr/Hz ← CP/ACLR Settings ← Ch Power ACLR
If deactivated, the channel power is displayed in dBm. If activated, the channel power density is displayed instead. Thus, the absolute unit of the channel power is switched from dBm to dBm/Hz. The channel power density in dBm/Hz corresponds to the power inside a bandwidth of 1 Hz and is calculated as follows:

"channel power density = channel power – $\log_{10}$(channel bandwidth)"

By means of this function it is possible e.g. to measure the signal/noise power density or use the additional functions "ACLR (Abs/Rel)" on page 108 and "ACLR Reference" on page 104 to obtain the signal to noise ratio.

Remote command:
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ on page 188

Power Mode ← CP/ACLR Settings ← Ch Power ACLR
Opens a submenu to select the power mode.

Clear/Write ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR
If this mode is activated, the channel power and the adjacent channel powers are calculated directly from the current trace (default mode).

Remote command:
CALC:MARK:FUNC:POW:MODE WRIT, see CALCulate<n>:MARKer<m>:FUNCtion:
POWer:MODE on page 187

Max Hold ← Power Mode ← CP/ACLR Settings ← Ch Power ACLR
If this mode is activated, the power values are calculated from the current trace and compared with the previous power value using a maximum algorithm. The higher value is retained. If activated, the enhancement label "Pwr Max" is displayed.

Remote command:
CALC:MARK:FUNC:POW:MODE MAXH, see CALCulate<n>:MARKer<m>:FUNCtion:
POWer:MODE on page 187

Select Trace ← CP/ACLR Settings ← Ch Power ACLR
Opens an edit dialog box to enter the trace number on which the CP/ACLR measurement is to be performed. Only activated traces can be selected.

For details on trace modes see chapter 6.4.4, "Trace Mode Overview", on page 157.

Remote command:
[SENSe:]POWer:TRACe on page 283

ACLR (Abs/Rel) ← CP/ACLR Settings ← Ch Power ACLR
Switches between absolute and relative power measurement in the adjacent channels.

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

Remote command:
[SENSe:]POWer:ACHannel:MODE on page 277

Adjust Settings ← CP/ACLR Settings ← Ch Power ACLR
Automatically optimizes all instrument settings for the selected channel configuration (channel bandwidth, channel spacing) within a specific frequency range (channel bandwidth). The adjustment is carried out only once. If necessary, the instrument settings can be changed later.

For details on the settings of span, resolution bandwidth, video bandwidth, detector and trace averaging see chapter 6.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 175.

Remote command:
[SENSe:]POWer:ACHannel:PRESet on page 278

Sweep Time ← Ch Power ACLR
Opens an edit dialog box to enter the sweep time. With the RMS detector, a longer sweep time increases the stability of the measurement results.

The function of this softkey is identical to the Sweeptime Manual softkey in the "Bandwidth" menu.

Remote command:
[SENSe:]SWEep:TIME on page 288

Fast ACLR (On/Off) ← Ch Power ACLR
Switches between the IBW method ("Fast ACLR Off") and the zero span method ("Fast ACLR On").

When switched on, the R&S FSV sets the center frequency consecutively to the different channel center frequencies and measures the power with the selected measurement time (= sweep time/number of channels). The RBW filters suitable for the selected standard and frequency offset are automatically used (e.g. root raised cos with IS 136). For details on available channel filters see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 159.

The RMS detector is used for obtaining correct power measurement results. Therefore this requires no software correction factors.

Measured values are output as a list. The powers of the transmission channels are output in dBm, the powers of the adjacent channels in dBm.

The sweep time is selected depending on the desired reproducibility of results. Reproducibility increases with sweep time since power measurement is then performed over a longer time period. As a general approach, it can be assumed that approx. 500 non-correlated measured values are required for a reproducibility of 0.5 dB (99 % of the measurements are within 0.5 dB of the true measured value). This holds true for white noise. The measured values are considered as non-correlated if their time interval corresponds to the reciprocal of the measured bandwidth.

With IS 136 the measurement bandwidth is approx. 25 kHz, i.e. measured values at an interval of 40 μs are considered as non-correlated. A measurement time of 40 ms is thus required per channel for 1000 measured values. This is the default sweep time which the R&S FSV sets in coupled mode. Approx. 5000 measured values are required for a reproducibility of 0.1 dB (99 %), i.e. the measurement time is to be increased to 200 ms.

Remote command:
[SENSe:]POWer:HSPeed on page 282

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

The softkey is available only for multi carrier ACLR measurements.

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

Remote command:
[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE on page 279

Noise Correction ← Ch Power ACLR

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

"ON"   A reference measurement of the instrument's inherent noise is carried out. The noise power measured is then subtracted from the power in the channel that is being examined.
                The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A disable message is displayed on the screen. Noise correction must be switched on again manually after the change.

"OFF"   No noise correction is performed.

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

Remote command:
[SENSe:]POWer:NCORrection on page 282

Adjust Ref Lvl ← Ch Power ACLR

Adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSV or limiting the dynamic range by a too small S/N ratio.

For details on manual settings see "Settings of CP/ACLR test parameters" in the description of the base unit.

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

Remote command:
[SENSe:]POWer:ACHannel:PRESet:RLEVel on page 279

Spectrum Emission Mask

Performs a comparison of the signal power in different carrier offset ranges with the maximum values specified in the 1xEV-DO specification.

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 234
CALCulate<n>:LIMit<k>:FAIL? on page 206

Sweep List ← Spectrum Emission Mask

Opens a submenu to edit the sweep list and displays the "Sweep List" dialog box.

Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
After a preset, the sweep list contains a set of default ranges and parameters. For each range, you can change the parameters listed below. To insert or delete ranges, use the "Insert Before Range", "Insert After Range", "Delete Range" softkeys. The measurement results are not updated during editing but on closing the dialog box ("Edit Sweep List/ Close Sweep List" softkey, see "Close Sweep List" on page 114).

The changes of the sweep list are only kept until you load another parameter set (by pressing PRESET or by loading an XML file). If you want a parameter set to be available permanently, create an XML file for this configuration (for details refer to chapter 6.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 163).

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

Note: If you edit the sweep list, always follow the rules and consider the limitations described in chapter 6.4.11, "Ranges and Range Settings", on page 171.

Range Start / Range Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the start frequency/stop frequency of the selected range. Follow the rules described in chapter 6.4.11, "Ranges and Range Settings", on page 171.

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

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt on page 259
[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP on page 260

Fast SEM ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Activates "Fast SEM" mode for all ranges in the sweep list. For details see chapter 6.4.12, "Fast Spectrum Emission Mask Measurements", on page 172.

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

Remote command:
[SENSe:]ESPectrum:HighSPeed on page 256

Filter Type ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the filter type for this range. For details on filters see also chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 159.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE on page 259

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution] on page 257

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo on page 258

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO on page 265

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME on page 264

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:RLEVel on page 264

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO on page 261

RF Attenuator ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the attenuation value for that range.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation on page 260

Preamp ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Switches the preamplifier on or off.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe on page 261

Transd. Factor ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:TRANsducer on page 265

Limit Check 1-4 ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets the type of limit check for all ranges.

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

The limit state affects the availability of all limit settings ("Abs Limit Start" on page 113, "Abs Limit Stop" on page 113, "Rel Limit Start" on page 114, "Rel Limit Stop" on page 114).

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

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:STATe on page 263
CALCulate<n>:LIMit<k>:FAIL? on page 206

Abs Limit Start ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets an absolute limit value at the start frequency of the range [dBm].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 113).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STARt on page 262

Abs Limit Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask
Sets an absolute limit value at the stop frequency of the range [dBm].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 113).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:ABSolute:STOP on page 262

Rel Limit Start ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask

Sets a relative limit value at the start frequency of the range [dBc].

This parameter is only available if the limit check is set accordingly (see "Limit Check 1-4" on page 113).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STARt on page 263

Rel Limit Stop ← Sweep List dialog box ← Sweep List ← Spectrum Emission Mask

Sets a relative limit value at the stop frequency of the range [dBc].

This parameter is only available if the limit check is set accordingly (see "Sweep List dialog box" on page 111).

Remote command:
[SENSe:]ESPectrum:RANGe<range>:LIMit<source>:RELative:STOP on page 263

Close Sweep List ← Sweep List ← Spectrum Emission Mask

Closes the "Sweep List" dialog box and updates the measurement results.

Insert before Range ← Sweep List ← Spectrum Emission Mask

Inserts a new range to the left of the currently focused range. The range numbers of the currently focused range and all higher ranges are increased accordingly. The maximum number of ranges is 20.

For further details refer to chapter 6.4.11, "Ranges and Range Settings", on page 171.

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

Insert after Range ← Sweep List ← Spectrum Emission Mask

Inserts a new range to the right of the currently focused range. The range numbers of all higher ranges are increased accordingly. The maximum number of ranges is 20.

For further details refer to chapter 6.4.11, "Ranges and Range Settings", on page 171.

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

Delete Range ← Sweep List ← Spectrum Emission Mask

Deletes the currently focused range, if possible. The range numbers are updated accordingly. For further details refer to chapter 6.4.11, "Ranges and Range Settings", on page 171.

Remote command:
[SENSe:]ESPectrum:RANGe<range>:DELete on page 258

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

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

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

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

Edit Reference Range ← Sweep List ← Spectrum Emission Mask
Opens the "Reference Range" dialog box to edit the additional settings used for SEM measurements.

Two different power reference types are supported:

- "Peak Power"
  Measures the highest peak within the reference range.
- "Channel Power"
  Measures the channel power within the reference range (integral bandwidth method).
  If the "Channel Power" reference power type is activated, the dialog box is extended to define additional settings:
- "Tx Bandwidth"
  Defines the bandwidth used for measuring the channel power:
  minimum span ≤ value ≤ span of reference range

- "RRC Filter State"
  Activates or deactivates the use of an RRC filter.
- "RRC Filter Settings"
  Sets the alpha value of the RRC filter. This window is only available if the RRC filter is activated.

For further details refer to chapter 6.4.11, "Ranges and Range Settings", on page 171.

Remote command:
[SENSe:]ESPectrum:RTYPe on page 266
[SENSe:]ESPectrum:BWID on page 255
[SENSe:]ESPectrum:FILTer[:RRC][:STATe] on page 255
[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa on page 256

List Evaluation ← Spectrum Emission Mask
Opens a submenu to edit the list evaluation settings.

List Evaluation (On/Off) ← List Evaluation ← Spectrum Emission Mask
Activates or deactivates the list evaluation.

Remote command:
Turning list evaluation on and off:
CALCulate<n>:PEAKsearch|PSEarch:AUTO on page 218
Querying list evaluation results:
TRACe<n>[:DATA]? on page 292

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

Remote command:
CALCulate<n>:PEAKsearch|PSEarch:MARGin on page 218

Show Peaks ← List Evaluation ← Spectrum Emission Mask
In the diagram, marks all peaks with blue squares that have been listed during an active list evaluation.

Remote command:
CALCulate<n>:ESPectrum:PSEarch|:PEAKsearch:PSHow on page 223

Save Evaluation List ← List Evaluation ← Spectrum Emission Mask
Opens the "ASCII File Export Name" dialog box to save the result in ASCII format to a specified file and directory. For further details refer also to the "ASCII File Export" softkey ("ASCII File Export" on page 116).

Remote command:
MMEMory:STORe<n>:LIST on page 312

ASCII File Export ← Save Evaluation List ← List Evaluation ← Spectrum Emission Mask
Opens the "ASCII File Export Name" dialog box and saves the active peak list in ASCII format to the specified file and directory.

The file consists of the header containing important scaling parameters and a data section containing the marker data. For details on an ASCII file see chapter 6.4.7, "ASCII File Export Format", on page 161.

This format can be processed by spreadsheet calculation programs, e.g. MS-Excel. It is necessary to define ';' as a separator for the data import. Different language versions of evaluation programs may require a different handling of the decimal point. It is therefore possible to select between separators '.' (decimal point) and ',' (comma) using the "Decim Sep" softkey (see "Decim Sep" on page 117).

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

Remote command:
FORMat:DEXPort:DSEParator on page 310
MMEMory:STORe<n>:LIST on page 312

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

Remote command:
FORMat:DEXPort:DSEParator on page 310

Edit Reference Range ← Spectrum Emission Mask
Opens the "Reference Range" dialog box to edit the additional settings used for SEM measurements.

Two different power reference types are supported:

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

- "Tx Bandwidth"
  Defines the bandwidth used for measuring the channel power:
  minimum span ≤ value ≤ span of reference range
- "RRC Filter State"
  Activates or deactivates the use of an RRC filter.
- "RRC Filter Settings"
  Sets the alpha value of the RRC filter. This window is only available if the RRC filter is activated.

For further details refer to chapter 6.4.11, "Ranges and Range Settings", on page 171.

Remote command:

[SENSe:]ESPectrum:RTYPe on page 266

[SENSe:]ESPectrum:BWID on page 255

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

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

Edit Power Classes ← Spectrum Emission Mask
Opens a dialog box to modify the power class settings.
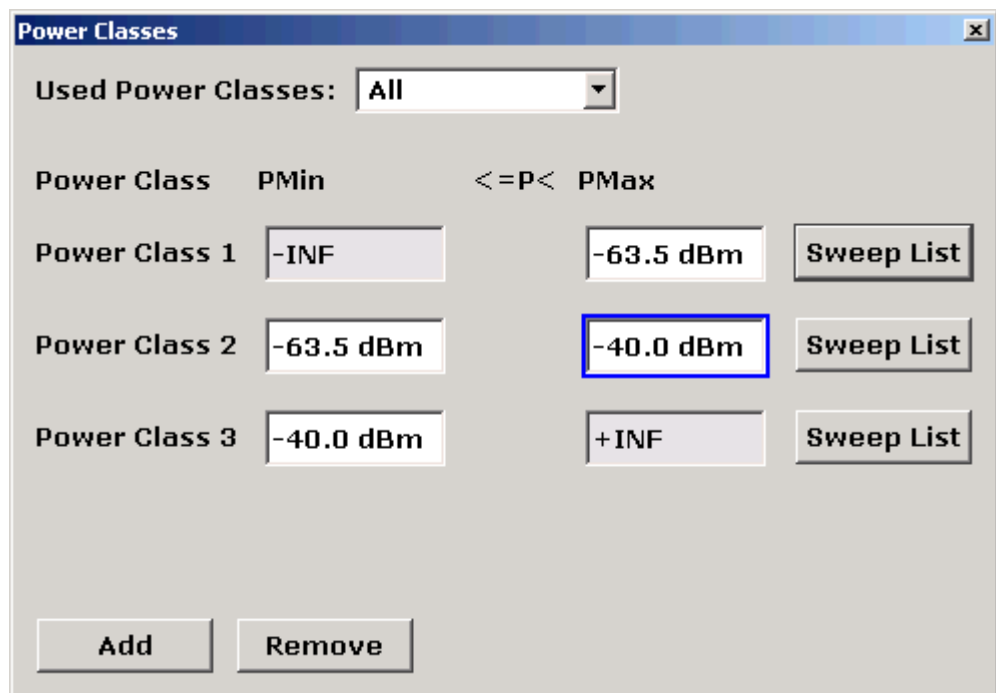
Used Power Classes ← Edit Power Classes ← Spectrum Emission Mask
Choose the power classes to be used from this dropdown menu. It is only possible to select either one of the defined power classes or all of the defined power classes together.

Only power classes for which limits are defined are available for selection.

If "All" is selected, the power class that corresponds to the currently measured power in the reference range is used. The limits assigned to that power class are applied (see "PMin/PMax" on page 119).

Remote command:

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] on page 207
To define all limits in one step:
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe] on page 208

PMin/PMax ← Edit Power Classes ← Spectrum Emission Mask
Defines the level limits for each power class. The range always starts at -200 dBm (-INF) and always stops at 200 dBm (+INF). These fields cannot be modified. If more than one Power Class is defined, the value of "PMin" must be equal to the value of "PMax" of the last Power Class and vice versa.

Note that the power level may be equal to the lower limit, but must be lower than the upper limit:

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

Remote command:

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum on page 209
CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum on page 209

Sweep List ← Edit Power Classes ← Spectrum Emission Mask
See "Sweep List" on page 110

Add/Remove ← Edit Power Classes ← Spectrum Emission Mask
Activates or deactivates power classes to be defined. Up to four power classes can be defined. The number of active power classes affects the availability of the items of the Used Power Classes dropdown menu.

Remote command:

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] on page 207

Bandclass ← Spectrum Emission Mask
Opens a dialog box to select a specific bandclass.

For a list of predefined bandclasses refer to the "Bandclass" softkey in the ACP menu ("Bandclass" on page 101.

The settings for each bandclass are provided in *.xml files that are located in the directory C:\R_S\INSTR\sem_std\evdo\dl. The files themselves are named DO_DL_BC01.XML (bandclass 1) to DO_DL_BC17.XML (bandclass 17). By selecting one of the bandclasses from the dialog box, the correct file is loaded automatically. The file can also be loaded manually (see Load Standard softkey).

Remote command:

CONFigure:CDPower[:BTS]:BCLass|BANDclass on page 225

Load Standard ← Spectrum Emission Mask
Opens a dialog box to select an XML file which includes the desired standard specification. For details on the provided XML files refer to chapter 6.4.10, "Provided XML Files for the Spectrum Emission Mask Measurement", on page 168.

Remote command:
[SENSe:]ESPectrum:PRESet[:STANdard] on page 257

Save As Standard ← Spectrum Emission Mask
Opens the "Save As Standard" dialog box, in which the currently used SEM settings and parameters can be saved and exported into an *.xml file. Enter the name of the file in the "File name" field. For details on the structure and contents of the XML file refer to chapter 6.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 163.

Remote command:
[SENSe:]ESPectrum:PRESet:STORe on page 257

Meas Start/Stop ← Spectrum Emission Mask
Aborts/restarts the current measurement and displays the status:

"Start"   The measurement is currently running.

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

Remote command:
ABORt on page 310
INITiate<n>:ESPectrum on page 311

Restore Standard Files ← Spectrum Emission Mask
Copies the XML files from the C:\R_S\instr\sem_backup folder to the C:\R_S\instr\sem_std folder. Files of the same name are overwritten.

Remote command:
[SENSe:]ESPectrum:PRESet:RESTore on page 257

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

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 234
CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? on page 187

% Power Bandwidth (span > 0) ← Occupied Bandwidth
Opens an edit dialog box to enter the percentage of total power in the displayed frequency range which defines the occupied bandwidth. Values from 10% to 99.9% are allowed.

Remote command:
[SENSe:]POWer:BANDwidth|BWIDth on page 282

Channel Bandwidth (span > 0) ← Occupied Bandwidth

Opens an edit dialog box to enter the channel bandwidth for the transmission channel. The specified channel bandwidth is used for optimization of the test parameters (for details see chapter 6.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 175). The default setting is 14 kHz.

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

Remote command:
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>] on page 274

Adjust Ref Lvl (span > 0) ← Occupied Bandwidth

Adjusts the reference level to the measured total power of the signal. the softkey is activated after the first sweep with active measurement of the occupied bandwidth has been completed and the total power of the signal is thus known.

Adjusting the reference level ensures that the signal path will not be overloaded and the dynamic range not limited by too low a reference level. Since the measurement bandwidth for channel power measurements is significantly lower than the signal bandwidth, the signal path may be overloaded although the trace is distinctly below the reference level. If the measured channel power is equal to the reference level, the signal path cannot be overloaded.

Remote command:
[SENSe:]POWer:ACHannel:PRESet:RLEVel on page 279

Adjust Settings ← Occupied Bandwidth

Automatically optimizes all instrument settings for the selected channel configuration (channel bandwidth, channel spacing) within a specific frequency range (channel bandwidth). The adjustment is carried out only once. If necessary, the instrument settings can be changed later.

For details on the settings of span, resolution bandwidth, video bandwidth, detector and trace averaging see chapter 6.4.14, "Optimized Settings for CP/ACLR Test Parameters", on page 175.

Remote command:
[SENSe:]POWer:ACHannel:PRESet on page 278

CCDF

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

Also opens the CCDF submenu containing the following softkeys:

Remote command:
CONFigure:CDPower[:BTS]:MEASurement on page 234

Res BW ← CCDF

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

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

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution] on page 266

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

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

Remote command:
CALCulate<n>:STATistics:NSAMples on page 220

Scaling ← CCDF
Opens a submenu to change the scaling parameters of x- and y-axis.

x-Axis Ref Level ← Scaling ← CCDF
Opens an edit dialog box to enter the reference level in the currently active unit (dBm, dBµV, etc). The function of this softkey is identical to the "Ref Level" softkey in the "Amplitude" menu (see "Ref Level" on page 62).

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

Remote command:
CALCulate<n>:STATistics:SCALe:X:RLEVel on page 222

x-Axis Range ← Scaling ← CCDF
Opens the "Range" submenu to select a value for the level range to be covered by the statistics measurement selected.

Remote command:
CALCulate<n>:STATistics:SCALe:X:RANGe on page 221

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

Remote command:
Logarithmic scaling:
DISP:WIND:TRAC:Y:SPAC LOG, see DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 241
Display range:
DISP:WIND:TRAC:Y 100DB, see DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] on page 238

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

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241
Display range:
`DISP:WIND:TRAC:Y 50DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 238

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

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241
Display range:
`DISP:WIND:TRAC:Y 10DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 238

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

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241
Display range:
`DISP:WIND:TRAC:Y 5DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 238

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

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241
Display range:
`DISP:WIND:TRAC:Y 1DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 238

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

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241
Display range:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 238

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

The grid is divided into decadal sections.

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

Remote command:
`DISP:TRAC:Y:SPAC LIN`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

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

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

Remote command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

y-Axis Max Value ← Scaling ← CCDF
Opens an edit dialog box to define the upper limit of the displayed probability range. Values on the y-axis are normalized which means that the maximum value is 1.0. The y-axis scaling is defined via the y-Unit % / Abs softkey. The distance between max and min value must be at least one decade.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:UPPer` on page 223

y-Axis Min Value ← Scaling ← CCDF
Opens an edit dialog box to define the lower limit of the displayed probability range. Values in the range $1e^{-9} < value < 0.1$ are allowed. The y-axis scaling is defined via the y-Unit % / Abs softkey. The distance between max and min value must be at least one decade.

Remote command:
`CALCulate<n>:STATistics:SCALe:Y:LOWer` on page 222

y-Unit % / Abs ← Scaling ← CCDF

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

Remote command:
CALCulate<n>:STATistics:SCALe:Y:UNIT on page 222

Default Settings ← Scaling ← CCDF

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

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

Remote command:
CALCulate<n>:STATistics:PRESet on page 220

Adjust Settings ← Scaling ← CCDF

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

Remote command:
CALCulate<n>:STATistics:SCALe:AUTO ONCE on page 221

Gated Trigger (On/Off) ← CCDF

Activates and deactivates the gating for statistics functions for the ACP and the CCDF channel. The trigger source is changed to "EXTERN" if this function is switched on. The gate ranges are defined using the "Gate Ranges" on page 125 softkey.

Remote command:
[SENSe:]SWEep:EGATe on page 284
[SENSe:]SWEep:EGATe:SOURce on page 285

Gate Ranges ← CCDF

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

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

Remote command:
`SWE:EGAT ON` (see `[SENSe:]SWEep:EGATe` on page 284)
Switches on the external gate mode.
`SWE:EGAT:TRAC1:COMM "SlotA"` (see `[SENSe:]SWEep:EGATe:TRACe<k>: COMMent` on page 286)
Adds a comment to trace 1.
`SWE:EGAT:TRAC1:STAT1 ON` (see `[SENSe:]SWEep:EGATe:TRACe<k>[: STATe<range>]` on page 287)
Activates tracing for range 1 of trace 1.
`SWE:EGAT:TRAC1:STAR1 3ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>: STARt<range>` on page 286)
Sets the starting point for range 1 on trace 1 at 3 ms.
`SWE:EGAT:TRAC1:STop1 5ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>: STOP<range>` on page 287)
Sets the stopping point for range 1 on trace 1 at 5 ms.
`SWE:EGAT:TRAC1:PER 5ms` (see `[SENSe:]SWEep:EGATe:TRACe<k>: PERiod` on page 286)
Defines the period for gated triggering to 5 ms.

Adjust Settings ← CCDF
Adjusts the level settings according to the measured difference between peak and min-imum power for APD measurement or peak and mean power for CCDF measurement in order to obtain maximum power resolution. Adjusts the reference level to the current input signal. For details see also the Adjust Ref Lvl softkey.

Remote command:
`CALCulate<n>:STATistics:SCALe:AUTO ONCE` on page 221

6.3.2 Softkeys of the Frequency Menu

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

Center

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.

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

Remote command:
[SENSe:]FREQuency:CENTer on page 270

CF Stepsize

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

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

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

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

This softkey is available for RF measurements.

0.1*Span (span > 0) ← CF Stepsize

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

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

0.1*RBW (span > 0) ← CF Stepsize

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

This is the default setting.

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

0.5*Span (span > 0) ← CF Stepsize

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

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

0.5*RBW (span > 0) ← CF Stepsize

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

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

x*Span (span > 0) ← CF Stepsize

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

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

x*RBW (span > 0) ← CF Stepsize

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

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

=Center ← CF Stepsize

Sets the step size to the value of the center frequency and removes the coupling of the step size to span or resolution bandwidth.

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

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

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

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

Remote command:
[SENSe:]FREQuency:CENTer:STEP on page 270

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

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

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

Remote command:
[SENSe:]FREQuency:STARt on page 272

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

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

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

Remote command:
[SENSe:]FREQuency:STOP on page 273

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

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

Remote command:
[SENSe:]FREQuency:OFFSet on page 272

6.3.3 Softkeys of the Span Menu for RF Measurements

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

Span Manual

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

The following range is allowed:

span = 0: 0 Hz

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

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

Remote command:
[SENSe:]FREQuency:SPAN on page 272

Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

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

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

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

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

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

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

Full Span

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

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

Last Span

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

Remote command:

-

6.3.4 Softkeys of the Amplitude Menu

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

Ref Level

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

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

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel on page 239

Range

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

This softkey and its submenu are available for RF measurements.

Range Log 100 dB ← Range

Sets the level display range to 100 dB.

Remote command:

Logarithmic scaling:

`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

Display range:

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

Range Log 50 dB ← Range

Sets the level display range to 50 dB.

Remote command:

Logarithmic scaling:

`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

Display range:

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

Range Log 10 dB ← Range

Sets the level display range to 10 dB.

Remote command:

Logarithmic scaling:

`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

Display range:

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

Range Log 5 dB ← Range

Sets the level display range to 5 dB.

Remote command:

Logarithmic scaling:

`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

Display range:

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

Range Log 1 dB ← Range

Sets the level display range to 1 dB.

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241
Display range:
`DISP:WIND:TRAC:Y 1DB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 238

Range Log Manual ← Range

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

Remote command:
Logarithmic scaling:
`DISP:WIND:TRAC:Y:SPAC LOG`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241
Display range:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 238

Range Linear % ← Range

Selects linear scaling for the level axis in %.

The grid is divided into decadal sections.

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

Remote command:
`DISP:TRAC:Y:SPAC LIN`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

Range Lin. Unit ← Range

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

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

Remote command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 241

Unit

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

The default setting is dBm.

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

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

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

Remote command:
CALCulate<n>:UNIT:POWer on page 224

Preamp On/Off
Switches the preamplifier on and off.

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

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

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

Remote command:
INPut:GAIN:STATe   on page 306

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

The mechanical attenuation can be set in 10 dB steps.

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

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

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

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

Note: As of firmware version 1.61, the maximum mixer level allowed is **0 dBm**. Mixer levels above this value may lead to incorrect measurement results, which are indicated by the "OVLD" status display. The increased mixer level allows for an improved signal, but also increases the risk of overloading the instrument!

Remote command:
INPut:ATTenuation on page 300

RF Atten Auto/Mech Att Auto

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

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

Remote command:
INPut:ATTenuation:AUTO on page 300

El Atten On/Off

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

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

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

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

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

Remote command:
INPut:EATT:AUTO on page 305

El Atten Mode (Auto/Man)

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

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

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

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

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

Remote command:
INPut:EATT:AUTO on page 305
INPut:EATT on page 305

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

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

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

Only available for RF measurements.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition on page 240

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

Only available for RF measurements.

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

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

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

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

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

Remote command:
[SENSe:]POWer:NCORrection on page 282

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

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

Remote command:
INPut:COUPling on page 301

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

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

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

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

Remote command:
INPut:IMPedance on page 306

6.3.5 Softkeys of the Bandwidth Menu

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

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

Res BW Manual

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

For details on the correlation between resolution bandwidth and filter type refer to chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 159.

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

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

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

Remote command:

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

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

Res BW Auto

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

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

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

Remote command:

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

Video BW Manual

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

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

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

Note: RMS detector and VBW.
If an RMS detector is used, the video bandwidth in the hardware is bypassed. Thus, duplicate trace averaging with small VBWs and RMS detector no longer occurs. However, the VBW is still considered when calculating the sweep time. This leads to a longer sweep time for small VBW values. Thus, you can reduce the VBW value to achieve more stable trace curves even when using an RMS detector. Normally, if the RMS detector is used the sweep time should be increased to get more stable trace curves. For details on detectors see chapter 6.4.3, "Detector Overview", on page 156.

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

Remote command:
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 269
[SENSe:]BANDwidth|BWIDth:VIDeo on page 268

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Sweep Type
Opens a submenu to define the sweep type.

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

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

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

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

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

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

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

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

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

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

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

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

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

Remote command:
SWE:TYPE AUTO, see [SENSe:]SWEep:TYPE on page 289

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

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

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT on page 267

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

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT on page 267

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

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

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

"video bandwidth = resolution bandwidth"

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

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

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
BAND:VID:RAT 1, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio
on page 269

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

"video bandwidth = 10 × resolution bandwidth or"

"video bandwidth = 10 MHz (= max. VBW)."

This coupling ratio is recommended whenever the amplitudes of pulsed signals are to be measured correctly. The IF filter is exclusively responsible for pulse shaping. No additional evaluation is performed by the video filter.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
BAND:VID:RAT 10, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio
on page 269

RBW/VBW Noise [10] ← Coupling Ratio
Sets the following coupling ratio:

"video bandwidth = resolution bandwidth/10"

At this coupling ratio, noise and pulsed signals are suppressed in the video domain. For noise signals, the average value is displayed.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
BAND:VID:RAT 0.1, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio
on page 269

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

The resolution bandwidth/video bandwidth ratio can be set in the range 0.001 to 1000.

This setting takes effect if you define the video bandwidth automatically (Video BW Auto).

Remote command:
BAND:VID:RAT 10, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio
on page 269

Span/RBW Auto [100] ← Coupling Ratio
Sets the following coupling ratio:

"resolution bandwidth = span/100"

This coupling ratio is the default setting of the R&S FSV.

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

Remote command:
BAND:VID:RAT 0.001, see [SENSe:]BANDwidth|BWIDth:VIDeo:RATio
on page 269

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

This setting takes effect if you define the resolution bandwidth automatically (Res BW Auto).

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

Remote command:
BAND:RAT 0.1, see [SENSe:]BANDwidth|BWIDth[:RESolution]:RATio on page 268

Default Coupling ← Coupling Ratio
Sets all coupled functions to the default state ("AUTO").

In addition, the ratio "RBW/VBW" is set to "SINE [1/1]" and the ratio "SPAN/RBW" to *100.*

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO on page 267
[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO on page 269
[SENSe:]SWEep:TIME:AUTO on page 288

Filter Type
Opens a submenu to select the filter type.

This softkey and its submenu are available for measuring the Adjacent Channel Power, the Spectrum Emission Mask, the Occupied Bandwidth and the CCDF. Instead of opening a submenu, this softkey opens the "Sweep List" dialog box to select the filter type when measuring the Spectrum Emission Mask.

The submenu contains the following softkeys:

- Normal (3 dB)
- CISPR (6 dB)
- MIL Std (6 dB)
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
- Channel
- RRC
- 5-Pole (not available for sweep type "FFT")

For detailed information on filters see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 159 and chapter 6.4.6, "List of Available RRC and Channel Filters", on page 160.

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

6.3.6 Softkeys of the Sweep Menu

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

Continuous Sweep

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 84).

Remote command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 311

Single Sweep

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

Remote command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 311

Continue Single Sweep

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

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

Remote command:
`INITiate<n>:CONMeas` on page 310

Sweeptime Manual

Opens an edit dialog box to enter the sweep time.

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

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

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

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

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

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

[SENSe:]SWEep:TIME on page 288

Sweeptime Auto

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

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

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

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

Sweep Type

Opens a submenu to define the sweep type.

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

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

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

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

Sweep ← Sweep Type

Sets the Sweep Type to standard analog frequency sweep.

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

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

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

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

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

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

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

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

Remote command:
SWE:TYPE AUTO, see [SENSe:]SWEep:TYPE on page 289

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

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

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT on page 267

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

Remote command:
[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT on page 267

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

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

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

Remote command:
[SENSe:]SWEep:COUNt on page 284

Sweep Points

Opens an edit dialog box to enter the number of measured values to be collected during one sweep.

- Entry via rotary knob:
  - In the range from 101 to 1001, the sweep points are increased or decreased in steps of 100 points.
  - In the range from 1001 to 32001, the sweep points are increased or decreased in steps of 1000 points.
- Entry via keypad:
  All values in the defined range can be set.

The default value is 691 sweep points.

This softkey is available for RF measurements.

Remote command:
`[SENSe:]SWEep:POINts` on page 288

6.3.7 Softkeys of the Marker Menu for RF Measurements

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

Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta
The "Marker X" softkey activates the corresponding marker and opens an edit dialog box to enter a value for the marker to be set to. Pressing the softkey again deactivates the selected marker.

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

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

Remote command:

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

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

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

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

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

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

CALCulate<n>:DELTamarker<m>:Y? on page 198

More Markers

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

Marker Norm/Delta

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

Remote command:

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

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

Marker to Trace

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

Remote command:

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

All Marker Off

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

Remote command:

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

Marker Table

Defines how the marker information is displayed.

This softkey is available for RF measurements.

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

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

"Aut"   (Default) The marker table is displayed automatically if more than 2 markers are active, and removed if only 1 or 2 markers are active. This helps keep the information in the display clear.

Remote command:
DISPlay:MTABle on page 235

Marker Stepsize

Opens a submenu to set the step size of all markers and delta markers.

Default value for the marker step size is Stepsize Sweep Points.

This softkey is available for RF measurements.

Stepsize Standard ← Marker Stepsize

Moves the marker or delta marker from one measurement point to the next, if the marker or delta marker value is changed via the rotary knob ("Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" softkeys, see "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147). If more measured values than measurement points exist, it is not possible to read out all measured values. In this case, use the Stepsize Sweep Points softkey.

Remote command:
CALC:MARK:X:SSIZ STAN (see CALCulate<n>:MARKer<m>:X:SSIZe on page 216)

Stepsize Sweep Points ← Marker Stepsize

Moves the marker or delta marker from one measured value to the next, if the marker or delta marker value is changed via the rotary knob ("Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" softkeys, see "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147). If more measured values than measurement points exist, every single measured value is accessible and its value is displayed in the marker field.

The number of measured values is defined in the ""Sweep"" menu via the Sweep Points softkey.

This functionality is available for all base unit measurements with the exception of statistics ("APD" and "CCDF" softkeys in the "Measurement" menu).

Remote command:
CALC:MARK:X:SSIZ POIN (see CALCulate<n>:MARKer<m>:X:SSIZe on page 216)

Link Mkr1 and Delta1

The delta marker 1 is linked to marker 1, so if the x-axis value of the marker 1 is changed, the delta marker 1 will follow on the same x-position. The link is off by default.

You can set the two markers on different traces to measure the difference (e.g. between a max hold trace and a min hold trace or between a measurement and a reference trace).

This softkey is available for RF measurements.

Remote command:
CALCulate<n>:DELTamarker<m>:LINK on page 194

6.3.8   Softkeys of the Input/Output Menu for RF Measurements

The following chapter describes all softkeys available in the "Input/Output" menu for RF measurements. For CDA measurements, see chapter 6.2.10, "Softkeys of the Input/Output Menu for CDA Measurements", on page 93.

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

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

Remote command:
INPut:COUPling on page 301

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

Remote command:
DIAGnostic<n>:SERVice:NSOurce on page 310

Video Output
Sends a video output signal according to the measured level to the connector on the rear panel of the R&S FSV.

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

Remote command:
OUTP:IF VID , see OUTPut:IF[:SOURce] on page 313

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

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

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

This softkey is available for RF measurements.

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

This softkey is available for RF measurements.

Remote command:
OUTPut:TRIGger on page 313

6.4 Further Information

6.4.1 Predefined Channel Tables

Predefined channel tables offer access to a quick configuration for the channel search. The CDMA2000 BTS Analysis (R&S FSV-K82) option provides the following set of channel tables compliant with the CDMA2000 specification:

Channel table	Contents
RECENT	Contains the channels that were automatically created during the last measurement with the "Auto Search" option activated (for details refer to "Channel Tables" on page 67).
MPC_RC1 (Base Station Main Path 6 Channels Radio Configuration 1)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
MPC_RC4 (Base Station Main Path 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.

Channel table	Contents
TDC_RC4 (Base Station Transmit Diversity Path 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-SYNC/F-PCH and 6 data channels.
BPC_RC4 (Base Station Both Paths 6 Channels Radio Configuration 4)	Channel table with F-PICH/F-TDPICH/F-SYNC/F-PCH and 6 data channels This standard does not specify a channel number for the data channels.

The CDMA2000 MS Analysis (R&S FSV-K83) option provides the following set of channel tables compliant with the CDMA2000 specification:

Channel table	Contents
RECENT	Contains the channels that were automatically created during the last measurement with the "Auto Search" option activated (for details refer to "Channel Tables" on page 67).
EACHOP	Channel table for Enhanced Access CHannel OPeration with PICH and EACH
RCCCHOP	Channel table for Reverse Common Control CHannel OPeration with PICH and CCCH
RTCHOP3	Channel table for Reverse Traffic CHannel OPeration with the following 3 channels: PICH/DCCH/FCH
RTCHOP5	Channel table for Reverse Traffic CHannel OPeration with the following 5 channels: PICH/DCCH/FCH/S1CH/S2CH

To use channels other than those in the predefined channel tables, you can copy the original tables and modify the channels in the copy.

Table 6-1: Base station channel table for main branch in radio configuration 1 (MPC_RC1)

Channel Type	Number of Channels	Code Channel (Walsh Code.SF)	Radio Configuration
F-PICH	1	0.64	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.64	1
		10.64	1
		11.64	1
		15.64	1
		17.64	1
		25.64	1

Table 6-2: Base station channel table for main branch in radio configuration 4 (MPC_RC4)

Channel Type	Number of Chan-nels	Code Channel (Walsh Code.SF)	Radio Configura-tion
F-PICH	1	0.64	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128	4
		10.128	4
		11.128	4
		15.128	4
		17.128	4
		25.128	4

Table 6-3: Base station test model for aggregate signal in radio configuration 4 (TDC_RC4)

Channel Type	Number of Chan-nels	Code Channel (Walsh Code.SF)	Radio Configura-tion
F-PICH	1	16.128	-
F-SYNC	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128	4
		10.128	4
		11.128	4
		15.128	4
		17.128	4
		25.128	4

Table 6-4: Base station test model for aggregate signal in radio configuration 4 (BPC_RC4)

Channel Type	Number of Chan-nels	Code Channel (Walsh Code.SF)	Radio Configura-tion
F-PICH	1	0.64	-
F-SYNC	1	16.128	-
	1	32.64	-
F-PCH	1	1.64	-
CHAN	6	9.128	4
		10.128	4
		11.128	4
		15.128	4
		17.128	4
		25.128	4

Table 6-5: Channel table for enhanced access channel operation

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
EACH	2.8	Q

Table 6-6: Channel table for reverse commom control channel operation

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
CCCH	2.8	Q

Table 6-7: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 3

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
FCH	4.16	Q
S1CH	2.4	Q

Table 6-8: Channel table for REVERSE TRAFFIC CHANNEL OPERATION 5

Channel type	Code channel (Walsh Code.SF)	Mapping
PICH	0.32	I
DCCH	8.16	I
FCH	4.16	Q
S1CH	2.4	Q
S2CH	6.8	I

6.4.1.1 Relationship Between Channel and Modulation Type

Channel type	Channel	Modulation
F-PICH	Pilot channel	BPSK
F-SYNC	Synchronisation channel	BPSK
F-PCH	Paging channel	BPSK
F-TDPICH	Transmit diversity pilot channel	BPSK
F-APICH	Auxiliary pilot channel	BPSK
F-ATDPICH	Auxiliary transmit diversity channel	BPSK
F-BCH	Broadcast channel	QPSK
F-CPCCH	Common power control channel	QPSK
F-CACH	Common assignment channel	QPSK
F-CCCH	Common control channel	QPSK

F-PDCCH	Packet data control channel	QPSK
F-PDCH	Packet data channel	QPSK, 8PSK or 16QAM
CHAN	Data channel radio configuration 1-2	BPSK
CHAN	Data channel radio configuration 3-5	QPSK

6.4.2 Working with Channel Tables

Creating a channel table

1. Select the "Code Domain Analyzer" softkey.

2. Select the "Channel Table Settings" softkey.
   The "Channel Table Settings" dialog box is displayed.

3. Select the "Predef" channel search mode and set a threshold for inactive channels.

4. Press the "New / Copy / Edit" on page 67 softkey to create a new channel table.
   The "New Channel Table" dialog box is displayed. The new channel table contains no data at all.

5. Enter a name for the new channel table, e.g. 'Test Table' in the corresponding field.
   The name you enter in this field is also the name of the table channel file.

6. Enter a description for your new channel table, e.g. 'Channel table created for test purposes' in the "Description" field.

7. Build your channel table by adding the channels with the configuration you need
   or
   Measure the current signal by pressing the "Meas" on page 69 softkey. The R&S FSV automatically adds the channels of the current signal to the channel table.
   Refer to the "New / Copy / Edit" on page 67 softkey for a description of all parameters relating to a channel.

8. Save your table by pressing the "Save" on page 69 softkey. All data is lost if you just close the dialog box.
   The list of available channel tables in the "Channel Table Settings" dialog box now contains the 'Test Table'.

Editing a channel table

1. Select the "Code Domain Analyzer" softkey.

2. Select the "Channel Table Settings" softkey.

3. Select your recently created channel table. Press the "New / Copy / Edit" on page 67 softkey to open and modify the channel table.
   Each row in the channel table represents one channel.

4. Sort the channels in the channel table by pressing the "Sort" on page 69 softkey. The R&S FSV sorts the channels according to the rules listed in the "Sort" on page 69 softkey description.

5. Add a new channel by pressing the "Add Channel" on page 69 softkey.

    a) Select a channel type, e.g. a data channel.
    b) In the "Channel Type" field select "CHAN" from the dropdown menu.
    c) Sspecify the channel number (a value between 0 and 127) and spreading factor.
    d) Choose the radio configuration (usually 3-5)
    e) Activate the channel by editing the "State" field.
        The other values (symbol rate and power) are automatically calculated. If there is a conflict with another channel in the table, a red diamond is displayed in the "Domain Conflict" field of the conflicting channels.

1. You can delete a channel with the "Delete Channel" on page 69 softkey. Note that a channel is deleted without further notice.

2. If you want to discard your changes, you can restore the original table with the "Reload" on page 70 softkey. All your changes will be lost.
    You can also restore the default channel tables delivered with the R&S FSV with the "Restore Default Tables" on page 70. This recovery can be done even if you have saved changes to these tables.

For more information on softkeys, dialog boxes and parameters concerning channel tables refer to the description of the "Channel Table Settings" on page 65 dialog box.

6.4.3 Detector Overview

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

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

Table 6-9: Detector types

Detector	Indicator	Function
Auto Peak	Ap	Determines the maximum and the minimum value within a measurement point (not available for SEM)
Positive Peak	Pk	Determines the maximum value within a measurement point
Negative Peak (min peak)	Mi	Determines the minimum value within a measurement point
RMS	Rm	Determines the root mean square power within a measurement point

Detector	Indicator	Function
Average	Av	Determines the linear average power within a measurement point
Sample	Sa	Selects the last value within a measurement point

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

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

Number of measured values

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

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

RMS detector and VBW

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

6.4.4 Trace Mode Overview

The traces can be activated individually for a measurement or frozen after completion of a measurement. Traces that are not activate are hidden. Each time the trace mode is changed, the selected trace memory is cleared.

The R&S FSV offers 6 different trace modes:

Clear Write
Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

All available detectors can be selected.

Remote command:
`DISP:TRAC:MODE WRIT`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 236

Max Hold

The maximum value is determined over several sweeps and displayed. The R&S FSV saves the sweep result in the trace memory only if the new value is greater than the previous one.

The detector is automatically set to "Positive Peak".

This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each sweep until all signal components are detected in a kind of envelope.

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE MAXH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 236

Min Hold

The minimum value is determined from several measurements and displayed. The R&S FSV saves the smallest of the previously stored/currently measured values in the trace memory.

The detector is automatically set to "Negative Peak".

This mode is useful e.g. for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed whereas a CW signal is recognized by its constant level.

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE MINH, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 236

Average

The average is formed over several sweeps. The Sweep Count determines the number of averaging procedures.

All available detectors can be selected. If the detector is automatically selected, the sample detector is used (see chapter 6.4.3, "Detector Overview", on page 156).

This mode is not available for statistics measurements.

Remote command:
DISP:TRAC:MODE AVER, see DISPlay[:WINDow<n>]:TRACe<t>:MODE on page 236

View

The current contents of the trace memory are frozen and displayed.

Note: If a trace is frozen, the instrument settings, apart from level range and reference level (see below), can be changed without impact on the displayed trace. The fact that the displayed trace no longer matches the current instrument setting is indicated by the ★ icon on the tab label.

If the level range or reference level is changed, the R&S FSV automatically adapts the measured data to the changed display range. This allows an amplitude zoom to be made after the measurement in order to show details of the trace.

Remote command:
`DISP:TRAC:MODE VIEW`, see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 236

Blank
Hides the selected trace.

Remote command:
`DISP:TRAC OFF`, see `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]` on page 237

6.4.5 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

The video filters are responsible for smoothing the displayed trace. Using video bandwidths that are small compared to the resolution bandwidth, only the signal average is displayed and noise peaks and pulsed signals are repressed. If pulsed signals are to be measured, it is advisable to use a video bandwidth that is large compared to the resolution bandwidth (VBW * 10 x RBW) for the amplitudes of pulses to be measured correctly.

The following filter types are available:

● Normal (3dB) (Gaussian) filters
  The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.
● CISPR (6 dB) filters
● MIL Std (6 dB) filters
  Note that the 6 dB bandwidths are available only with option R&S FSV-K54.
● Channel filters
  For details see chapter 6.4.6, "List of Available RRC and Channel Filters", on page 160 .
  Channel filters do not support FFT mode.
● RRC filters
  For details see chapter 6.4.6, "List of Available RRC and Channel Filters", on page 160 .
  RRC filters do not support FFT mode.
● 5-Pole filters
  The available bandwidths are specified in the data sheet.
  5-Pole filters do not support FFT mode.

6.4.6   List of Available RRC and Channel Filters

For power measurement a number of especially steep-edged channel filters are available (see the following table). The indicated filter bandwidth is the 3 dB bandwidth. For RRC filters, the fixed roll-off factor (a) is also indicated.

Table 6-10: Filter types

Filter Bandwidth	Filter Type	Application
100 Hz	CFILter	
200 Hz	CFILter	A0
300 Hz	CFILter	
500 Hz	CFILter	
1 kHz	CFILter	
1.5 kHz	CFILter	
2 kHz	CFILter	
2.4 kHz	CFILter	SSB
2.7 kHz	CFILter	
3 kHz	CFILter	
3.4 kHz	CFILter	
4 kHz	CFILter	DAB, Satellite
4.5 kHz	CFILter	
5 kHz	CFILter	
6 kHz	CFILter	
6 kHz, a=0.2	RRC	APCO
8.5 kHz	CFILter	ETS300 113 (12.5 kHz channels)
9 kHz	CFILter	AM Radio
10 kHz	CFILter	
12.5 kHz	CFILter	CDMAone
14 kHz	CFILter	ETS300 113 (20 kHz channels)
15 kHz	CFILter	
16 kHz	CFILter	ETS300 113 (25 kHz channels)
18 kHz, a=0.35	RRC	TETRA
20 kHz	CFILter	
21 kHz	CFILter	PDC
24.3 kHz, a=0.35	RRC	IS 136

Filter Bandwidth	Filter Type	Application
25 kHz	CFILter	
30 kHz	CFILter	CDPD, CDMAone
50 kHz	CFILter	
100 kHz	CFILter	
150 kHz	CFILter	FM Radio
192 kHz	CFILter	PHS
200 kHz	CFILter	
300 kHz	CFILter	
500 kHz	CFILter	J.83 (8-VSB DVB, USA)
1 MHz	CFILter	CDMAone
1.228 MHz	CFILter	CDMAone
1.28 MHz, a=0.22	RRC	
1.5 MHz	CFILter	DAB
2 MHz	CFILter	
3 MHz	CFILter	
3.75 MHz	CFILter	
3.84 MHz, a=0.22	RRC	W-CDMA 3GPP
4.096 MHz, a=0.22	RRC	W-CDMA NTT DOCoMo
5 MHz	CFILter	
20 MHz	CFILter	
28 MHz	CFILter	
40 MHz	CFILter	

6.4.7 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

File contents: header and data section	Description
Date;01.Apr 2010;	Date of data set storage
Screen;A;	Instrument mode
Points per Symbol;4;	Points per symbol
x Axis Start;-13;sym;	Start value of the x axis
x Axis Stop;135;sym;	Stop value of the x axis
Ref value y axis;-10.00;dBm;	Y axis reference value
Ref value position;100;%;	Y axis reference position
Trace;1;	Trace number
Meas;Result;	Result type
Meas Signal;Magnitude;	Result display
Demodulator;Offset QPSK;	Demodulation type
ResultMode;Trace;	Result mode
x unit;sym;	Unit of the x axis
y unit;dBm;	Unit of the y axis
Trace Mode;Clear Write;	Trace mode
Values;592;	Number of results
<values>	List of results

6.4.8 ASCII File Export Format (Spectrum Emission Mask)

The first part of the file lists information about the signal analyzer and the general setup. For a detailed description refer to chapter 6.4.7, "ASCII File Export Format", on page 161.

File contents	Description
RefType; CPOWER; TxBandwidth;9540000;Hz Filter State; ON; Alpha;0.22;	reference range setup, for details see "Edit Reference Range" on page 115
PeaksPerRange;1; Values;4;	evaluation list information
0;-22500000;-9270000;1000000;2986455000;-74.762840 270996094; -10.576210021972656;-45.762840270996094;PASS; 1;-9270000;-4770000;100000;2991405000;-100.1769561 7675781; -35.990325927734375;-1.490325927734375;PASS 3;4770000;9270000;100000;3005445000;-100.17695617 675781; -35.990325927734375;-1.490325927734375;PASS; 4;9270000;22500000;1000000;3018225000;-74.7628402 70996094; -10.576210021972656;-45.762840270996094;PASS;	information about each peak: <range number>; <start frequency>; <stop frequency>; <resolution bandwidth of range>; <frequency of peak>; <absolute power in dBm of peak>; <relative power in dBc of peak (related to the channel power)>; <distance to the limit line in dB (positive value means above the limit)>; <limit fail (pass = 0, fail =1)>;

6.4.9 Format Description of Spectrum Emission Mask XML Files

The files for importing range settings are in XML format and therefore obey the rules of the XML standard. Below, the child nodes, attributes, and structure defined for the data import is described. Build your own XML files according to these conventions because the R&S FSV can only interpret XML files of a known structure. For example files look in the `C:\r_s\instr\sem_std` directory.

Spectrum Emission Mask		Standard: W-CDMA 3GPP (39,43)dBm DL				
Tx Power -47.93 dBm		**Tx Bandwidth** 3.840 MHz			**RBW** 30.000 kHz	
Range Low	**Range Up**	**RBW**	**Frequency**	**Power Abs**	**Power Rel**	**ΔLimit**
-12.750 MHz	-8.000 MHz	1.000 MHz	14.99094 GHz*	-74.76 dBm*	-26.83 dB*	27.67 dB*
-8.000 MHz	-4.000 MHz	1.000 MHz	14.99598 GHz	-36.79 dBm	11.14 dB	-25.29 dB
-4.000 MHz	-3.515 MHz	30.000 kHz	14.99628 GHz	-100.18 dBm	-52.25 dB	-75.68 dB
-3.515 MHz	-2.715 MHz	30.000 kHz	14.99648 GHz	-103.55 dBm	-55.63 dB	-79.05 dB
-2.715 MHz	-2.515 MHz	30.000 kHz	14.99747 GHz	-108.91 dBm	-60.98 dB	-96.41 dB
2.515 MHz	2.715 MHz	30.000 kHz	15.00251 GHz	-48.25 dBm	-0.32 dB	-35.75 dB
2.715 MHz	3.515 MHz	30.000 kHz	15.00272 GHz	-52.48 dBm	-4.56 dB	-39.98 dB
3.515 MHz	4.000 MHz	30.000 kHz	15.00398 GHz	-74.53 dBm	-26.60 dB	-50.03 dB
4.000 MHz	8.000 MHz	1.000 MHz	15.00769 GHz	-74.76 dBm	-26.83 dB	-63.26 dB
8.000 MHz	12.750 MHz	1.000 MHz	15.01273 GHz*	-36.79 dBm*	11.14 dB*	65.64 dB*

Fig. 6-17: Example Spectrum emission mask standard file (PowerClass_39_43.xml)

Be sure to follow the structure exactly as shown below or else the R&S FSV is not able to interpret the XML file and error messages are shown on the screen. Therefore, we recommend you make a copy of an existing file (see Save As Standard softkey) and edit the copy of the file.

Alternatively, edit the settings using the "Spectrum Emission Mask" softkey and the Sweep List dialog box and save the XML file with the Save As Standard softkey afterwards. This way, no modifications have to be done in the XML file itself.

Basically, the file consists of three elements that can be defined:

- The "BaseFormat" element
- The "PowerClass" element
- The "Range" element

The "BaseFormat" element

It carries information about basic settings. In this element only the "ReferencePower" child node has any effects on the measurement itself. The other attributes and child nodes are used to display information about the Spectrum Emission Mask Standard on the measurement screen. The child nodes and attributes of this element are shown in table 6-11.

In the example above (`PowerClass_39_43.xml` under `C:\r_s\instr\sem_std\WCDMA\3GPP`, see figure 6-17), these attributes are defined as follows:

- Standard="W-CDMA 3GPP"
- LinkDirection="DL"
- PowerClass="(39,43)dBm"

The "PowerClass" element

It is embedded in the "BaseFormat" element and contains settings information about the power classes. Up to four different power classes can be defined. For details refer to the "Sweep List" softkey ("Sweep List" on page 110) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 6-12.

The "Range" element

This element is embedded in the "PowerClass" element. It contains the settings information of the range. There have to be at least three defined ranges: one reference range and at least one range to either side of the reference range. The maximum number of ranges is 20. Note that the R&S FSV uses the same ranges in each power class. Therefore, the contents of the ranges of each defined power class have to be identical to the first power class. An exception are the Start and Stop values of the two Limit nodes that are used to determine the power class. Note also, that there are two Limit nodes to be defined: one that gives the limit in absolute values and one in relative values. Make sure units for the Start and Stop nodes are identical for each Limit node.

For details refer to the "Sweep List" softkey ("Sweep List" on page 110) and the corresponding parameter description. The child nodes and attributes of this element are shown in table 6-13.

The following tables show the child nodes and attributes of each element and show if a child node or attribute is mandatory for the R&S FSV to interpret the file or not. Since the hierarchy of the XML can not be seen in the tables, either view one of the default files already stored on the R&S FSV in the "C:\r_s\instr\sem_std" directory or check the structure as shown below.

Below, a basic example of the structure of the file is shown, containing all mandatory attributes and child nodes. Note that the "PowerClass" element and the range element are themselves elements of the "BaseFormat" element and are to be inserted where noted. The separation is done here simply for reasons of a better overview. Also, no example values are given here to allow a quick reference to the tables above. Italic font shows the placeholders for the values.

- The "BaseFormat" element is structured as follows:
    - <RS_SEM_ACP_FileFormat Version=""1.0.0.0"">
    <Name>"Standard"</Name>
    <Instrument>
    <Type>"Instrument Type"</Type>
    <Application>"Application"</Application>
    </Instrument>
    <LinkDirection Name=""Name"">
    <ReferencePower>
    <Method>"Method"</Method>
    </ReferencePower>
    <PowerClass Index=""n"">
    <!-- For contents of the PowerClass node see
    table 6-12 -->
    <!-- Define up to four PowerClass nodes -->
    </PowerClass>
    </LinkDirection>
    </RS_SEM_ACP_File>

- The "PowerClass" element is structured as follows:
    - <PowerClass Index=""n"">
    <StartPower Unit=""dBm"" InclusiveFlag=""true"" Value=""StartPowerValue""/>
    <StopPower Unit=""dBm"" InclusiveFlag=""false"" Value=""StopPowerValue""/>
    <DefaultLimitFailMode>"Limit Fail Mode"</DefaultLimitFailMode>
    <Range Index=""n"">
    <!-- For contents of the Range node see table 6-13 -->
    <!-- Define up to twenty Range nodes -->
    </Range>
    …
    </PowerClass>

- The "Range" element is structured as follows:
    - <Range Index=""n"">
    <Name=""Name"">
    <ChannelType>"Channel Type"</Channel Type>
    <WeightingFilter>

```
<Type>"FilterType"</Type>
<RollOffFactor>"Factor"</RollOffFactor>
<Bandwith>"Bandwidth"</Bandwidth>
</WeightingFilter>
<FrequencyRange>
<Start>"RangeStart"</Start>
<Stop>"RangeStop"</Stop>
</FrequencyRange>
<Limit>
<Start Unit=""Unit"" Value=""Value""/>
<Stop Unit=""Unit"" Value=""Value""/>
</Limit>
<Limit>
<Start Unit=""Unit"" Value=""Value""/>
<Stop Unit=""Unit"" Value=""Value""/>
</Limit>
<RBW Bandwidth=""Bandwidth"" Type=""FilterType""/>
<VBW Bandwidth=""Bandwidth""/>
<Detector>"Detector"</Detector>
<Sweep Mode=""SweepMode"" Time=""SweepTime""/>
<Amplitude>
<ReferenceLevel Unit=""dBm"" Value=""Value""/>
<RFAttenuation Mode=""Auto"" Unit=""dB"" Value=""Value""/>
<Preamplifier State=""State""/>
</Amplitude>
</Range>
```

Table 6-11: Attributes and child nodes of the BaseFormat element

Child Node	Attribute	Value	Parameter Description	Mand.
	FileFormatVersion	1.0.0.0		Yes
	Date	YYYY-MM-DD HH:MM:SS	Date in ISO 8601 format	No
Name		<string>	Name of the standard	Yes
Instrument	Type	FSL	Name of the instrument	No
	Application	SA | K72 | K82	Name of the application	No
LinkDirection	Name	Downlink | Uplink | None		Yes
	ShortName	DL | UL		No
Reference-Power				Yes
Method	TX Channel Power | TX Channel Peak Power			Yes
Reference-Channel	<string>			No

Table 6-12: Attributes and child nodes of the PowerClass element

Child Node	Attribute	Value	Parameter Description	Mand.
StartPower	Value	<power in dBm>	The start power must be equal to the stop power of the previous power class. The Start-Power value of the first range is -200	Yes
	Unit	dBm		Yes
	InclusiveFlag	true		Yes
StopPower	Value	<power in dBm>	The stop power must be equal to the start power of the next power class. The StopPower value of the last range is 200	Yes
	Unit	dBm		
	InclusiveFlag	false		Yes
DefaultLimitFailMode		Absolute | Relative | Absolute and Relative | Absolute or Relative		Yes

Table 6-13: Attributes and child nodes of the Range element (normal ranges)

Child Node	Attribute	Value	Parameter Description	Mand.
	Index	0…19	Inde XE s are continuous and have to start with 0	Yes
	Name	<string>	Name of the range	Only if ReferenceChannel contains a name and the range is the reference range
	Short-Name	<string>	Short name of the range	No
ChannelType		TX | Adjacent		Yes
WeightingFilter				Only if ReferencePower method is TX Channel Power and the range is the reference range
Type		RRC | CFilter	Type of the weighting filter	Yes
Roll Off Factor		0…1	Excess bandwidth of the filter	Only if the filter type is RRC
Bandwidth		<bandwidth in Hz>	Filter bandwidth	Only if the filter type is RRC
FrequencyRange				Yes
Start		<frequency in Hz>	Start value of the range	Yes
Stop		<frequency in Hz>	Stop value of the range	Yes

Child Node	Attribute	Value	Parameter Description	Mand.
Limit		dBm/Hz | dBm | dBc | dBr | dB	A Range must contain exactly two limit nodes; one of the limit nodes has to have a relative unit (e.g. dBc), the other one must have an absolute unit (e.g. dBm)	Yes
Start	Value	<numeric_value>	Power limit at start frequency	Yes
	Unit	dBm/Hz | dBm | dBc | dBr | dB	Sets the unit of the start value	
Stop	Value	<numeric_value>	Power limit at stop frequency	
	Unit	dBm/Hz | dBm | dBc | dBr | dB	Sets the unit of the stop value	
LimitFailMode		Absolute | Relative | Absolute and Relative | Absolute or Relative	If used, it has to be identical to DefaultLimitFailMode	No
RBW	Bandwidth	<bandwidth in Hz>	"RBW" on page 112	Yes
	Type	NORM | PULS | CFIL | RRC		No
VBW	Bandwidth	<bandwidth in Hz>	"VBW" on page 112	Yes
Detector		NEG | POS | SAMP | RMS | AVER | QUAS	If used, it has to be identical in all ranges.	No
Sweep	Mode	Manual | Auto	"Sweep Time Mode" on page 112	Yes
	Time	<time in sec>	"Sweep Time" on page 112	No
Amplitude				No
ReferenceLevel	Value	<power in dBm>	"Ref. Level" on page 112	Yes, if the ReferenceLevel child node is used
	Unit	dBm	Defines dBm as unit	Yes, if the ReferenceLevel node is used
RFAttenuation	Mode	Manual | Auto	"RF Att. Mode" on page 112	Yes, if the ReferenceLevel child node is used
Preamplifier		ON | OFF	"Preamp" on page 113	Yes

6.4.10 Provided XML Files for the Spectrum Emission Mask Measurement

You can change the settings manually or via XML files. The XML files offer a quick way to change the configuration. A set of ready-made XML files for different standards is

already provided. For details see table 6-14. You can also create and use your own XML files (for details see chapter 6.4.9, "Format Description of Spectrum Emission Mask XML Files", on page 163). All XML files are stored under "C:\r_s\instr\sem_std". Use the "Load Standard" softkey for quick access to the available XML files (see "Load Standard" on page 120).

Table 6-14: Provided XML files

Path	XML file name	Displayed standard characteristics*
cdma2000\DL	default0.xml	CDMA2000 BC0 DL
	default1.xml	CDMA2000 BC1 DL
cdma2000\UL	default0.xml	CDMA2000 BC0 UL
	default1.xml	CDMA2000 BC1 UL
WCDMA\3GPP\DL	PowerClass_31_39.xml	W-CDMA 3GPP (31,39)dBm DL
	PowerClass_39_43.xml	W-CDMA 3GPP (39,43)dBm DL
	PowerClass_43_INF.xml	W-CDMA 3GPP (43,INF)dBm DL
	PowerClass_negINF_31.xml	W-CDMA 3GPP (-INF,31)dBm DL
WIBRO\DL	PowerClass_29_40.xml	WiBro TTA (29,40)dBm DL
	PowerClass_40_INF.xml	WiBro TTA (40,INF)dBm DL
	PowerClass_negINF_29.xml	WiBro TTA (-INF,29)dBm DL
WIBRO\UL	PowerClass_23_INF.xml	WiBro TTA (23,INF)dBm UL
	PowerClass_negINF_23.xml	WiBro TTA (23,INF)dBm UL
WIMAX\DL\ETSI\…MHz (1.75 MHz, 2.00 MHz, 3.5 MHz, 7.00 MHz, 14.00 MHz, 28 MHz)	System_Type_E.xml	WIMAX System Type E DL
	System_Type_F.xml	WIMAX System Type F DL
	System_Type_G.xml	WIMAX System Type G DL
WIMAX\DL\IEEE	10MHz.xml	WIMAX 10MHz DL
	20MHz.xml	WIMAX 20MHz DL
WIMAX\UL\ETSI…MHz (1.75 MHz, 2.00 MHz, 3.5 MHz, 7.00 MHz, 14.00 MHz, 28 MHz)	System_Type_E.xml	WIMAX System Type E UL
	System_Type_F.xml	WIMAX System Type F UL
	System_Type_G.xml	WIMAX System Type G UL
WIMAX\UL\IEEE	10MHz.xml	WIMAX 10MHz UL
	20MHz.xml	WIMAX 20MHz UL
WLAN\802_11_TURBO	ETSI.xml	IEEE 802.11
	IEEE.xml	IEEE 802.11

Path	XML file name	Displayed standard characteristics*
WLAN\802_11a	ETSI.xml	IEEE 802.11a
	IEEE.xml	IEEE 802.11a
WLAN\802_11b	IEEE.xml	IEEE 802.11b
WLAN\802_11j_10MHz	ETSI.xml	IEEE.802.11j
	IEEE.xml	IEEE.802.11j
WLAN\802_11j_20MHz	ETSI.xml	IEEE 802.11j
	IEEE.xml	IEEE 802.11j
EUTRA-LTE\DL\CategoryA\	BW_01_4_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_01_4_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_03_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_03_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_05_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_05_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_10_0_MHz__Cfhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_10_0_MHz__Cflower1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_15_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_15_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_20_0_MHz__CFhigher1GHz.xml	LTE Cat. A >1GHz DL
EUTRA-LTE\DL\CategoryA\	BW_20_0_MHz__CFlower1GHz.xml	LTE Cat. A <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_01_4_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_01_4_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_03_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_03_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_05_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_05_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_10_0_MHz__Cfhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_10_0_MHz__Cflower1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_15_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL

Path	XML file name	Displayed standard character-istics*
EUTRA-LTE\DL\CategoryB\	BW_15_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_20_0_MHz__CFhigher1GHz.xml	LTE Cat. B >1GHz DL
EUTRA-LTE\DL\CategoryB\	BW_20_0_MHz__CFlower1GHz.xml	LTE Cat. B <1GHz DL
EUTRA-LTE\UL\Standard\	BW_05_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_10_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_15_0_MHz.xml	LTE UL
EUTRA-LTE\UL\Standard\	BW_20_0_MHz.xml	LTE UL

*Used abbreviations:

BC: band class

UL: uplink

DL: downlink

TTA: Telecommunications Technology Association

6.4.11 Ranges and Range Settings

In the Spectrum Emission Mask measurements, a range defines a segment for which you can define the following parameters separately:

● Start and stop frequency
● RBW
● VBW
● Sweep time
● Sweep points
● Reference level
● Attenuator settings
● Limit values

Via the sweep list, you define the ranges and their settings. For details on settings refer to "Sweep List dialog box" on page 111.

For details on defining the limits (masks) see the base unit description "Working with Lines in SEM".

The following rules apply to ranges:

● The minimum span of a range is 20 Hz.
● The individual ranges must not overlap (but need not directly follow one another).
● The maximum number of ranges is 20.
● A minimum of three ranges is mandatory.

- The reference range cannot be deleted (it is marked in blue color).
- The reference range has to be centered on the center frequency.
- The minimum span of the reference range is given by the current TX Bandwidth.
- Frequency values for each range have to be defined relative to the center frequency.

In order to change the start frequency of the first range or the stop frequency of the last range, select the appropriate span with the SPAN key. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last ranges are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Symmetrical ranges

You can easily define a sweep list with symmetrical range settings, i.e. the ranges to the left and right of the center range are defined symmectrically. In the "Sweep List" menu, select the "Symmetrical Setup" softkey to activate symmetrical setup mode. The current sweep list configuration is changed to define a symmetrical setup regarding the reference range. The number of ranges to the left of the reference range is reflected to the right, i.e. any missing ranges on the right are inserted, while superfluous ranges are removed. The values in the ranges to the right of the reference range are adapted symmetrically to those in the left ranges.

For details see "Symmetric Setup" on page 115.

Symmetrical ranges fulfull the conditions required for "Fast SEM" mode (see chapter 6.4.12, "Fast Spectrum Emission Mask Measurements", on page 172).

6.4.12 Fast Spectrum Emission Mask Measurements

In order to improve the performance of the R&S FSV for spectrum emission mask measurements, a "Fast SEM" mode is available. If this mode is activated, several consecutive ranges with identical sweep settings are combined to one sweep internally, which makes the measurement considerably more efficient. The displayed results remain unchanged and still consist of several ranges. Thus, measurement settings that apply only to the results, such as limits or transducer factors, can nevertheless be defined individually for each range.

Prerequisites

"Fast SEM" mode is available if the following criteria apply:

- The frequency ranges are consecutive, without frequency gaps
- The following sweep settings are identical:
  – "Filter Type", see "Filter Type" on page 112
  – "RBW", see "RBW" on page 112
  – "VBW", see "VBW" on page 112
  – "Sweep Time Mode", see "Sweep Time Mode" on page 112
  – "Ref Level", see "Ref. Level" on page 112

- "Rf Att. Mode", see "RF Att. Mode" on page 112
- "RF Attenuator", see "RF Att. Mode" on page 112
- "Preamp", see "Preamp" on page 113

Activating Fast SEM mode

"Fast SEM" mode is activated in the sweep list (see "Fast SEM" on page 111) or using a remote command. Activating the mode for one range automatically activates it for all ranges in the sweep list.

In the provided XML files for the Spectrum Emission Mask measurement, "Fast SEM" mode is activated by default.

SCPI command:

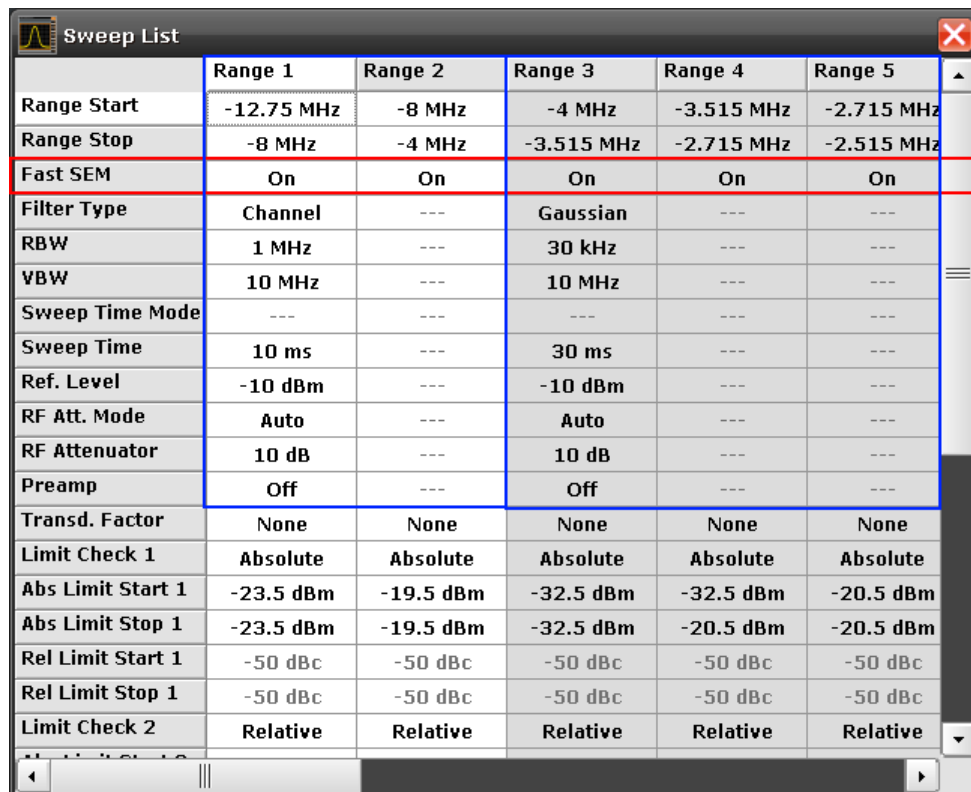`[SENSe:]ESPectrum:HighSPeed` on page 256

Consequences

When the "Fast SEM" mode is activated, the ranges for which these criteria apply are displayed as one single range. The sweep time is defined as the sum of the individual sweep times, initially, but can be changed. When the "Fast SEM" mode is deactivated, the originally defined individual sweep times are reset.

If "Symmetrical Setup" mode is active when "Fast SEM" mode is activated, not all sweep list settings can be configured symmetrically automatically (see also "Symmetric Setup" on page 115).

Any other changes to the sweep settings of the combined range are applied to each included range and remain changed even after deactivating "Fast SEM" mode.

Example

Fig. 6-18: Sweep list using Fast SEM mode

In figure 6-18, a sweep list is shown for which Fast SEM is activated. The formerly 5 separately defined ranges are combined to 2 sweep ranges internally.

6.4.13 Predefined CP/ACLR Standards

When using predefined standards for ACLR measurement, the test parameters for the channel and adjacent-channel measurements are configured automatically. The available standards are listed below.

Predefined standards are selected using the "CP/ACLR Standard" softkey or the `CALC:MARK:FUNC:POW:PRES` command.

Standard	GUI-Parameter	SCPI-Parameter
EUTRA/LTE Square	EUTRA/LTE Square	EUTRa
EUTRA/LTE Square/RRC	EUTRA/LTE Square/RRC	REUTRa
W-CDMA 3.84 MHz forward	W-CDMA 3GPP FWD	FW3G
W-CDMA 3.84 MHz reverse	W-CDMA 3GPP REV	RW3G

Standard	GUI-Parameter	SCPI-Parameter
CDMA IS95A forward	CDMA IS95A FWD	F8CD	FIS95a
CDMA IS95A reverse	CDMA IS95A REV	R8CD	RIS95a
CDMA IS95C Class 0 forward**)**	CDMA IS95C Class 0 FWD	FIS95c0
CDMA IS95C Class 0 reverse**)**	CDMA IS95C Class 0 REV	RIS95c0
CDMA J-STD008 forward	CDMA J-STD008 FWD	F19C	FJ008
CDMA J-STD008 reverse	CDMA J-STD008 REV	R19C	RJ008
CDMA IS95C Class 1 forward**)**	CDMA IS95C Class 1 FWD	FIS95c1
CDMA IS95C Class 1 reverse**)**	CDMA IS95C Class 1 REV	RIS95c1
CDMA 2000	CDMA 2000	S2CD
TD-SCDMA forward	TD SCDMA FWD	FTCD	TCDMa
TD-SCDMA reverse	TD SCDMA REV	RTCD
WLAN 802.11A	WLAN 802.11A	AWLan
WLAN 802.11B	WLAN 802.11B	BWLan
WiMAX	WiMAX	WiMAX
WIBRO	WIBRO	WIBRO
GSM	GSM	GSM
RFID 14443	RFID 14443	RFID14443
TETRA	TETRA	TETRA
PDC	PDC	PDC
PHS	PHS	PHS
CDPD	CDPD	CDPD
APCO-25 Phase 2	APCO-25 P2	PAPCo25

For the R&S FSV, the channel spacing is defined as the distance between the center frequency of the adjacent channel and the center frequency of the transmission channel. The definition of the adjacent-channel spacing in standards IS95C and CDMA 2000 is different. These standards define the adjacent-channel spacing from the center of the transmission channel to the closest border of the adjacent channel. This definition is also used for the R&S FSV if the standards marked with an asterisk **)** are selected.

6.4.14 Optimized Settings for CP/ACLR Test Parameters

The "Adjust Settings" softkey (see "Adjust Settings" on page 108) automatically optimizes all instrument settings for the selected channel configuration, as described in the following:

- **Frequency span**

  The frequency span must at least cover the channels to be measured plus a measurement margin of approx. 10 %.

  If the frequency span is large in comparison to the channel bandwidth (or the adjacent-channel bandwidths) being examined, only a few points on the trace are available per channel. This reduces the accuracy of the waveform calculation for the channel filter used, which has a negative effect on the measurement accuracy. It is therefore strongly recommended that the formulas mentioned be taken into consideration when selecting the frequency span.

  For channel power measurements the Adjust Settings softkey sets the frequency span as follows:

  "(No. of transmission channels – 1) x transmission channel spacing + 2 x transmission channel bandwidth + measurement margin"

  For adjacent-channel power measurements, the Adjust Settings softkey sets the frequency span as a function of the number of transmission channels, the transmission channel spacing, the adjacent-channel spacing, and the bandwidth of one of adjacent-channels ADJ, ALT1 or ALT2, whichever is furthest away from the transmission channels:

  "(No. of transmission channels – 1) x transmission channel spacing + 2 x (adjacent-channel spacing + adjacent-channel bandwidth) + measurement margin"

  The measurement margin is approx. 10 % of the value obtained by adding the channel spacing and the channel bandwidth.

- **Resolution bandwidth (RBW)**

  To ensure both, acceptable measurement speed and required selection (to suppress spectral components outside the channel to be measured, especially of the adjacent channels), the resolution bandwidth must not be selected too small or too large. As a general approach, the resolution bandwidth is to be set to values between 1% and 4% of the channel bandwidth.

  A larger resolution bandwidth can be selected if the spectrum within the channel to be measured and around it has a flat characteristic. In the standard setting, e.g. for standard IS95A REV at an adjacent channel bandwidth of 30 kHz, a resolution bandwidth of 30 kHz is used. This yields correct results since the spectrum in the neighborhood of the adjacent channels normally has a constant level.

  With the exception of the IS95 CDMA standards, the Adjust Settings softkey sets the resolution bandwidth (RBW) as a function of the channel bandwidth:

  "RBW ≤ 1/40 of channel bandwidth"

  The maximum possible resolution bandwidth (with respect to the requirement RBW ≤ 1/40) resulting from the available RBW steps (1, 3) is selected.

- **Video bandwidth (VBW)**

  For a correct power measurement, the video signal must not be limited in bandwidth. A restricted bandwidth of the logarithmic video signal would cause signal averaging and thus result in a too low indication of the power (-2.51 dB at very low video bandwidths). The video bandwidth should therefore be selected at least three times the resolution bandwidth:

  "VBW ≥ 3 x RBW"

  The Adjust Settings softkey sets the video bandwidth (VBW) as a function of the channel bandwidth (see formula above) and the smallest possible VBW with regard to the available step size will be selected.

- **Detector**

The Adjust Settings softkey selects the RMS detector. This detector is selected since it correctly indicates the power irrespective of the characteristics of the signal to be measured. The whole IF envelope is used to calculate the power for each measurement point. The IF envelope is digitized using a sampling frequency which is at least five times the resolution bandwidth which has been selected. Based on the sample values, the power is calculated for each measurement point using the following formula:

$$P_{RMS} = \sqrt{\frac{1}{N} \cdot \sum_{i=1}^{N} s_i^2}$$

where:
"s_i = linear digitized video voltage at the output of the A/D converter"
"N = number of A/D converter values per measurement point"
"P_{RMS} = power represented by a measurement point"
When the power has been calculated, the power units are converted into decibels and the value is displayed as a measurement point.
In principle, the sample detector would be possible as well. Due to the limited number of measurement points used to calculate the power in the channel, the sample detector would yield less stable results.

- **Trace averaging**
  The Adjust Settings softkey switches off this function. Averaging, which is often performed to stabilize the measurement results, leads to a too low level indication and should therefore be avoided. The reduction in the displayed power depends on the number of averages and the signal characteristics in the channel to be measured.

- **Reference level**
  The Adjust Settings softkey does not influence the reference level. It can be adjusted separately using the "Adjust Ref Lvl" softkey (see "Adjust Ref Lvl" on page 100).

7 Remote Commands of the CDMA2000 BTS Analysis

This chapter describes the remote commands specific to the CDMA2000 Analysis options (R&S FSV-K82/-K83). The abbreviation CDMA stands for the operating mode of this option. For details on conventions used in this chapter refer to chapter 7.1, "Notation", on page 179.

For further information on analyzer or basic settings commands, refer to the corresponding subsystem in the base unit description.

In particular, the following subsystems are identical to the base unit; refer to the base unit description:

- CALCulate:DELTamarker
- CALCulate:MARKer (except for the specific commands described in chapter 7.2, "CALCulate Subsystem", on page 181)
- DISPlay subsystem
- FORMat subsystem
- INITiate subsystem
- INPut subsystem
- MMEM subsystem
- OUTput subsystem
- SENSe subsystem (except for the specific commands described in chapter 7.6, "SENSe Subsystem", on page 243)
- TRIGger subsystem

7.1 Notation

In the following sections, all commands implemented in the instrument are first listed and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

Individual Description

The individual description contains the complete notation of the command. An example for each command, the *RST value and the SCPI information are included as well.

The options and operating modes for which a command can be used are indicated by the following abbreviations:

Abbreviation	Description
A	spectrum analysis
A-F	spectrum analysis – span > 0 only (frequency mode)
A-T	spectrum analysis – zero span only (time mode)
ADEMOD	analog demodulation (option R&S FSV-K7)
BT	Bluetooth (option R&S FSV-K8)
CDMA	CDMA 2000 base station measurements (option R&S FSV-K82)
EVDO	1xEV-DO base station analysis (option R&S FSV-K84)
GSM	GSM/Edge measurements (option R&S FSV-K10)
IQ	IQ Analyzer mode
OFDM	WiMAX IEEE 802.16 OFDM measurements (option R&S FSV-K93)
OFDMA/WiBro	WiMAX IEEE 802.16e OFDMA/WiBro measurements (option R&S FSV-K93)
NF	Noise Figure measurements (R&S FSV-K30)
PHN	Phase Noise measurements (R&S FSV-K40)
PSM	Power Sensor measurements (option R&S FSV-K9)
SFM	Stereo FM measurements (optionR&S FSV-K7S)
SPECM	Spectogram mode (option R&S FSV-K14)
TDS	TD-SCDMA base station / UE measurements (option R&S FSV-K76/K77)
VSA	Vector Signal Analysis (option R&S FSV-K70)

WCDMA	3GPP Base Station measurements (option R&S FSV-K72), 3GPP UE measurements (option R&S FSV-K73)
WLAN	WLAN TX measurements (option R&S FSV-K91)

> The spectrum analysis mode is implemented in the basic unit. For the other modes, the corresponding options are required.

Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description. The instrument itself does not distinguish between upper and lower case letters.

Special Characters

|	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.

Example:

```
SENSe:FREQuency:CW|:FIXed
```

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

```
SENSe:FREQuency:CW 1E3
```

```
SENSe:FREQuency:FIXed 1E3
```

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.

Example: Selection of the parameters for the command

```
[SENSe<1…4>:]AVERage<1…4>:TYPE VIDeo | LINear
```

[]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards.
	Parameters in square brackets can be incorporated optionally in the command or omitted as well.

{}	Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.

Description of Parameters

Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<…>) and is briefly explained in the following.

For details see the chapter "SCPI Command Structure" in the base unit description.

<Boolean>

This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword OFF or by the numeric value 0, the "on" state is indicated by ON or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value> <num>

These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data). The following keywords given below are permitted:

- `MAXimum`: This keyword sets the parameter to the largest possible value.
- `MINimum`: This keyword sets the parameter to the smallest possible value.
- `DEFault`: This keyword is used to reset the parameter to its default value.
- `UP`: This keyword increments the parameter value.
- `DOWN`: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

`SENSe:FREQuency:CENTer? MAXimum`

Returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

7.2 CALCulate Subsystem

The CALCulate subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquisition, i.e. following the SENSe subsystem.

Note that most commands in the `CALCulate` subsystem are identical to the base unit; only the commands specific to this option are described here.

7.2.1   CALCulate:FEED Subsystem

The CALCulate:FEED subsystem selects the result display for the measurement data. This corresponds to the result display selection in manual operation.

CALCulate<n>:FEED... 182

CALCulate<n>:FEED <result display>

This command selects the result display for the measured data.

In MS mode, the results are displayed for the branch selected by [SENSe:]CDPower: MAPPing.

Suffix:

<n>   1...4
                       screen

Parameters:

<result display>   'XPOW:CDP' | 'XPOW:CDP:RAT' | 'XPOW:CDEP' |
'XTIM:CDP:ERR:CTABle' | 'XTIM:CDP:PVSLot' |
'XTIM:CDP:ERR:SUMMary' | 'XTIM:CDP:MACCuracy' |
'XTIM:CDP:ERR:PCDomain' |
'XTIM:CDP:SYMB:CONStellation' | 'XTIM:CDP:SYMB:EVM' |
'XTIM:CDP:BSTReam' | 'XTIM:CDP:COMP:CONStellation' |
'XTIM:CDP:PVSYmbol' | 'XTIMe:CDPower:CHIP:MAGNitude' |
'XTIMe:CDPower:CHIP:PHASe' |
'XTIMe:CDPower:SYMBol:EVM:PHASe' |
'XTIMe:CDPower:SYMBol:EVM:MAGNitude'

'XPOW:CDP'
Code Domain Power (CDP) result display (absolute)

'XPOW:CDP:RAT'
Code Domain Power (CDP) result display (relative)

'XTIM:CDP:BSTReam'
Channel Bitstream result display

'XTIM:CDP:COMP:CONStellation'
Composite Constellation result display

'XPOW:CDEP'
Code Domain Error Power (CDEP) result display

'XTIM:CDP:ERR:CTABle'
Channel Table result display

'XTIM:CDP:ERR:PCDomain'
Peak Code Domain Error result display

'XTIM:CDP:ERR:SUMMary'
Result Summary result display

'XTIM:CDP:MACCuracy'
Composite EVM result display

'XTIM:CDP:PVSLot'
Power versus Power Control Group (PCG) result display

'XTIM:CDP:PVSYmbol'
Power versus Symbol result display

'XTIM:CDP:SYMB:CONStellation'
Channel Constellation result display

'XTIM:CDP:SYMB:EVM'
Symbol Error Vector Magnitude result display

'XTIMe:CDPower:SYMBol:EVM:MAGNitude'
Result display of the symbol magnitude error

'XTIMe:CDPower:SYMBol:EVM:PHASe'
Result display of the symbol phase error

'XTIMe:CDP:CHIP:MAGNitude'
Result display magnitude error versus chip

'XTIMe:CDPower:CHIP:PHASe'

Result display phase error versus chip

*RST:	'XPOW:CDP:RAT' (screen A), ''XTIM:CDP:ERR:SUMM' (screen B)
Example:	`CALC2:FEED 'XTIM:CDP:MACC'` Selects the Composite EVM result display for measurement screen 2
Usage:	SCPI confirmed
Mode:	CDMA
Manual operation:	See "Code Power" on page 76

7.2.2 CALCulate:MARKer:FUNCtion Subsystem

The CALCulate:MARKer:FUNCtion subsystem checks the marker functions in the instrument.

CALCulate<n>:MARKer<m>:FUNCtion:CDPower[:BTS]:RESult?

This command queries the results of the code domain measurement for the selected channel. The channel is selected via the `[SENSe:]CDPower:CODE` command.

For a description of the result types refer to chapter 6.1.3, "Code Domain Analysis Results", on page 38.

Suffix:

<n>	1...4 window
<m>	irrelevant

Parameters:

<Result> SLOT | PTOTal | PPICh | RHO | MACCuracy | PCDerror | ACTive | FERRor | FERPpm | CERRor | TFRame I IQOFfset | IQIMbalance | SRATe | CHANnel | SFACtor | TOFFset | POFFset | CDPabsolute | CDPRelative | EVMRms | EVMPeak | DMType

SLOT
PCG number

PTOTal
Total power in dBm

PPICh
Pilot power in dBm

RHO
RHO

MACCuracy
Composite EVM in %

PCDerror
Peak code domain error in dB

ACTive
Number of active channels

FERRor
Frequency error in Hz

FERPpm
Frequency error in ppm

CERRor
Chip rate error in ppm

TFRame I
Trigger to frame

IQOFfset
IQ offset in %

IQIMbalance
IQ imbalance in %

SRATe
Symbol rate in ksps

CHANnel
Channel number

SFACtor
Spreading factor of channel

TOFFset
Timing offset in s

POFFset
Phase offset in rad

CDPabsolute
Channel power absolute in dBm

CDPRelative

Channel power relative in dB (relative to total or PICH power, refer to `CDP:PREF` command)

EVMRms
Error vector magnitude RMS in %

EVMPeak
Error vector mag. peak in %

DMType
Domain type

Example:	`CALC:MARK:FUNC:CDP:RES? PTOT`
	Reads out total power.
	`CDP:SLOT 2`
	Selects power control group 2.
	`CDP:CODE 11`
	Selects code number 11.
	`CALC:MARK:FUNC:CDP:RES? EVMR`
	Reads out Composite EVM of the code with number 11 in PCG 2.

Usage:	Query only
Mode:	CDMA

CALCulate<n>:MARKer<m>:FUNCtion:CENTer

This command matches the center frequency to the frequency of a marker.

If you use the command in combination with a delta marker, that delta marker is turned into a normal marker.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.
Example:	`CALC:MARK2:FUNC:CENT` Sets the center frequency to the frequency of marker 2.
Manual operation:	See "Center =Mkr Freq (span > 0)" on page 91

CALCulate<n>:MARKer<m>:FUNCtion:PICH

This command sets the marker to channel 0.64.

Suffix:

<n>	1...4 window
<m>	1...4 marker to be set to the pilot channel

Example:	CALC:MARK:FUNC:PICH
	Activates marker and positions it at pilot 0.64.
	CALC:MARK:Y?
	Queries value of the relative Code Domain Power of the pilot channel.
Usage:	Event
Mode:	CDMA
Manual operation:	See "F-PICH (BTS mode only)" on page 90
	See "PICH (MS mode only)" on page 90

CALCulate<n>:MARKer<m>:FUNCtion:POWer:MODE <Mode>

This commands defines the method by which the channel power values are calculated from the current trace in the window specified by the suffix <n>.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<Mode>	WRITe | MAXHold
	WRITe
	The channel power and the adjacent channel powers are calculated directly from the current trace
	MAXHold
	The power values are calculated from the current trace and compared with the previous power value using a maximum algorithm.

Example:	CALC:MARK:FUNC:POW:MODE MAXH
	Sets the Maxhold channel power mode.
Manual operation:	See "Clear/Write" on page 108
	See "Max Hold" on page 108

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? <ResultType>

This command queries the result of the performed power measurement in the window specified by the suffix <n>. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the SENSe:POWer subsystem.

To obtain a correct result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single sweep mode.

Suffix:

<n>	Selects the measurement window.

<m>	Selects the marker.

Parameters:

<ResultType>   ACPower | CPOWer

ACPower
Adjacent-channel power measurement
Results are output in the following sequence, separated by commas:
Power of transmission channel
Power of lower adjacent channel
Power of upper adjacent channel
Power of lower alternate channel 1
Power of upper alternate channel 1
Power of lower alternate channel 2
Power of upper alternate channel 2
The number of measured values returned depends on the number of adjacent/alternate channels selected with [SENSe:]POWer:ACHannel:ACPairs.
With logarithmic scaling (RANGE "LOG"), the power is output in the currently selected level unit; with linear scaling (RANGE "LIN dB" or "LIN %"), the power is output in W. If [SENSe:]POWer:ACHannel:MODE is set to "REL", the adjacent/alternate-channel power is output in dB.

CPOWer
Channel power measurement
In a Spectrum Emission Mask measurement, the query returns the power result for the reference range, if this power reference type is selected.
With logarithmic scaling (RANGE LOG), the channel power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the channel power is output in W.

Manual operation: See "Power" on page 100
See "Ch Power ACLR" on page 100
See "Occupied Bandwidth" on page 120

CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult:PHZ <State>

This command switches the query response of the power measurement results between output of absolute values and output referred to the measurement bandwith.

The measurement results are output with the CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult? command.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<State>   ON | OFF

                           ON
                           Results output: channel power density in dBm/Hz

                           OFF
                           Results output: channel power is displayed in dBm

                           *RST: OFF

Example: CALC:MARK:FUNC:POW:RES:PHZ ON
                           Output of results referred to the channel bandwidth.
                           For details on a complete measurement example refer to
                           CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?
                           on page 187.

Manual operation: See "Chan Pwr/Hz" on page 107

CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect <MeasType>

This command selects – and switches on – the specified power measurement type in the window specified by the suffix <n>.

The channel spacings and channel bandwidths are configured in the SENSe:POWer subsystem.

Note: If CPOWer is selected, the number of adjacent channels ([SENSe:]POWer: ACHannel:ACPairs) is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.

The channel/adjacent-channel power measurement is performed for the trace selected with [SENSe:]POWer:TRACe.

The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of CALCulate<n>:MARKer<m>:TRACe.

Suffix:

<n>   Selects the measurement window.

<m>   Selects the marker.

Parameters:

<MeasType>	ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CNO

ACPower
Adjacent-channel power measurement with a single carrier signal

CPOWer
Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with "NO. OF ADJ CHAN" = 0)

MCACpower
Channel/adjacent-channel power measurement with several carrier signals

OBANdwidth | OBWidth
Measurement of occupied bandwidth

CN
Measurement of carrier-to-noise ratio

CN0
Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth

Example:	CALC:MARK:FUNC:POW:SEL ACP Switches on adjacent-channel power measurement.

CALCulate<n>:MARKer<m>:FUNCtion:TDPIch

This command sets the marker to channel 16.128.

Suffix:

<n>	1...4 window
<m>	1...4 marker
Example:	CALC:MARK:FUNC:TDPI Activates marker and positions it at TDPICH 16.128. CALC:MARK:Y? Queries value of the relative Code Domain Power of the transmit diversity pilot channel.
Usage:	Event
Mode:	CDMA
Manual operation:	See "F-TDPICH (BTS mode only)" on page 90

7.2.3 Other CALCulate Commands Referenced in this Manual

7.2.3.1   CALCulate:DELTamarker subsystem

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X <Reference>

This command defines the horizontal position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the frequency reference for delta marker 2.

Suffix:

<n>   Selects the measurement window.

<m>   Selects the marker.

Parameters:

<Reference>	Numeric value that defines the horizontal position of the reference.
	For frequency domain measurements, it is a frequency in Hz.
	For time domain measurements, it is a point in time in s.
	*RST: Fixed reference: OFF

Example: CALC:DELT:FUNC:FIX:RPO:X 128 MHz
Sets the frequency reference to 128 MHz.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y <RefPointLevel>

This command defines the vertical position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

When measuring the phase noise, the command defines the level reference for delta marker 2.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<RefPointLevel>	Numeric value that defines the vertical position of the reference. The unit and value range is variable.
	*RST: Fixed reference: OFF

Example: CALC:DELT:FUNC:FIX:RPO:Y –10dBm
Sets the reference point level for delta markers to -10 dBm.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed[:STATe] <State>

This command switches the relative measurement to a fixed reference value on or off. Marker 1 is activated previously and a peak search is performed, if necessary. If marker 1 is activated, its position becomes the reference point for the measurement. The reference point can then be modified with the CALCulate<n>: DELTamarker<m>:FUNCtion:FIXed:RPOint:X commands and CALCulate<n>: DELTamarker<m>:FUNCtion:FIXed:RPOint:Y independently of the position of marker 1 and of a trace. It applies to all delta markers as long as the function is active.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<State>	ON	OFF
	*RST: OFF

Example: CALC:DELT:FUNC:FIX ON
                      Switches on the measurement with fixed reference value for all
                      delta markers.
                      CALC:DELT:FUNC:FIX:RPO:X 128 MHZ
                      Sets the frequency reference to 128 MHz.
                      CALC:DELT:FUNC:FIX:RPO:Y 30 DBM
                      Sets the reference level to +30 dBm.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO <State>

This command turns an automatic peak search for the fixed reference marker at the
end of a sweep on and off.

Suffix:

<n>   Selects the measurement window.

<m>   irrelevant

Parameters:

<State>   ON | OFF

                      *RST: OFF

Example: CALC:DELT:FUNC:PNO:AUTO ON
                      Activates an automatic peak search for the reference marker in
                      a phase-noise measurement.

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>

This command turns the phase noise measurement at the delta marker position on and
off.

The correction values for the bandwidth and the log amplifier are taken into account in
the measurement.

The reference marker for phase noise measurements is either a normal marker or a
fixed reference. If necessary, the command turns on the reference marker

A fixed reference point can be modified with the CALCulate<n>:DELTamarker<m>:
FUNCtion:FIXed:RPOint:X and CALCulate<n>:DELTamarker<m>:FUNCtion:
FIXed:RPOint:Y commands independent of the position of marker 1 and of a trace.

Suffix:

<n>   Selects the measurement window.

<m>   irrelevant
                      Note: marker 2 is always the deltamarker for phase noise mea-
                      surement results.

Parameters:

<State>   ON | OFF

                      *RST: OFF

Example: CALC:DELT:FUNC:PNO ON
                         Switches on the phase-noise measurement with all delta mark-
                         ers.
                         CALC:DELT:FUNC:FIX:RPO:X 128 MHZ
                         Sets the frequency reference to 128 MHz.
                         CALC:DELT:FUNC:FIX:RPO:Y 30 DBM
                         Sets the reference level to +30 dBm

CALCulate<n>:DELTamarker<m>:LINK <State>

This command links delta marker 1 to marker 1.

If you change the horizontal position of the marker, so does the delta marker.

Suffix:

<n>   Selects the measurement window.

<m>   1
                         irrelevant

Parameters:

<State>   ON | OFF
                         *RST: OFF

Example: CALC:DELT:LINK ON

Manual operation: See "Link Mkr1 and Delta1" on page 149

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command positions the delta marker to the next smaller trace maximum on the left of the current value (i.e. descending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>   Selects the measurement window.

<m>   Selects the marker.

Example: CALC:DELT:MAX:LEFT
                         Sets delta marker 1 to the next smaller maximum value to the
                         left of the current value.

Manual operation: See "Next Peak Mode" on page 89

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command positions the delta marker to the next smaller trace maximum. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.
Example:	CALC:DELT2:MAX:NEXT
	Sets delta marker 2 to the next smaller maximum value.
Manual operation:	See "Next Peak" on page 89
	See "Next Peak Mode" on page 89

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command positions the delta marker to the current trace maximum. If necessary, the corresponding delta marker is activated first.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.
Example:	CALC:DELT3:MAX
	Sets delta marker 3 to the maximum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command positions the delta marker to the next smaller trace maximum on the right of the current value (i.e. ascending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.
Example:	CALC:DELT:MAX:RIGH
	Sets delta marker 1 to the next smaller maximum value to the right of the current value.
Manual operation:	See "Next Peak Mode" on page 89

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command positions the delta marker to the next higher trace minimum on the left of the current value (i.e. descending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: CALC:DELT:MIN:LEFT
Sets delta marker 1 to the next higher minimum to the left of the current value.

Manual operation: See "Next Min Mode" on page 91

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command positions the delta marker to the next higher trace minimum. The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: CALC:DELT2:MIN:NEXT
Sets delta marker 2 to the next higher minimum value.

Manual operation: See "Next Min" on page 90
See "Next Min Mode" on page 91

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command positions the delta marker to the current trace minimum. The corresponding delta marker is activated first, if necessary.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: CALC:DELT3:MIN
Sets delta marker 3 to the minimum value of the associated trace.

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command positions the delta marker to the next higher trace minimum on the right of the current value (i.e. ascending X values). The corresponding delta marker is activated first, if necessary.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example:	CALC:DELT:MIN:RIGH
	Sets delta marker 1 to the next higher minimum value to the right of the current value.
Manual operation:	See "Next Min Mode" on page 91

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command turns delta markers on and off.

If the corresponding marker was a normal marker, it is turned into a delta marker.

No suffix at DELTamarker turns on delta marker 1.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<State>	ON	OFF
	*RST: OFF

Example:	CALC:DELT1 ON
	Switches marker 1 to delta marker mode.
Manual operation:	See "Marker 1/2/3/4" on page 88
	See "Marker Norm/Delta" on page 88
	See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147

CALCulate<n>:DELTamarker<m>:TRACe <TraceNumber>

This command selects the trace a delta marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<TraceNumber>	**1 ... 6**
	Trace number the marker is positioned on.

Example:	CALC:DELT3:TRAC 2
	Assigns delta marker 3 to trace 2.

CALCulate<n>:DELTamarker<m>:X <Position>

This command positions a delta marker on a particular coordinate on the x-axis.

The position is an absolute value.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<Position>	0 to maximum frequency or sweep time

Example:	`CALC:DELT:X?`
	Outputs the absolute frequency/time of delta marker 1.

Manual operation:	See "Marker 1/2/3/4" on page 88
	See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147

CALCulate<n>:DELTamarker<m>:X:RELative?

This command queries the x-value of the selected delta marker relative to marker 1 or to the reference position (for `CALC:DELT:FUNC:FIX:STAT ON`). The command activates the corresponding delta marker, if necessary.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example:	`CALC:DELT3:X:REL?`
	Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Usage:	Query only

Manual operation:	See "Marker 1/2/3/4" on page 88
	See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147

CALCulate<n>:DELTamarker<m>:Y?

This command queries the measured value of a delta marker. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with `CALC:UNIT:POW` or on the activated measuring functions, the query result is output in the units below:

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example:	`INIT:CONT OFF`
	Switches to single sweep mode.
	`INIT;*WAI`
	Starts a sweep and waits for its end.
	`CALC:DELT2 ON`
	Switches on delta marker 2.
	`CALC:DELT2:Y?`
	Outputs measurement value of delta marker 2.

Usage:	Query only
Manual operation:	See "Marker 1/2/3/4" on page 88 See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147

7.2.3.2 CALCulate:LIMit subsystem

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute <LowerLimit>,
    <UpperLimit>

This command defines the absolute limit value for the lower/upper adjacent channel during adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value has no effect on the limit check as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<LowerLimit>, <UpperLimit>	first value: -200DBM to 200DBM; limit for the lower and the upper adjacent channel
	*RST: -200DBM

Example:　　　　　　CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM

Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

CALCulate<n>:LIMit<k>:ACPower:ACHannel:ABSolute:STATe <State>

This command activates the limit check for the adjacent channel when adjacent-channel power measurement (Adjacent Channel Power) is performed. Before the command, the limit check for the channel/adjacent-channel measurement must be globally switched on using CALCulate<n>:LIMit<k>:ACPower[:STATe].

The result can be queried with CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n>　　　　　　　　　Selects the measurement window.

<k>　　　　　　　　　irrelevant

Parameters:

<State>　　　　　　　ON | OFF

　　　　　　　　　　　*RST:　　　　OFF

Example:　　　　　　CALC:LIM:ACP:ACH 30DB, 30DB

Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM

Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.

CALC:LIM:ACP ON

Switches on globally the limit check for the channel/adjacent-channel measurement.

CALC:LIM:ACP:ACH:REL:STAT ON

Switches on the check of the relative limit values for adjacent channels.

CALC:LIM:ACP:ACH:ABS:STAT ON

Switches on the check of absolute limit values for the adjacent channels.

INIT;*WAI

Starts a new measurement and waits for the sweep end.

CALC:LIM:ACP:ACH:RES?

Queries the limit check result in the adjacent channels.

Manual operation:　　See "Absolute Limit" on page 107

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative] <LowerLimit>,
    <UpperLimit>

This command defines the relative limit of the upper/lower adjacent channel for adjacent-channel power measurements. The reference value for the relative limit value is the measured channel power.

It should be noted that the relative limit value has no effect on the limit check as soon as it is below the absolute limit value defined with the CALCulate<n>:LIMit<k>: ACPower:ACHannel:ABSolute command. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<LowerLimit>, <UpperLimit>	0 to 100dB; the value for the lower limit must be lower than the value for the upper limit
	*RST: 0 dB

Example: CALC:LIM:ACP:ACH 30DB, 30DB
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.

CALCulate<n>:LIMit<k>:ACPower:ACHannel:RESult

This command queries the result of the limit check for the upper/lower adjacent channel when adjacent channel power measurement is performed.

If the power measurement of the adjacent channel is switched off, the command produces a query error.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Return values:

Result	The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Example:	`CALC:LIM:ACP:ACH 30DB, 30DB`
	Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
	`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
	Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dB.
	`CALC:LIM:ACP ON`
	Switches on globally the limit check for the channel/adjacent channel measurement.
	`CALC:LIM:ACP:ACH:STAT ON`
	Switches on the limit check for the adjacent channels.
	`INIT;*WAI`
	Starts a new measurement and waits for the sweep end.
	`CALC:LIM:ACP:ACH:RES?`
	Queries the limit check result in the adjacent channels.
Manual operation:	See "Limit Checking" on page 106

CALCulate<n>:LIMit<k>:ACPower:ACHannel[:RELative]:STATe <State>

This command activates the limit check for the relative limit value of the adjacent channel when adjacent-channel power measurement is performed. Before this command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[: STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ACHannel: RESult`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant

Parameters:

<State>	ON | OFF	
	*RST:	OFF

Example: `CALC:LIM:ACP:ACH 30DB, 30DB`
Sets the relative limit value for the power in the lower and upper adjacent channel to 30 dB below the channel power.
`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper adjacent channel to -35 dBm.
`CALC:LIM:ACP ON`
Switches on globally the limit check for the channel/adjacent channel measurement.
`CALC:LIM:ACP:ACH:STAT ON`
Switches on the check of the relative limit values for adjacent channels.
`CALC:LIM:ACP:ACH:ABS:STAT ON`
Switches on the check of absolute limit values for the adjacent channels.
`INIT;*WAI`
Starts a new measurement and waits for the sweep end.
`CALC:LIM:ACP:ACH:RES?`
Queries the limit check result in the adjacent channels.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute <LowerLimit>, <UpperLimit>

This command defines the absolute limit value for the lower/upper alternate adjacent-channel power measurement (Adjacent Channel Power).

Note that the absolute limit value for the limit check has no effect as soon as it is below the relative limit value defined with `CALCulate<n>:LIMit<k>:ACPower: ACHannel[:RELative]`. This mechanism allows automatic checking of the absolute basic values defined in mobile radio standards for the power in adjacent channels.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant
<Channel>	1...11
	the alternate channel

Parameters:

<LowerLimit>, <UpperLimit>	first value: -200DBM to 200DBM; limit for the lower and the upper alternate adjacent channel
	*RST: -200DBM

Example: `CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`
Sets the absolute limit value for the power in the lower and upper second alternate adjacent channel to -35 dBm.

CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative] <LowerLimit>, <UpperLimit>

This command defines the limit for the alternate adjacent channels for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

Note that the relative limit value has no effect on the limit check as soon as it is below the absolute limit defined with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant
<Channel>	1...11 the alternate channel

Parameters:

<LowerLimit>, <UpperLimit>	first value: 0 to 100dB; limit for the lower and the upper alternate adjacent channel
	*RST: 0 DB

Example:	`CALC:LIM:ACP:ALT2 30DB, 30DB` Sets the relative limit value for the power in the lower and upper second alternate adjacent channel to 30 dB below the channel power.

Manual operation:	See "Limit Checking" on page 106

CALCulate<n>:LIMit<k>:ACPower:ALTernate<Channel>[:RELative]:STATe <State>

This command activates the limit check for the alternate adjacent channels for adjacent channel power measurements. Before the command, the limit check must be activated using `CALCulate<n>:LIMit<k>:ACPower[:STATe]`.

The result can be queried with `CALCulate<n>:LIMit<k>:ACPower:ALTernate<channel>[:RELative]`. Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are obtained.

Suffix:

<n>	Selects the measurement window.
<k>	irrelevant
<Channel>	1...11 the alternate channel

Parameters:

<State>   ON | OFF

                        *RST: OFF

Example: `CALC:LIM:ACP:ALT2 30DB, 30DB`

                        Sets the relative limit value for the power in the lower and upper
                        second alternate adjacent channel to 30 dB below the channel
                        power.

                        `CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`

                        Sets the absolute limit value for the power in the lower and
                        upper second alternate adjacent channel to -35 dBm.

                        `CALC:LIM:ACP ON`

                        Switches on globally the limit check for the channel/adjacent
                        channel measurement.

                        `CALC:LIM:ACP:ALT2:STAT ON`

                        Switches on the check of the relative limit values for the lower
                        and upper second alternate adjacent channel.

                        `CALC:LIM:ACP:ALT2:ABS:STAT ON`

                        Switches on the check of absolute limit values for the lower and
                        upper second alternate adjacent channel.

                        `INIT;*WAI`

                        Starts a new measurement and waits for the sweep end.

                        `CALC:LIM:ACP:ALT2:RES?`

                        Queries the limit check result in the second alternate adjacent
                        channels.

CALCulate<n>:LIMit<k>:ACPower[:STATe] <State>

This command switches on and off the limit check for adjacent-channel power meas-
urements. The commands `CALCulate<n>:LIMit<k>:ACPower:ACHannel[:`
`RELative]:STATe` or `CALCulate<n>:LIMit<k>:ACPower:`
`ALTernate<Channel>[:RELative]:STATe` must be used in addition to specify
whether the limit check is to be performed for the upper/lower adjacent channel or for
the alternate adjacent channels.

Suffix:

<n>   Selects the measurement window.

<k>   irrelevant

Parameters:

<State>   ON | OFF

                        *RST: OFF

Example: `CALC:LIM:ACP ON`

                        Switches on the ACLR limit check.

Manual operation: See "Limit Checking" on page 106
                        See "Relative Limit" on page 107
                        See "Absolute Limit" on page 107

CALCulate<n>:LIMit<k>:FAIL?

This command queries the result of a limit check.

Note that for SEM measurements, the limit line suffix <k> is irrelevant, as only one specific SEM limit line is checked for the currently relevant power class.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:

<n>	irrelevant
<k>	limit line

Return values:

<Result>	**0**
	PASS
	1
	FAIL

Example:	`INIT;*WAI`
	Starts a new sweep and waits for its end.
	`CALC:LIM3:FAIL?`
	Queries the result of the check for limit line 3.
Usage:	Query only
Manual operation:	See "Spectrum Emission Mask" on page 110
	See "Limit Check 1-4" on page 113

7.2.3.3　CALCulate:LIMit:ESPectrum subsystem

The `CALCulate:LIMit:ESPectrum` subsystem defines the limit check for the Spectrum Emission Mask.

CALCulate<n>:LIMit<k>:ESPectrum:LIMits <Limits>

This command sets or queries up to 4 power classes in one step.

Suffix:

<n>	irrelevant
<k>	irrelevant

Parameters:

<Limits>	1–3 numeric values between -200 and 200, separated by commas
	-200, <0-3 numeric values between -200 and 200, in ascending order, separated by commas>, 200

Example:	`CALC:LIM:ESP:LIM -50,50,70`
	Defines the following power classes:
	`<-200, -50>`
	`<-50, 50>`
	`<50, 70>`
	`<70, 200>`
	Query:
	`CALC:LIM:ESP:LIM?`
	Response:
	`-200,-50,50,70,200`

CALCulate<n>:LIMit<k>:ESPectrum:MODE <Mode>

This command activates or deactivates the automatic selection of the limit line in the Spectrum Emission Mask measurement.

Suffix:

<n>	1...4
	window
<k>	irrelevant

Parameters:

<Mode>	AUTO | MANUAL
	AUTO
	The limit line depends on the measured channel power.
	MANUAL
	One of the three specified limit lines is set. The selection is made with the chapter 7.2.3.3, "CALCulate:LIMit:ESPectrum subsystem", on page 206 command.
	*RST: AUTO

Example:	`CALC:LIM:ESP:MODE AUTO`
	Activates automatic selection of the limit line.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>[:EXCLusive] <State>

This command sets the power classes used in the spectrum emission mask measurement. It is only possible to use power classes for which limits are defined. Also, either only one power class at a time or all power classes together can be selected.

Suffix:

<n>	irrelevant
<k>	irrelevant

<Class>	1...4
	the power class to be evaluated

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	`CALC:LIM:ESP:PCL1 ON`
	Activates the first defined power class.

Manual operation:	See "Used Power Classes" on page 118
	See "Add/Remove" on page 119

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:COUNt <NoPowerClasses>

This command sets the number of power classes to be defined.

Suffix:

<n>	irrelevant
<k>	irrelevant
<Class>	irrelevant

Parameters:

<NoPowerClasses>	1 to 4
	*RST: 1

Example:	`CALC:LIM:ESP:PCL:COUN 2`
	Two power classes can be defined.

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:LIMit[:STATe] <State>

This command defines which limits are evaluated in the measurement.

Suffix:

<n>	irrelevant
<k>	irrelevant
<Class>	1...4
	the power class to be evaluated

Parameters:

<State>	ABSolute | RELative | AND | OR

ABSolute
Evaluates only limit lines with absolute power values

RELative
Evaluates only limit lines with relative power values

AND
Evaluates limit lines with relative and absolute power values. A negative result is returned if both limits fail.

OR
Evaluates limit lines with relative and absolute power values. A negative result is returned if at least one limit failed.

*RST: REL

Example:	CALC:LIM:ESP:PCL:LIM ABS
Manual operation:	See "Used Power Classes" on page 118

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MAXimum <Level>

This command sets the upper limit level for one power class. The unit is dBm. The limit always ends at + 200 dBm, i.e. the upper limit of the last power class can not be set. If more than one power class is in use, the upper limit must equal the lower limit of the next power class.

Suffix:

<n>	irrelevant
<k>	irrelevant
<Class>	1...4 the power class to be evaluated

Parameters:

<Level>	**<numeric value>** *RST: +200

Example:	CALC:LIM:ESP:PCL1:MAX –40 dBm Sets the maximum power value of the first power class to -40 dBm.
Manual operation:	See "PMin/PMax" on page 119

CALCulate<n>:LIMit<k>:ESPectrum:PCLass<Class>:MINimum <Level>

This command sets the minimum lower level limit for one power class. The unit is dBm. The limit always start at – 200 dBm, i.e. the first lower limit can not be set. If more than one power class is in use, the lower limit must equal the upper limit of the previous power class.

Suffix:

<n>	irrelevant

<k>	irrelevant
<Class>	1...4
	the power class to be evaluated

Parameters:

<Level>	**<numeric_value>**
	*RST: -200 for class1, otherwise +200

Example:	CALC:LIM:ESP:PCL2:MIN -40 dBm
	Sets the minimum power value of the second power class to -40 dBm.

Manual operation:	See "PMin/PMax" on page 119

CALCulate<n>:LIMit<k>:ESPectrum:RESTore

This command restores the predefined limit lines for the Spectrum Emission Mask

measurement. All modifications made to the predefined limit lines are lost and the factory-set values are restored.

Suffix:

<n>	1...4
	window
<k>	irrelevant

Example:	CALC:LIM:ESP:REST
	Resets the limit lines for the Spectrum Emission Mask to the default setting.

CALCulate<n>:LIMit<k>:ESPectrum:VALue <Power>

This command activates the manual limit line selection and specifies the expected power as a value. Depending on the entered value, one of the predefined limit lines is selected.

Suffix:

<n>	1...4
	window
<k>	irrelevant

Parameters:

<Power>	33 | 28 | 0
	33
	$P \geq 33$
	28
	$28 < P < 33$
	0
	$P < 28$
	*RST: 0

Example: `CALC:LIM:ESP:VAL 33`

Activates manual selection of the limit line and selects the limit line for P = 33.

7.2.3.4 CALCulate:MARKer subsystem

CALCulate<n>:MARKer<m>:AOFF

This command all markers off, including delta markers and marker measurement functions.

Suffix:

<n>	Selects the measurement window.
<m>	depends on mode irrelevant

Example: `CALC:MARK:AOFF`

Switches off all markers.

Usage: Event

Manual operation: See "All Marker Off" on page 89

CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command positions a marker to the next smaller trace maximum on the left of the current position (i.e. in descending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example:	CALC:MARK2:MAX:LEFT
	Positions marker 2 to the next lower maximum value to the left of the current value.
Usage:	Event
Manual operation:	See "Next Peak Mode" on page 89

CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command positions the marker to the next smaller trace maximum.

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:	
<n>	Selects the measurement window.
<m>	Selects the marker.
Example:	CALC:MARK2:MAX:NEXT
	Positions marker 2 to the next lower maximum value.
Usage:	Event
Manual operation:	See "Next Peak" on page 89
	See "Next Peak Mode" on page 89

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command positions the marker on the current trace maximum.

The corresponding marker is activated first or switched to the marker mode.

If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:	
<n>	Selects the measurement window.
<m>	depends on mode
	Selects the marker.
Example:	CALC:MARK2:MAX
	Positions marker 2 to the maximum value of the trace.
Usage:	Event
Manual operation:	See "Peak" on page 89

CALCulate<n>:MARKer<m>:MAXimum:RIGHt

This command positions a marker to the next smaller trace maximum on the right of the current value (i.e. in ascending X values).

If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: CALC:MARK2:MAX:RIGH

Positions marker 2 to the next lower maximum value to the right of the current value.

Usage: Event

Manual operation: See "Next Peak Mode" on page 89

CALCulate<n>:MARKer<m>:MINimum:LEFT

This command positions a marker to the next higher trace minimum on the left of the current value (i.e. in descending X direction).

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: CALC:MARK2:MIN

Positions marker 2 to the minimum value of the trace.

CALC:MARK2:MIN:LEFT

Positions marker 2 to the next higher minimum value to the left of the current value.

Usage: Event

Manual operation: See "Next Min Mode" on page 91

CALCulate<n>:MARKer<m>:MINimum:NEXT

This command positions ae marker to the next higher trace minimum.

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Example: CALC:MARK2:MIN

Positions marker 2 to the minimum value of the trace.

CALC:MARK2:MIN:NEXT

Positions marker 2 to the next higher maximum value.

Usage: Event

Manual operation: See "Next Min" on page 90
See "Next Min Mode" on page 91

CALCulate\<n\>:MARKer\<m\>:MINimum[:PEAK]

This command positions the marker on the current trace minimum.

The corresponding marker is activated first or switched to marker mode, if necessary.

If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

\<n\>	Selects the measurement window.
\<m\>	depends on mode Selects the marker.

Example:	`CALC:MARK2:MIN` Positions marker 2 to the minimum value of the trace.
Usage:	Event
Manual operation:	See "Min" on page 90

CALCulate\<n\>:MARKer\<m\>:MINimum:RIGHt

This command positions a marker to the next higher trace minimum on the right of the current value (i.e. in ascending X direction).

If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.

Suffix:

\<n\>	Selects the measurement window.
\<m\>	Selects the marker.

Example:	`CALC:MARK2:MIN`
	Positions marker 2 to the minimum value of the trace.
	`CALC:MARK2:MIN:RIGH`
	Positions marker 2 to the next higher minimum value to the right of the current value.

Usage:	Event
Manual operation:	See "Next Min Mode" on page 91

CALCulate\<n\>:MARKer\<m\>[:STATe] \<State\>

This command turns markers on and off.

If the corresponding marker number is currently active as a deltamarker, it is turned into a normal marker.

Suffix:

<n>	Selects the measurement window.
<m>	depends on mode Selects the marker.

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	`CALC:MARK3 ON` Switches on marker 3 or switches to marker mode.
Manual operation:	See "Marker 1/2/3/4" on page 88 See "Marker Norm/Delta" on page 88 See "Select 1/2/3/4/Δ" on page 89 See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command selects the trace a marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

If necessary, the corresponding marker is switched on prior to the assignment.

Suffix:

<n>	Selects the measurement window.
<m>	depends on mode Selects the marker.

Parameters:

<Trace>	**1 ... 6** Trace number the marker is positioned on.

Example:	`CALC:MARK3:TRAC 2` Assigns marker 3 to trace 2.
Manual operation:	See "Marker to Trace" on page 148

CALCulate<n>:MARKer<m>:X <Position>

This command positions a marker on a particular coordinate on the x-axis.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Parameters:

<Position>   Numeric value that defines the marker position on the x-axis.
                  The unit is either Hz (frequency domain) or s (time domain) or
                  dB (statistics).

                  Range: The range depends on the current x-axis range.

Example: `CALC:MARK2:X 1.7MHz`
                  Positions marker 2 to frequency 1.7 MHz.

Manual operation: See "Marker 1/2/3/4" on page 88
                        See "Select 1/2/3/4/Δ" on page 89
                        See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker
                        Norm/Delta" on page 147

CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] <State>

This command turns marker search limits on and off.

If the power measurement in zero span is active, this command limits the evaluation
range on the trace.

Suffix:

<n>   Selects the measurement window.

<m>   marker

Parameters:

<State>   ON | OFF

                  *RST: OFF

Example: `CALC:MARK:X:SLIM ON`
                  Switches on search limitation.

CALCulate<n>:MARKer<m>:X:SSIZe <StepSize>

This command defines the step size of the rotary knob for marker or delta marker value
changes. It only takes effect in manual operation.

The marker step size is unavailable for statistical measurements.

Suffix:

<n>   irrelevant

<m>   irrelevant

Parameters:

<StepSize>	**STANdard**
	step size corresponds to space between two pixels
	POINts
	step size corresponds to space between two measured values (number of measured values is defined via the `[SENSe<n>:]SWEep:POINts` command, see `[SENSe:]SWEep:POINts` on page 288)
	*RST: POINts

Example:	`CALC:MARK:X:SSIZ STAN`
	Sets the measured value step size.

Manual operation:	See "Stepsize Standard" on page 149
	See "Stepsize Sweep Points" on page 149

CALCulate<n>:MARKer<m>:Y?

This command queries the measured value of a marker.

The corresponding marker is activated before or switched to marker mode, if necessary.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps.

Suffix:

<n>	Selects the measurement window.
<m>	Selects the marker.

Return values:

<Result>	The measured value of the selected marker is returned.
	The unit is variable and depends on the one you have currently set.

Example:	`INIT:CONT OFF`
	Switches to single sweep mode.
	`CALC:MARK2 ON`
	Switches marker 2.
	`INIT;*WAI`
	Starts a sweep and waits for the end.
	`CALC:MARK2:Y?`
	Outputs the measured value of marker 2.

Usage:	Query only

Manual operation:	See "Marker 1/2/3/4" on page 88
	See "Select 1/2/3/4/Δ" on page 89
	See "Marker 1 / Marker 2 / Marker 3 / … Marker 16,/ Marker Norm/Delta" on page 147

7.2.3.5 CALCulate:PSE subsystem

CALCulate<n>:PEAKsearch|PSEarch[:IMMediate]

This command switches the spurious limit check off.

If you want to read out the values peak values including the delta to a limit, you have to switch on the limit again.

This command is only for FSP compatibility, and not necessary to use on the R&S FSV.

Suffix:

<n>	irrelevant

Example: CALC:PSE
Starts to determine the list.

CALCulate<n>:PEAKsearch|PSEarch:AUTO <State>

This command activates or deactivates the list evaluation.

Suffix:

<n>	Selects the measurement window.

Parameters:

<State>	ON | OFF
	*RST: ON

Example: CALC:ESP:PSE:AUTO OFF
Deactivates the list evaluation.

Manual operation: See "List Evaluation (On/Off)" on page 116

CALCulate<n>:PEAKsearch|PSEarch:MARGin <Margin>

This command sets the margin used for the limit check/peak search.

Suffix:

<n>	Selects the measurement window.

Parameters:

<Margin>	-200 to 200 dB
	*RST: 200 dB

Example: CALC:ESP:PSE:MARG 100
Sets the margin to 100 dB.

Manual operation:　　　See "Margin" on page 116

CALCulate\<n\>:PEAKsearch|PSEarch:PSHow

This command marks all peaks with blue squares in the diagram.

Suffix:

\<n\>　　　　　　　　　Selects the measurement window.

Parameters:

\<State\>　　　　　　　ON | OFF

　　　　　　　　　　*RST:　　　OFF

Example:　　　　　CALC:ESP:PSE:PSH ON

　　　　　　　　　　Marks all peaks with blue squares.

CALCulate\<n\>:PEAKsearch|PSEarch:SUBRanges \<NumberPeaks\>

This command sets the number of peaks per range that are stored in the list. Once the selected number of peaks has been reached, the peak search is stopped in the current range and continued in the next range.

Suffix:

\<n\>　　　　　　　　　irrelevant

Parameters:

\<NumberPeaks\>　　　1 to 50

　　　　　　　　　　*RST:　　　25

Example:　　　　　CALC:PSE:SUBR 10

　　　　　　　　　　Sets 10 peaks per range to be stored in the list.

7.2.3.6　CALCulate:STATistics subsystem

CALCulate\<n\>:STATistics:CCDF[:STATe] \<State\>

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF). On activating this function, the APD measurement is switched off.

Suffix:

<n>	irrelevant

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	CALC:STAT:CCDF ON
	Switches on the CCDF measurement.

CALCulate<n>:STATistics:NSAMples <NoMeasPoints>

This command sets the number of measurement points to be acquired for the statistical measurement functions.

Suffix:

<n>	irrelevant

Parameters:

<NoMeasPoints>	100 to 1E9
	*RST: 100000

Example:	CALC:STAT:NSAM 500
	Sets the number of measurement points to be acquired to 500.

Manual operation:	See "# of Samples" on page 122

CALCulate<n>:STATistics:PRESet

This command resets the scaling of the X and Y axes in a statistical measurement. The following values are set:

x-axis ref level:	-20 dBm
x-axis range APD:	100 dB
x-axis range CCDF:	20 dB
y-axis upper limit:	1.0
y-axis lower limit:	1E-6

Suffix:

<n>	irrelevant

Example:	CALC:STAT:PRES
	Resets the scaling for statistical functions

Manual operation:	See "Default Settings" on page 125

CALCulate<n>:STATistics:RESult<Trace> <ResultType>

This command reads out the results of statistical measurements of a recorded trace.

Suffix:

<n>	irrelevant

<Trace>	1...6
	trace

Parameters:

<ResultType>	MEAN | PEAK | CFACtor | ALL

MEAN

Average (=RMS) power in dBm measured during the measurement time.

PEAK

Peak power in dBm measured during the measurement time.

CFACtor

Determined CREST factor (= ratio of peak power to average power) in dB.

ALL

Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

The required result is selected via the following parameters:

Example:	`CALC:STAT:RES2? ALL`
	Reads out the three measurement results of trace 2. Example of answer string: 5.56,19.25,13.69 i.e. mean power: 5.56 dBm, peak power 19.25 dBm, CREST factor 13.69 dB

CALCulate<n>:STATistics:SCALe:AUTO ONCE

This command optimizes the level setting of the instrument depending on the measured peak power, in order to obtain maximum instrument sensitivity.

To obtain maximum resolution, the level range is set as a function of the measured spacing between peak power and the minimum power for the APD measurement and of the spacing between peak power and mean power for the CCDF measurement. In addition, the probability scale for the number of test points is adapted.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the auto range process which would otherwise be aborted.

Suffix:

<n>	irrelevant

Example:	`CALC:STAT:SCAL:AUTO ONCE;*WAI`
	Adapts the level setting for statistical measurements.

Manual operation:	See "Adjust Settings" on page 125

CALCulate<n>:STATistics:SCALe:X:RANGe <Value>

This command defines the level range for the x-axis of the measurement diagram. The setting is identical to the level range setting defined with the `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` command.

Suffix:

<n>	irrelevant

Parameters:

<Value>	10dB to 200dB
	*RST: 100dB

Example:	CALC:STAT:SCAL:X:RANG 20dB
Manual operation:	See "x-Axis Range" on page 122

CALCulate<n>:STATistics:SCALe:X:RLEVel <Value>

This command defines the reference level for the x-axis of the measurement diagram. The setting is identical to the reference level setting using the DISPlay[: WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel command.

With the reference level offset <> 0 the indicated value range of the reference level is modified by the offset.

The unit depends on the setting performed with CALCulate<n>:UNIT:POWer.

Suffix:

<n>	irrelevant

Parameters:

<Value>	-120dBm to 20dBm
	*RST: -20dBm

Example:	CALC:STAT:SCAL:X:RLEV −60dBm
Manual operation:	See "x-Axis Ref Level" on page 122

CALCulate<n>:STATistics:SCALe:Y:LOWer <Value>

This command defines the lower limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

Suffix:

<n>	selects the screen

Parameters:

<Value>	1E-9 to 0.1
	*RST: 1E-6

Example:	CALC:STAT:SCAL:Y:LOW 0.001
Manual operation:	See "y-Axis Min Value" on page 124

CALCulate<n>:STATistics:SCALe:Y:UNIT <Unit>

This command defines the scaling type of the y-axis.

Suffix:

<n> selects the screen

Parameters:

<Unit> PCT | ABS

  *RST: ABS

Example: CALC:STAT:SCAL:Y:UNIT PCT

  Sets the percentage scale.

Manual operation: See "y-Unit % / Abs" on page 125

CALCulate<n>:STATistics:SCALe:Y:UPPer <Value>

This command defines the upper limit for the y-axis of the diagram in statistical measurements. Since probabilities are specified on the y-axis, the entered numeric values are dimensionless.

Suffix:

<n> irrelevant

Parameters:

<Value> 1E-8 to 1.0

  *RST: 1.0

Example: CALC:STAT:SCAL:Y:UPP 0.01

Manual operation: See "y-Axis Max Value" on page 124

7.2.3.7 Other Referenced CALCulate Commands

CALCulate<n>:ESPectrum:PSEarch|:PEAKsearch:PSHow <State>

This command marks all peaks with blue squares in the diagram.

Suffix:

<n> Selects the measurement window.

Parameters:

<State> ON | OFF

  *RST: OFF

Example: CALC:ESP:PSE:PSH ON

  Marks all peaks with blue squares.

Manual operation: See "Show Peaks" on page 116

CALCulate<n>:THReshold <Threshold>

This command defines a threshold value for the marker peak search.

A threshold line is automatically turned on.

Suffix:

<n>   irrelevant

Parameters:

<Threshold>   The unit depends on `CALCulate<n>:UNIT:POWer`.

                        *RST: (STATe to OFF)

Example: `CALC:THR -82DBM`
                        Sets the threshold value to -82 dBm.

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit of the y-axis.

The unit applies to all measurement windows.

Suffix:

<n>   irrelevant

Parameters:

<Unit>   DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT |
                        DBUA | AMPere

                        *RST: dBm

Example: `CALC:UNIT:POW DBM`
                        Sets the power unit to dBm.

Manual operation: See "Unit" on page 133

7.3 CONFigure Subsystem

The CONFigure subsystem contains commands for configuring the measurements.

7.3.1 CONFigure:CDPower Subsystem (K82/K84)

This subsystem contains the commands for measurement selection and configuration.

Further setting commands for the spectrum emission mask measurement are described in the `CALCulate:ESPectrum` subsystem.

CONFigure:CDPower[:BTS]:BCLass|BANDclass <Bandclass>

This command selects the bandclass for the measurement.

Parameters:

<Bandclass>   0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 21 | 22

0
800 MHz band

1
1900 MHz PCS

2
TACS band

3
(3A) JTACS band, see "Bandclass" on page 101.

4
Korean PCS band

5
450 MHz NMT

6
2 GHz IMT-2000

7
700 MHz band

8
1800 MHz band

9
900 MHz band

10
Secondary 800 MHz band

11
400 MHz European PAMR band

12
800 MHz PAMR band

13
2.5 GHz IMT2000 Extension

14
US PCS 1.9GHz Band

15
AWS Band

16
US 2.5 GHz

17
US 2.5 GHz

21
(3B) JTACS band, see "Bandclass" on page 101.

22
(3C) JTACS band, see "Bandclass" on page 101.

*RST: 0

Example:	`CONF:CDP:BCL 1`
	Selects band class 1, 1900 MHz
Mode:	CDMA, EVDO
Manual operation:	See "Bandclass" on page 101
	See "Bandclass" on page 119

CONFigure:CDPower[:BTS]:CTABle[:STATe] <State>

This command activates or deactivates the "RECENT" channel table. To select another channel table, use the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Parameters:

<State>	ON | OFF
	*RST: OFF
Example:	`CONF:CDP:CTAB OFF`
	Deactivates the RECENT channel table and activates a predefined channel table.
	`CONF:CDP:CTAB:SEL 'CTAB_1'`
	Selects channel table 'CTAB_1'.
Mode:	CDMA, EVDO
Manual operation:	See "Channel Search Mode" on page 66

CONFigure:CDPower[:BTS]:CTABle:CATalog?

This command queries the names of all the channel tables stored on the flash disk for the current application (CDMA/1xEVDO).

Parameters:

	<sum of file sizes of all subsequent files>, <spare storage space on hard disk>, <1st file name>, <1st file size>, <2nd file name>, <2nd file size>, …, <nth file name>, <nth file size>, …
Example:	`CONF:CDP:CTAB:CAT?`
	Queries catalog.
Usage:	Query only
Mode:	CDMA, EVDO
Manual operation:	See "Channel Tables" on page 67

CONFigure:CDPower[:BTS]:CTABle:COMMent <Comment>

This command defines a comment on the selected channel table.

Parameters:

<Comment>	<'string'> = comment on the channel table

Example: CONF:CDP:CTAB:NAME 'NEW_TAB'
                      Selects channel table for editing. If a channel table with this
                      name does not exist, a new channel table is created.
                      CONF:CDP:CTAB:DATA
                      0,6,0,0,0,0,1,0.0,10,5,3,4,0,0,1,0.0
                      Defines a table with the following channels: PICH 0.64 and data
                      channel with RC4/Walsh code 3.32.
                      CONF:CDP:CTAB:COMM 'Comment for NEW_TAB'
                      Specifies 'Comment for NEW_TAB' as comment.

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:COPY <TargetFileName>

This command copies one channel table to another. Select the channel table you want
to copy using the CONFigure:CDPower[:BTS]:CTABle:SELect command.

Parameters:
<TargetFileName>   <'string'> = name of the new channel table.

Example: CONF:CDP:CTAB:NAME 'CTAB_1'
                      Selects channel table CTAB_1 for copying.
                      CONF:CDP:CTAB:COPY 'CTAB_2'
                      Copies CTAB_1 to CTAB_2.

Usage: Event

Mode: CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:DATA <ChannelType>, <CodeClass>,
         <CodeNumber>, <Modulation>, <Reserved1>, <Reserved2>, <Status>,
         <CDPRelative>

This command defines a channel table. The following description applies to EVDO
BTS mode (K84) only.

For MS mode, see CONFigure:CDPower[:BTS]:CTABle:DATA on page 229.

Before using this command, you must set the name of the channel table using the
CONFigure:CDPower[:BTS]:CTABle:SELect command.

Parameters:
<ChannelType>   The channel type is numerically coded as follows:
                     0 = PILOT
                     1 = MAC
                     2 = PREAMBLE with 64 chip length
                     3 = PREAMBLE with 128 chip length
                     4 = PREAMBLE with 256 chip length
                     5 = PREAMBLE with 512 chip length
                     6 = PREAMBLE with 1024 chip length
                     7 = DATA

\<CodeClass\>	Depending on channel type, the following values are allowed: PILOT: 5 MAC: 6 PREAMBLE: 5 DATA: 4 (spreading factor = $2^{\text{code class}}$)
\<CodeNumber\>	0…spreading factor-1
\<Modulation\>	Modulation type including mapping: 0 = BPSK-I 1 = BPSK-Q 2 = QPSK 3 = 8-PSK 4 = 16-QAM Modulation types QPSK/8-PSK/16-QAM have complex values.
\<Reserved1\>	Always 0 (reserved)
\<Reserved2\>	Always 0 (reserved)
\<Status\>	0: inactive, 1: active Can be used in a setting command to disable a channel temporarily
\<CDPRelative\>	Power value in dB.
Example:	CONF:CDP:CTAB:NAME 'NEW_TAB' Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created. CONF:CDP:CTAB:DATA 0,6,0,0,0,0,1,0.0,10,5,3,4,0,0,1,0.0 Defines a table with the following channels: PICH 0.64 and data channel with RC4/Walsh code 3.32.
Mode:	EVDO BTS
Manual operation:	See "Add Channel" on page 69

CONFigure:CDPower[:BTS]:CTABle:DATA \<ChannelType\>, \<CodeClass\>,
    \<CodeNumber\>, \<Mapping\>, \<Activity\>, \<Reserved1\>, \<Status\>, \<Reserved2\>

This command defines a channel table. The following description applies to EVDO MS mode (K85) only. For BTS mode, see CONFigure:CDPower[:BTS]:CTABle:DATA on page 228.

Before using this command, you must set the name of the channel table using the CONFigure:CDPower[:BTS]:CTABle:SELect command.

Parameters:

<ChannelType>	The channel type is numerically coded as follows: 0 = PICH 1 = RRI 2 = DATA 3 = ACK 4 = DRC 5 = INACTIVE
<CodeClass>	2 to 4
<CodeNumber>	0…15
<Mapping>	0 = I branch 1 = Q branch
<Activity>	0..65535 (decimal) The decimal number - interpreted as a binary number in 16 bits - determines the half slot in which the channel is active (value 1) or inactive (value 0). See table 7-1.
<Reserved1>	Always 0 (reserved)
<Status>	0: inactive, 1: active Can be used in a setting command to disable a channel temporarily
<Reserved2>	Always 0 (reserved)

Example:	`"INST:SEL MDO"`
	'Activate 1xEV–DO MS
	`"CONF:CDP:CTAB:NAME 'NEW_TAB'"`
	'Select table to edit
	`"CONF:CDP:CTAB:DATA 0,4,0,0,65535,0,1,0,`
	`1,4,0,0,43690,0,1,0, 2,2,2,1,65535,0,1,0"`
	'Selects PICH 0.16 on I with full activity, RRI 0.16 on I in each even–numbered half slot, and DATA 2.4 on Q with full activity.

Mode:	EVDO MS

Table 7-1: Examples for <Activity> parameter settings

Dec.	Binary	Description
65535	1111 1111 1111 1111	Channel is active in each half slot(e.g. DATA)
43690	1010 1010 1010 1010	Channel is active in half slot 0, 2, 4 etc(e.g. RRI)
24576	0110 0000 0000 0000	Channel is active in half slot 1 and 2(e.g. DRC)

CONFigure:CDPower[:BTS]:CTABle:DELete

This command deletes the selected channel table. Select the channel table you want to delete using the CONFigure:CDPower[:BTS]:CTABle:SELect command.

Example:	`CONF:CDP:CTAB:NAME 'CTAB_1'`
	Selects channel table CTAB_2 for deleting.
	`CONF:CDP:CTAB:DEL`
	Deletes channel table CTAB_2.
Usage:	Event
Mode:	CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:NAME <ChannelTable>

This command selects a channel table for editing or creating. To select a command for analysis, use the `CONFigure:CDPower[:BTS]:CTABle:SELect` command.

Parameters:

<ChanTableName>	<'string'> = name of the channel table
Example:	`CONF:CDP:CTAB:NAME 'NEW_TAB'`
	Selects channel table for editing. If a channel table with this name does not exist, a new channel table is created.
Mode:	CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:RESTore

This command restores the predefined channel tables to their factory-set values. In this way, you can undo unintentional overwriting.

Example:	`CONF:CDP:CTAB:REST`
	Restores the channel table.
Usage:	Event
Mode:	CDMA, EVDO

CONFigure:CDPower[:BTS]:CTABle:SELect <ChannelTable>

This command selects a predefined channel table.

Parameters:

<ChanTableName>	<'string'> = name of the channel table
	*RST: "RECENT"
Mode:	CDMA, EVDO
Manual operation:	See "Channel Search Mode" on page 66

CONFigure:CDPower[:BTS]:MCARrier [:STATe] <State>

This command activates or deactivates the multi-carrier mode.

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	CONF:CDP:MCAR ON
	Activates the multi-carrier settings.

Mode:	CDMA, EVDO

Manual operation:	See "Multi Carrier" on page 71

CONFigure:CDPower[:BTS]:MCARrier:FILTer [:STATe] <State>

This command activates or deactivates the usage of a filter for multi-carrier measurements.

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	CONF:CDP:MCAR ON
	Activates multi-carrier mode
	CONF:CDP:MCAR:FILT OFF
	Activates an additional filter for multi-carrier measurements

Mode:	CDMA, EVDO

Manual operation:	See "Multi Carrier Filter" on page 71

CONFigure:CDPower[:BTS]:MCARrier:FILTer:COFRequency <Frequency>

This command sets the cut-off frequency for the RRC filter.

Parameters:

<Frequency>	Range:	0.1 MHz to 2.4 MHz
	*RST:	1.25

Example:	CONF:CDP:MCAR ON
	Activates multi-carrier mode
	CONF:CDP:MCAR:FILT ON
	Activates an additional filter for multi-carrier measurements
	CONF:CDP:MCAR:FILT:TYPE RRC
	Activates the RRC filter
	CONF:CDP:MCAR:FILT:COFR 1.5MHZ
	Sets the cut-off frequency to 1.5 MHz

Mode:	CDMA, EVDO

Manual operation:	See "Cut Off Frequency" on page 72

CONFigure:CDPower[:BTS]:MCARrier:FILTer:ROFF <RollOffFactor>

This command sets the roll-off factor for the RRC filter.

Parameters:

<RollOffFactor>	Range:	0.01 to 0.99
	*RST:	0.02

Example: CONF:CDP:MCAR ON

Activates multi-carrier mode

CONF:CDP:MCAR:FILT ON

Activates an additional filter for multi-carrier measurements

CONF:CDP:MCAR:FILT:TYPE RRC

Activates the RRC filter

CONF:CDP:MCAR:FILT:ROFF 0.05

Sets the roll-off factor to 0.05

Mode: CDMA, EVDO

Manual operation: See "Roll-Off Factor" on page 72

CONFigure:CDPower[:BTS]:MCARrier:FILTer:TYPE <Type>

This command sets the filter type to be used in multi-carrier mode.

You can set the parameters for the RRC filter with the CONFigure:CDPower[:BTS]: MCARrier:FILTer:ROFF on page 232 and CONFigure:CDPower[:BTS]: MCARrier:FILTer:COFRequency on page 232 commands.

Parameters:

<Type>	LPASs	RCC
	*RST: LPAS

Example: CONF:CDP:MCAR ON

Activates multi-carrier mode

CONF:CDP:MCAR:FILT ON

Activates an additional filter for multi-carrier measurements

CONF:CDP:MCAR:FILT:TYPE RRC

Activates the RRC filter

Mode: CDMA, EVDO

Manual operation: See "Filter Type" on page 71
See "Roll-Off Factor" on page 72
See "Cut Off Frequency" on page 72

CONFigure:CDPower[:BTS]:MCARrier:MALGo <State>

This command activates or deactivates the enhanced algorithm for the filters in multi-carrier mode.

Parameters:

<State>	ON	OFF
	*RST: ON

Example:	`CONF:CDP:MCAR ON`
	Activates multi-carrier mode
	`CONF:CDP:MCAR:FILT ON`
	Activates an additional filter for multi-carrier measurements
	`CONF:CDP:MCAR:MALG OFF`
	Deactivates the enhanced algorithm
Mode:	CDMA, EVDO
Manual operation:	See "Enhanced Algorithm" on page 71

CONFigure:CDPower[:BTS]:MEASurement <Measurement>

This command selects the measurement type.

Parameters:

<Measurement>	ACLR | CCDF | CDPower | ESPectrum | OBWidth | POWer
	ACLR
	Adjacent-Channel Power measurement
	(with predefined settings according to the CDMA2000 standard)
	CCDF
	measurement of the complementary cumulative distribution function (signal statistics)
	CDPower
	Code Domain Analyzer measurement.
	ESPectrum
	check of signal power (Spectrum Emission Mask)
	OBWidth
	measurement of the occupied bandwidth
	POWer
	Signal Channel Power measurement
	(with predefined settings according to the CDMA2000 standard)
	*RST: CDPower
Example:	`CONF:CDP:MEAS POW`
	Selects Signal Channel Power measurement.
Mode:	CDMA, EVDO
Manual operation:	See "Code Domain Analyzer" on page 100
	See "Power" on page 100
	See "Ch Power ACLR" on page 100
	See "Spectrum Emission Mask" on page 110
	See "Occupied Bandwidth" on page 120
	See "CCDF" on page 121

7.4 DISPlay Subsystem

The DISPLay subsystem controls the selection and presentation of textual and graphic information as well as of measurement data on the display.

DISPlay:MTABle <DisplayMode>

This command turns the marker table on and off.

Parameters:

<DisplayMode> **ON**
Marker table is displayed.

OFF
Marker table is not displayed.

AUTO
Marker table is only displayed if 2 or more markers are active.

*RST: AUTO

Example: To activate the table display:
`DISP:MTAB ON`
To query the current state of the marker table display:
`DISP:MTAB?`

Manual operation: See "Marker Table" on page 148

DISPlay[:WINDow<n>]:SIZE <Size>

This command enlargens the measurement window indicated by the suffix to full screen. The result display of the screen is, by default, the same as that of the first measurement screen.

Suffix:

<n>   window; For applications that do not have more than 1 measure-
ment window, the suffix <n> is irrelevant.

Parameters:

<Size>   SMALl | LARGe

    *RST: SMALl

Example: `DISP:WIND2:SIZE LARG`
Maximizes the second measurement screen

Mode: CDMA, EVDO

DISPlay[:WINDow<n>]:SSELect

This command selects which window (screen) is active.

Suffix:

<n>   1...4
window; For applications that do not have more than 1 measure-
ment window, the suffix <n> is irrelevant.

Parameters:

    *RST: 1

Example: `DISP:WIND1:SSEL`
Sets the window 1 active.

Mode: CDMA, EVDO

DISPlay[:WINDow<n>]:STATe <State>

Activates/deactivates the window specified by the suffix <n>. The other measurements
are not aborted but continue running in the background:

Suffix:

<n>   window

Parameters:

<State>   ON | OFF

    *RST: OFF

Example: `DISP:WIND3:STAT ON`
Turns on a third measurement screen.

Mode: CDMA, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command defines the type of display and the evaluation of the traces. WRITE cor-
responds to the Clr/Write mode of manual operation. The trace is switched off (=
BLANK in manual operation) with `DISPlay[:WINDow<n>]:TRACe<t>[:STATe]`.

The number of measurements for AVERage, MAXHold and MINHold is defined with the `[SENSe:]AVERage<n>:COUNt` or `[SENSe:]SWEep:COUNt` commands. It should be noted that synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t>	trace

Parameters:

<Mode>	WRITe | VIEW | AVERage | MAXHold | MINHold | BLANk
	*RST: WRITe for TRACe1, STATe OFF for TRACe2/3/4/5/6
	For details on trace modes refer to chapter 6.4.4, "Trace Mode Overview", on page 157.

Example: `INIT:CONT OFF`
Switching to single sweep mode.
`SWE:COUN 16`
Sets the number of measurements to 16.
`DISP:TRAC3:MODE MAXH`
Switches on the calculation of the maximum peak for trace 3.
`INIT;*WAI`
Starts the measurement and waits for the end of the 16 sweeps.

Manual operation: See "Clear Write" on page 86
See "Max Hold" on page 87
See "Min Hold" on page 87
See "Average" on page 87
See "View" on page 87

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command switches on or off the display of the corresponding trace. The other measurements are not aborted but continue running in the background.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t>	trace

Parameters:

<State>	ON | OFF
	*RST: ON for TRACe1, OFF for TRACe2 to 6

Example: `DISP:TRAC3 ON`

Manual operation: See "Blank" on page 159

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis with logarithmic scaling.

The command works only for a logarithmic scaling. You can select the scaling with
DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing on page 241.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t>	irrelevant

Parameters:

<Range>	Range: 10 to 200
	*RST: 100
	Default unit: dB

Example: `DISP:TRAC:Y 110dB`

Manual operation: See "Range Log 100 dB" on page 122
See "Range Log 50 dB" on page 123
See "Range Log 10 dB" on page 123
See "Range Log 5 dB" on page 123
See "Range Log 1 dB" on page 123
See "Range Log Manual" on page 124

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:AUTO <Mode>

This command turns automatic scaling of the y-axis on and off.

If on, the R&S FSV determines the ideal scale of the y-axis for the current measurement results.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t>	only 1
	trace

Parameters:

<Mode>	**ON**
	Automatic scaling is on.
	OFF
	Automatic scaling is off.
	ONCE
	Automatic scaling is performed once.
	*RST: OFF

Example: `DISP:WIND2:TRAC:Y:SCAL:AUTO ONCE`
Activates automatic scaling of the Y-axis for the active trace

Mode: CDMA, EVDO, OFDM, OFDMA/WiBro, PHN

Manual operation: See "Auto Scale Once" on page 81

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>

This command selects the type of scaling of the y-axis.

When `SYSTem:DISPlay:UPDate` is turned off, this command has no immediate effect on the screen.

Suffix:

<n>   window; For applications that do not have more than 1 measure-
                     ment window, the suffix <n> is irrelevant.

<t>   irrelevant

Parameters:

<Mode>   **ABSolute**
                     absolute scaling of the y-axis
                     RELative
                     relative scaling of the y-axis
                     *RST: ABS

Example: DISP:TRAC:Y:MODE REL

Manual operation: See "Grid Abs/Rel " on page 136

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision <Value>

This remote command determines the grid spacing on the Y axis for all diagrams, where possible.

Suffix:

<n>   irrelevant

<t>   irrelevant

Parameters:

<Value>   numeric value; the unit depends on the result display
                     *RST: depends on the result display

Example: DISP:TRAC:Y:PDIV 10
                     Sets the grid spacing to 10 units (for example 10 dB in the Code
                     Domain Power result display).

Mode: CDMA, BT, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <ReferenceLevel>

This command defines the reference level.

With the reference level offset ≠ 0, the value range of the reference level is modified by the offset.

Suffix:

<n>   irrelevant.

<t>   irrelevant

Parameters:

<ReferenceLevel>   The unit is variable.

                        Range: see datasheet
                        *RST: -10dBm

Example: DISP:TRAC:Y:RLEV –60dBm

Manual operation: See "Ref Level" on page 62

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command defines a reference level offset.

Suffix:

<n>   irrelevant.

<t>   irrelevant

Parameters:

<Value>   Range: -200 to 200
                        *RST: 0
                        Default unit: dB

Example: DISP:TRAC:Y:RLEV:OFFS –10dB

Manual operation: See "Ref Level Offset" on page 63

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This command defines the position of the reference level on the display grid..

When using a tracking generator (only with option R&S FSV-B9 or -B10, requires active normalization), and in Bluetooth mode (option R&S FSV-K8) this command defines the position of the reference value for all windows.

Suffix:

<n>   Selects the measurement window.

<t>   irrelevant

Parameters:

<Position>   0 PCT corresponds to the lower display border, 100% corresponds to the upper display border.

                        Range: 0 to 100
                        *RST: Spectrum mode: 100 PCT, with tracking generator
                                    or time display: 50 PCT
                        Default unit: PCT

Example: DISP:TRAC:Y:RPOS 50PCT

Manual operation: See "Ref Level Position" on page 136

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator, this command requires active normalization.

Suffix:

<n>	irrelevant
<t>	irrelevant

Parameters:

<Value>	*RST: 0 dB, coupled to reference level

Example:	`DISP:TRAC:Y:RVAL -20dBm`
	Defines a reference position of -20 dBm.

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling of the y-axis.

Suffix:

<n>	Selects the measurement window.
<t>	irrelevant

Parameters:

<ScalingType>	**LOGarithmic**
	Logarithmic scaling.
	LINear
	Linear scaling in %.
	LDB
	Linear scaling in dB.
	*RST: LOGarithmic

Example:	`DISP:TRAC:Y:SPAC LIN`
	Select a linear scale.

Manual operation:	See "Range Log 100 dB" on page 122
	See "Range Log 50 dB" on page 123
	See "Range Log 10 dB" on page 123
	See "Range Log 5 dB" on page 123
	See "Range Log 1 dB" on page 123
	See "Range Log Manual" on page 124
	See "Range Linear %" on page 124
	See "Range Lin. Unit" on page 124

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MAXimum <Value>

This command defines the maximum value of the y-axis for the selected result display.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t>	irrelevant

Parameters:

<Value>	<numeric value>
	*RST: depends on the result display
	The unit and range depend on the result display.
Example:	DISP:TRAC:Y:MIN -60
	DISP:TRAC:Y:MAX 0
	Defines the y-axis with a minimum value of -60 and maximum value of 0.
Mode:	CDMA, EVDO
Manual operation:	See "Y-Axis Maximum" on page 81

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MINimum <Value>

This command defines the minimum value of the y-axis for the selected result display.

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t>	irrelevant

Parameters:

<Value>	<numeric value>
	*RST: depends on the result display
	The unit and range depend on the result display.
Example:	DISP:TRAC:Y:MIN -60
	DISP:TRAC:Y:MAX 0
	Defines the y-axis with a minimum value of -60 and maximum value of 0.
Mode:	CDMA, EVDO
Manual operation:	See "Y-Axis Minimum" on page 82

7.5 INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

INSTrument[:SELect] <Mode>

Parameters:

<Mode>   BC2K

                                This command switches to the CDMA2000 BTS Analysis mode
                                (R&S FSV-K82 option)

INSTrument:NSELect <Mode>

Parameters:

<Mode>   10

                                This command switches to the CDMA2000 BTS Analysis mode
                                (R&S FSV-K82 option)

7.6   SENSe Subsystem

The `SENSe` subsystem controls the essential parameters of the analyzer. In accordance with the SCPI standard, the keyword `SENSe` is optional, which means that it is not necessary to include the `SENSe` node in command sequences.

Note that most commands in the `SENSe` subsystem are identical to the base unit; only the commands specific to this option are described here.

7.6.1   SENSe:CDPower Subsystem

This subsystem sets the parameters for the code domain measurements mode.

[SENSe:]CDPower:ANTenna <AntennaState>

This command deactivates the orthogonal transmit diversity (two-antenna system) or defines the antenna for which the result display evaluated.

Parameters:

<AntennaState>	OFF | 1 | 2

OFF
The aggregate signal from both antennas is fed in.

1
The signal of antenna 1 is fed in.

2
The signal of antenna 2 is fed in.

*RST: OFF
For further details refer to "Antenna Diversity" on page 72.

Example:	CDP:ANT 2
Selects antenna 2.
Mode:	CDMA
Manual operation:	See "Antenna Diversity" on page 72

[SENSe:]CDPower:CODE <CodeNo>

This command selects the code number.

For further details refer to "Channel (Code) Number" on page 75.

Parameters:

<CodeNo>	<numeric value>

Range: 0 to base spreading factor - 1
Increment: 1
*RST: 0

Example:	CDP:CODE 8
	Selects the eighth channel.

Mode:	CDMA

Manual operation:	See "Channel (Code) Number" on page 75
	See "Select" on page 79

[SENSe:]CDPower:ICThreshold <ThresholdLevel>

This command defines the minimum power that a single channel must have compared to the total signal in order to be regarded as an active channel. Channels below the specified threshold are regarded as "inactive".

Parameters:

<ThresholdLevel>	Range:	-100 dB to 0 dB
	*RST:	-60 dB

Example:	CDP:ICT -50
	Sets the Inactice Channel Threshold to -50 dB.

Mode:	CDMA, EVDO, TDS, WCDMA

Manual operation:	See "Inactive Channel Threshold" on page 66

[SENSe:]CDPower:IQLength <CaptureLength>

This command sets the capture length in multiples of the power control group.

Parameters:

<CaptureLength>	Range:	2 to 64
	*RST:	3

Example:	SENS:CDP:IQLength 3

Mode:	CDMA

Manual operation:	See "Capture Length" on page 64

[SENSe:]CDPower:LEVel:ADJust

This command adjusts the reference level to the measured channel power. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSV or limiting the dynamic range by an S/N ratio that is too small.

Example:	CDP:LEV:ADJ
	Adjusts the reference level.

Mode:	CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:MAPPing <SignalComponent>

This command switches between I and Q component of the signal.

Parameters:

<SignalComponent>   I | Q

                     *RST: Q

Example: CDP:MAPP Q

Mode: CDMA, WCDMA

Manual operation: See "Select" on page 79

[SENSe:]CDPower:LCODe:MASK <Mask>

Defines the long code mask of the mobile in hexadecimal form.

Note: For the default mask value of 0 the long code offset (see) is not taken into consideration.

Parameters:

<Mask>   Range: #H0 to #H4FFFFFFFFFF
                     *RST: #H0

Example: INST:SEL MC2K
                     'Activate cdma2000 MS; by default, "CDP relative" is displayed
                     in screen A and "Result Summary" in screen B.
                     INIT:CONT OFF
                     'Select single sweep
                     TRIG:SOUR:EXT
                     'Select external trigger source
                     CDP:LCOD:MASK '#HF'
                     'Define long code mask
                     INIT;*WAI
                     'Start measurement with synchronization

Mode: CDMA

Manual operation: See "Long Code Mask" on page 74

[SENSe:]CDPower:LCODe:OFFSet <CodeOffset>

Defines the long code offset, including the PN offset. This offset is applied at the next trigger pulse (which cannot occur until a setup time of 300 ms has elapsed).

This command is ignored if [SENSe:]CDPower:LCODe:MASK is set to 0.

Parameters:

<CodeOffset>   **Offset in chips in hexadecimal format with a 52-bit resolution. The chips offset is calculated as follows: tSinceStartGPS * 1.2288 MChips/s, where tSinceStartGPS is defined in seconds.**
                     This value corresponds to the GPS timing since 6.1.1980
                     00:00:00 UTC.
                     *RST: #H0

Example:	The hexadecimal offset of 258000 h chips is set for the first even second clock trigger:
	`INST:SEL MC2K`
	'Activate cdma2000 MS; by default, "CDP relative" is displayed in screen A and "Result Summary" in screen B.
	`INIT:CONT OFF`
	'Select single sweep
	`TRIG:SOUR:EXT`
	'Select external trigger source
	`CDP:LCOD:MASK '#H2'`
	'Define long code mask
	`CDP:LCOD:OFFS '#H258000'`
	'Define long code offset
	`INIT;*WAI`
	'Start measurement with synchronization
Mode:	CDMA
Manual operation:	See "Long Code Offset" on page 74

[SENSe:]CDPower:LCODe:MODE <Mode>

This command selects the mode of the long code generation.

Parameters:

<Mode>	**STANdard**
	The cdma2000 standard long code generator is used.
	ESG101
	The Agilent ESG option 101 long code is used; in this case, only signals from that generator can be analysed.
	*RST: STANdard
Mode:	CDMA
Manual operation:	See "Long Code Gen Mode" on page 74

[SENSe:]CDPower:NORMalize <boolean>

This command activates or deactivates the elimination of the IQ offset from the signal.

Parameters:

<ON	OFF>	*RST: OFF
Example:	`CDP:NORM ON`
	Activates normalization.
Mode:	CDMA, EVDO, TDS, WCDMA

[SENSe:]CDPower:ORDer <SortOrder>

This command sets the channel sorting for the Code Domain Power and Code Domain Error Power result displays.

Parameters:

\<SortOrder\>	HADamard | BITReverse
	*RST: HADamard
	For further details refer to "Code Order" on page 76.

Example:	`CDP:ORD HAD`
	Sets Hadamard order.
	`TRAC? TRACE2`
	Reads out the results in Hadamard order.
	`CDP:ORD BITR`
	Sets BitReverse order.
	`TRAC? TRACE2`
	Reads out the results in BitReverse order.

Mode:	CDMA

Manual operation:	See "Code Order" on page 76

[SENSe:]CDPower:OVERview \<State\>

This command switches to an overview display of a code domain measurement (CDP rel./CDP abs./ CDEP). If enabled, the I branch of the code power is displayed in screen A and the Q branch in screen B. Both results can be read using `TRACE:DATA?` `TRACE1` and `TRACE:DATA? TRACE2`; respectively. If disabled, screen A displays the I branch and screen B provides the result summary display.

Parameters:

\<State\>	ON | OFF
	*RST: OFF

Example:	`CDP:OVER OFF`

Mode:	CDMA, EVDO, WCDMA

Manual operation:	See "Code Domain Overview (MS mode only)" on page 77

[SENSe:]CDPower:PNOFfset \<Offset\>

This command sets the PN offset of the base station in multiples of 64 chips.

Parameters:

\<Offset\>	Range:	0 to 511	
	*RST:	0	

Example:	`CDP:PNOF 45`
	Sets PN offset.

Mode:	CDMA

Manual operation:	See "PN Offset" on page 71

[SENSe:]CDPower:PPReference <Mode>

This command defines how the pilot channel power is displayed in the absolute summary. In relative mode, the reference power is the total power.

Parameters:

<Mode>	ABS | REL
	*RST: ABS

Example:	`CDP:PPR REL`
	Pilot channel power is displayed in relation to the total power.

Mode:	CDMA

Manual operation:	See "Pilot Power (MS mode only)" on page 76

[SENSe:]CDPower:PREFerence <Power>

This command specifies the reference power for the relative power result displays (e.g. Code Domain Power, Power vs PCG).

Parameters:

<Power>	PICH | TOTal
	PICH
	The reference power is the power of the pilot channel. Which pilot channel is used as reference depends on the antenna diversity (for details see `[SENSe:]CDPower:ANTenna` on page 244 command).
	TOTal
	The reference power is the total power of the signal referred per PCG to the corresponding PCG.
	*RST: PICH
	For further information refer to "Power Reference" on page 76

Example:	`CDP:PREF TOT`
	Sets total power as reference power.

Mode:	CDMA

Manual operation:	See "Power Reference" on page 76

[SENSe:]CDPower:QINVert <State>

This command inverts the Q component of the signal.

Parameters:

ON | OFF	*RST: OFF

Example:	`CDP:QINV ON`
	Activates inversion of Q component.

Mode:	CDMA, EVDO, TDS, WCDMA

Manual operation:	See "Invert Q" on page 63

[SENSe:]CDPower:SBANd <NORMal | INVers>

This command is used to swap the left and right sideband.

Parameters:
<NORMal | INVers>   *RST: NORM

Example: `CDP:SBAN INV`
                     Switches the right and left sideband.

Mode: CDMA, EVDO, TDS

[SENSe:]CDPower:SET:COUNt <NoOfSets>

This command sets the number of sets to be captured and stored in the instrument's memory.

Refer to "Set Count" on page 64 for more information.

Parameters:
<NoOfSets>   Range: 1 to TDS: 99; CDMA: 490
                     Increment: 1
                     *RST: 1

Example: `CDP:SET:COUN 12`
                     Sets the number of sets to 12.

Mode: TDS

Manual operation: See "Set Count" on page 64

[SENSe:]CDPower:SET <SetNo>

This command selects a specific set for further analysis. The number of sets has to be defined with the `[SENSe:]CDPower:SET` command before using this command.

Parameters:
<SetNo>   Range: 0 to SET COUNT -1
                     Increment: 1
                     *RST: 0

Example: `CDP:SET:COUN 10`
                     Selects the 10th set for further analysis.

Mode: CDMA, EVDO, TDS

Manual operation: See "Set to Analyze" on page 64

[SENSe:]CDPower:SFACtor <SpreadingFactor>

This command defines the base spreading factor. If the base spreading factor of 64 is used for channels with a spreading factor of 128 (code class 7), an alias power is displayed in the Code Domain Power and Code Domain Error Power diagrams.

Parameters:

\<SpreadingFactor\>	64 | 128
	*RST: 64

Example:	`CDP:SFAC 128`
	Selects base spreading factor 128.

Mode:	CDMA

Manual operation:	See "Base Spreading Factor" on page 70
	See "Base Spreading Factor" on page 73

[SENSe:]CDPower:SLOT \<numeric value\>

This command selects the slot/Power Control Group (PCG) to be analyzed.

Parameters:

\<numeric value\>	Range:	0 to TDS: 62; CDMA: (capture length-1); WCDMA. 14
	Increment:	1
	*RST:	0
	The capture length is defined via the `[SENSe:]CDPower: IQLength` on page 245 command.	

Example:	`CDP:SLOT 7`
	Selects slot number 7 for analysis.

Mode:	CDMA, EVDO, TDS, WCDMA

Manual operation:	See "Power Control Group" on page 75
	See "Select" on page 79

[SENSe:]CDPower:TPMeas \<State\>

This command actives or deactivates the timing and phase offset evaluation of the channels to the pilot.

The results are queried using the `TRACe<n>[:DATA]?` on page 292 command and the `CALCulate<1…4>:MARKer<1…4>:FUNCtion:CDPower[:BTS]:RESult?` command.

Parameters:

\<State\>	ON | OFF
	*RST: OFF

Example:	CDP:TPM ON

Example: CDP:TPM ON
Activates timing and phase offset.
CDP:SLOT 2
Selects power control group 2.
CDP:CODE 11
Selects code number 11.
CALC:MARK:FUNC:CDP:RES? TOFF
Reads out timing offset of the code with number 11 in PCG 2.
CALC:MARK:FUNC:CDP:RES? POFF
Reads out the phase offset of the code with number 11 in PCG 2.

Mode: CDMA

Manual operation: See "Time/Phase Estimation" on page 77
See "Normalize" on page 77

7.6.2 Other SENSe Commands Referenced in this Manual

7.6.2.1 SENSe:ADJust Subsystem

[SENSe:]ADJust:ALL

This command determines the ideal frequency and level configuration for the current measurement.

Example: ADJ:ALL

Manual operation: See "Auto All" on page 91

[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer <Threshold>

This command defines a lower threshold the signal must drop below before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see [SENSe:]ADJust:LEVel).

Parameters:
<Threshold>   Range: 0 to 200
     *RST: +1 dB
     Default unit: dB

Example:	SENS:ADJ:CONF:HYST:LOW 2
Example:	For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level falls below 18 dBm.
Manual operation:	See "Lower Level Hysteresis" on page 93

[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer <Threshold>

This command defines an upper threshold the signal must exceed before the reference level is automatically adjusted when the "Auto Level" function is performed.

For more information see [SENSe:]ADJust:LEVel).

Parameters:

<Threshold>	Range:	0 to 200
	*RST:	+1 dB
	Default unit: dB	

Example:	SENS:ADJ:CONF:HYST:UPP 2
	For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level rises above 22 dBm.
Manual operation:	See "Upper Level Hysteresis" on page 92

[SENSe:]ADJust:CONFigure:LEVel:DURation <Duration>

This command defines the duration of the level measurement used to determine the optimal reference level automatically (for SENS:ADJ:LEV ON).

Parameters:

<Duration>	<numeric value> in seconds	
	Range:	0.001 to 16000.0
	*RST:	0.001
	Default unit: s	

Example:	ADJ:CONF:LEV:DUR:5
Manual operation:	See "Meas Time Manual" on page 92

[SENSe:]ADJust:CONFigure:LEVel:DURation:MODE <Mode>

This command selects the way the R&S FSV determines the length of the measurement that is performed while determining the ideal reference level.

Parameters:

<Mode>	**AUTO**
	Automatically determines the measurement length.
	MANual
	Manual definition of the measurement length.
	*RST: AUTO

Example: `ADJ:CONF:LEV:DUR:MODE MAN`

Specifies manual definition of the measurement duration.

`ADJ:CONF:LEV:DUR:5`

Specifies the duration manually.

[SENSe:]ADJust:FREQuency

This command defines the center frequency and the reference level automatically by determining the highest level in the frequency span.

Example: `ADJ:FREQ`

Manual operation: See "Auto Freq" on page 92

[SENSe:]ADJust:LEVel

This command automatically sets the optimal reference level for the current measurement.

You can define a threshold that the signal must exceed before the reference level is adjusted, see `[SENSe:]ADJust:CONFiguration:HYSTeresis:UPPer` and `[SENSe:]ADJust:CONFiguration:HYSTeresis:LOWer`.

Example: `ADJ:LEV`

Manual operation: See "Adjust Ref Lvl" on page 63
                         See "Auto Level" on page 92

7.6.2.2 SENSe:ESPectrum Subsystem

The `SENSe:ESPectrum` subsystem contains the remote commands to configure Spectrum Emission Mask (SEM) measurements.

> The sweep list cannot be configured using remote commands during an on-going sweep operation.

[SENSe:]ESPectrum:BWID <Bandwidth>

This command defines the bandwidth used for measuring the channel power (reference range). This setting takes only effect if channel power is selected as power reference type (see [SENSe:]ESPectrum:RTYPe on page 266).

Parameters:

<Bandwidth>	minimum span ≤ value ≤ span of reference range
	*RST: 3.84 MHz

Example: `ESP:RTYP CPOW`
Sets the power reference type to channel power.
`ESP:BWID 1 MHZ`
Sets the Tx bandwidth to 1 MHz.

Manual operation: See "Edit Reference Range" on page 115

[SENSe:]ESPectrum:FILTer[:RRC][:STATe] <State>

This command activates or deactivates the use of an RRC filter. This setting only takes effect if channel power is selected as power reference type (see [SENSe:]ESPectrum:RTYPe on page 266).

Parameters:

<State>	ON	OFF
	*RST: ON

Example: `ESP:RTYP CPOW`
Sets the power reference type to channel power.
`ESP:FILT OFF`
Deactivates the use of an RRC filter.

Manual operation: See "Edit Reference Range" on page 115

[SENSe:]ESPectrum:FILTer[:RRC]:ALPHa <Value>

This command sets the alpha value of the RRC filter. This setting takes only effect if channel power is selected as power reference type (`[SENSe:]ESPectrum:RTYPe` command) and if the RRC filter is activated (`[SENSe:]ESPectrum:FILTer[:RRC][:STATe]` command).

Parameters:

<Value>　　　　　　　0 to 1

　　　　　　　　　　*RST:　　　0.22

Example:　　　　　`ESP:RTYP CPOW`

　　　　　　　　　　Sets the power reference type to channel power.

　　　　　　　　　　`ESP:FILT ON`

　　　　　　　　　　Activates the use of an RRC filter.

　　　　　　　　　　`ESP:FILT:ALPH 0.5`

　　　　　　　　　　Sets the alpha value of the RRC filter to 0.5.

Manual operation:　　　See "Edit Reference Range" on page 115

[SENSe:]ESPectrum:HighSPeed <State>

This command activates Fast SEM mode to accelerate spurious emission mask measurements. For details see chapter 6.4.12, "Fast Spectrum Emission Mask Measurements", on page 172.

Note that in Fast SEM mode, the following parameters cannot be changed in all ranges:

- Filter type, see `[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE` on page 259

- RBW, see `[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution]` on page 257

- VBW, see `[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo` on page 258

- Sweep Time Mode, see `[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO` on page 265

- Sweep Time, see `[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME` on page 264

- Reference level, see `[SENSe:]ESPectrum:RANGe<range>:RLEVel` on page 264

- RF Att Mode, see `[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO` on page 261

- Rf Attenuation, see `[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation` on page 260

- Preamp, see `[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe` on page 261

Parameters:

<State> ON | OFF

*RST: OFF

Example: ESP:HSP ON

Manual operation: See "Fast SEM" on page 111

[SENSe:]ESPectrum:PRESet[:STANdard]

This command selects the specified XML file under `C:\r_s\instr\sem_std`. If the file is stored in a subdirectory, include the relative path.

Example: ESP:PRES 'WCDMA\3GPP\DL\PowerClass_31_39.xml'

Selects the `PowerClass_31_39.xml` XML file in the `C:\R_S\instr\sem_std\WCDMA\3GPP\DL` directory.

ESP:PRES?

W-CDMA 3GPP DL (31,39)dBm

The query returns information about the selected standard, the link direction and the power class. If no standard has been selected, the query returns None.

Manual operation: See "Load Standard" on page 120

[SENSe:]ESPectrum:PRESet:RESTore

This command copies the XML files from the `C:\R_S\instr\sem_backup` folder to the `C:\R_S\instr\sem_std` folder. Files of the same name are overwritten.

Example: ESP:PRES:REST

Restores the originally provided XML files.

Manual operation: See "Restore Standard Files" on page 120

[SENSe:]ESPectrum:PRESet:STORe <FileName>

This command stores the current settings as presettings in the specified XML file under `C:\r_s\instr\sem_backup`.

Parameters:
<FileName>

Example: ESP:PRES:STOR
'WCDMA\3GPP\DL\PowerClass_31_39.xml'

Stores the settins in the `PowerClass_31_39.xml` file in the `C:\R_S\instr\sem_std\WCDMA\3GPP\DL` directory.

Manual operation: See "Save As Standard" on page 120

[SENSe:]ESPectrum:RANGe<range>:BANDwidth[:RESolution] <Value>

This command sets the RBW value for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 256).

Suffix:

<range>	1...20
	range

Parameters:

<Value>	Refer to the data sheet.
	*RST: 30.0 kHz

Example:	`ESP:RANG2:BAND:RES 5000`
	Sets the RBW for range 2 to 5 kHz.

Manual operation:	See "RBW" on page 112

[SENSe:]ESPectrum:RANGe<range>:BANDwidth:VIDeo <Value>

This command sets the VBW value for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 256).

Suffix:

<range>	1...20
	range

Parameters:

<Value>	Refer to the data sheet.
	*RST: 10.0 MHz

Example:	`ESP:RANG1:BAND:VID 5000000`
	Sets the VBW for range 1 to 5 MHz.

Manual operation:	See "VBW" on page 112

[SENSe:]ESPectrum:RANGe<range>:COUNt

This command returns the number of defined ranges.

Suffix:

<range>	1...20
	range

Example:	`ESP:RANG:COUNt?`
	Returns the number of defined ranges.

[SENSe:]ESPectrum:RANGe<range>:DELete

This command deletes the specified range. The range numbers are updated accordingly. The reference range cannot be deleted. A minimum of three ranges is mandatory.

Suffix:

<range>	1...20
	range

Example:	`ESP:RANG4:DEL`
	Deletes range 4.

Manual operation:	See "Delete Range" on page 114

[SENSe:]ESPectrum:RANGe<range>:FILTer:TYPE <Type>

This command sets the filter type for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 256).

Suffix:

<range>	1...20
	range

Parameters:

<Type>	**NORMal**
	Gaussian filters
	CFILter
	channel filters
	RRC
	RRC filters
	PULSe
	EMI (6dB) filters
	P5
	5 Pole filters
	*RST: NORM
	The available bandwidths of the filters are specified in the data sheet.

Example:	`ESP:RANG1:FILT:TYPE RRC`
	Sets the RRC filter type for range 1.

Manual operation:	See "Filter Type" on page 112

[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt <Frequency>

This command sets the start frequency for the specified range.

In order to change the start/stop frequency of the first/last range, select the appropriate span. If you set a span that is smaller than the overall span of the ranges, the measurement includes only the ranges that lie within the defined span and have a minimum span of 20 Hz. The first and last range are adapted to the given span as long as the minimum span of 20 Hz is not violated.

Note the rules for the <Frequency> parameter specified in chapter 6.4.11, "Ranges and Range Settings", on page 171.

Suffix:

<range>   1...20
                        range

Parameters:

<Frequency>   numeric value

                        *RST: -250.0 MHz (range 1), -2.52 MHz (range 2), 2.52 MHz (range 3)

Example: ESP:RANG1:STAR 100000000
                        Sets the start frequency for range 1 to 100 MHz.

Manual operation: See "Range Start / Range Stop" on page 111

[SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STOP <Frequency>

This command sets the stop frequency for the specified range. For further details refer to the [SENSe:]ESPectrum:RANGe<range>[:FREQuency]:STARt command.

Note the rules for the <Frequency> parameter specified in chapter 6.4.11, "Ranges and Range Settings", on page 171.

Suffix:

<range>   1...20
                        range

Parameters:

<Frequency>   numeric value

                        *RST: -2.52 MHz (range 1), 2.52 MHz (range 2), 250.0 MHz (range 3)

Example: ESP:RANG3:STOP 10000000
                        Sets the stop frequency for range 2 to 10 MHz.

Manual operation: See "Range Start / Range Stop" on page 111

[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation <Value>

This command sets the attenuation for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see [SENSe:]ESPectrum:HighSPeed on page 256).

Suffix:

<range>   1...20
                        range

Parameters:

<Value>   Refer to the data sheet.

                        *RST: 0 dB

Example: ESP:RANG3:INP:ATT 10
                        Sets the attenuation of range 3 to 10 dB.

Manual operation: See "RF Attenuator" on page 112

[SENSe:]ESPectrum:RANGe<range>:INPut:ATTenuation:AUTO <State>

This command activates or deactivates the automatic RF attenuation setting for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 256).

Suffix:

<range>   1...20
                           range

Parameters:

<State>   ON | OFF

                           *RST: ON

Example: `ESP:RANG2:INP:ATT:AUTO OFF`
                           Deactivates the RF attenuation auto mode for range 2.

Manual operation: See "RF Att. Mode" on page 112

[SENSe:]ESPectrum:RANGe<range>:INPut:GAIN:STATe <State>

This command switches the preamplifier on or off for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 256).

Suffix:

<range>   1...20
                           range

Parameters:

<State>   ON | OFF

                           *RST: OFF

Example: `ESP:RANG3:INP:GAIN:STATe ON`
                           Switches the preamplifier for range 3 on or off.

Manual operation: See "Preamp" on page 113

[SENSe:]ESPectrum:RANGe<range>:INSert <Mode>

This command inserts a new range before or after the specified range. The range numbers are updated accordingly.

Suffix:

<range>   1...20
                           range

Parameters:

<Mode>   AFTer | BEFore

Example:	`ESP:RANG3:INS BEF`
	Inserts a new range before range 3.
	`ESP:RANG1:INS AFT`
	Inserts a new range after range 1.
Manual operation:	See "Insert before Range" on page 114
	See "Insert after Range" on page 114

[SENSe:]ESPectrum:RANGe\<range>:LIMit\<source>:ABSolute:STARt \<Level>

This command sets an absolute limit value at the start frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

Suffix:

\<range>	1...20
	range

Parameters:

\<Level>	-400 to in 400 dBm
	*RST: 13 dBm

Example:	`ESP:RANG1:LIM:ABS:STAR 10`
	Sets an absolute limit of 10 dBm at the start frequency of the range.
Manual operation:	See "Abs Limit Start" on page 113

[SENSe:]ESPectrum:RANGe\<range>:LIMit\<source>:ABSolute:STOP \<Level>

This command sets an absolute limit value at the stop frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

Suffix:

\<range>	1...20
	range

Parameters:

\<Level>	-400 to in 400 dBm
	*RST: 13 dBm

Example:	`ESP:RANG1:LIM:ABS:STOP 20`
	Sets an absolute limit of 20 dBm at the stop frequency of the range.
Manual operation:	See "Abs Limit Stop" on page 113

[SENSe:]ESPectrum:RANGe\<range\>:LIMit\<source\>:RELative:STARt \<Limit\>

This command sets a relative limit value at the start frequency of the specified range. Different from manual operation, this setting is independent of the defined limit check type.

Suffix:

\<range\>   1...20
                        range

Parameters:

\<Limit\>   -400 to in 400 dBc

                        *RST: -50 dBc

Example: `ESP:RANG3:LIM:REL:STAR -20`
                        Sets a relative limit of -20 dBc at the start frequency of the range.

Manual operation: See "Rel Limit Start" on page 114

[SENSe:]ESPectrum:RANGe\<range\>:LIMit\<source\>:RELative:STOP \<Limit\>

This command sets a relative limit value at the stop frequency of the specified range. Different from manual operation, this setting is independently of the defined limit check type.

Suffix:

\<range\>   1...20
                        range

Parameters:

\<Limit\>   -400 to in 400 dBc

                        *RST: -50 dBc

Example: `ESP:RANG3:LIM:REL:STOP 20`
                        Sets a relative limit of 20 dBc at the stop frequency of the range.

Manual operation: See "Rel Limit Stop" on page 114

[SENSe:]ESPectrum:RANGe\<range\>:LIMit\<source\>:STATe \<State\>

This command sets the type of limit check for all ranges.

Suffix:

\<range\>   irrelevant

Parameters:

<State>   ABSolute | RELative | AND | OR

                           ABSolute
                           Checks only the absolute limits defined.

                           RELative
                           Checks only the relative limits. Relative limits are defined as rel-
                           ative to the measured power in the reference range.

                           AND
                           Combines the absolute and relative limit. The limit check fails
                           when both limits are violated.

                           OR
                           Combines the absolute and relative limit. The limit check fails
                           when one of the limits is violated.

                           *RST: REL

Example: ESP:RANG3:LIM:STAT AND
                           Sets for all ranges the combined absolute/relative limit check.

Manual operation: See "Limit Check 1-4" on page 113

[SENSe:]ESPectrum:RANGe<range>:RLEVel <Value>

This command sets the reference level for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated
(see [SENSe:]ESPectrum:HighSPeed on page 256).

Suffix:

<range>   1...20
                           range

Parameters:

<Value>   Refer to the data sheet.
                           *RST: -20 dBm

Example: ESP:RANG2:RLEV 0
                           Sets the reference level of range 2 to 0 dBm.

Manual operation: See "Ref. Level" on page 112

[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME <SweepTime>

This command sets the sweep time for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated
(see [SENSe:]ESPectrum:HighSPeed on page 256).

Suffix:

<range>   1...20
                           range

Parameters:

<SweepTime>	Allowed values depend on the ratio of span to RBW and RBW to VBW. For details refer to the data sheet.
	*RST:　　　0.27 s
Example:	`ESP:RANG1:SWE:TIME 1`
	Sets the sweep time for range 1 to 1 s.
Manual operation:	See "Sweep Time" on page 112

[SENSe:]ESPectrum:RANGe<range>:SWEep:TIME:AUTO <State>

This command activates or deactivates the automatic sweep time setting for the specified range.

Note that this parameter can not be set for all ranges if "Fast SEM" mode is activated (see `[SENSe:]ESPectrum:HighSPeed` on page 256).

Suffix:

<range>	1...20
	range

Parameters:

<State>	ON | OFF
	*RST:　　　ON
Example:	`ESP:RANG3:SWE:TIME:AUTO OFF`
	Deactivates the sweep time auto mode for range 3.
Manual operation:	See "Sweep Time Mode" on page 112

[SENSe:]ESPectrum:RANGe<range>:TRANsducer <TransducerName>

This command sets a transducer for the specified range. You can only choose a transducer that fulfills the following conditions:

- The transducer overlaps or equals the span of the range.
- The x-axis is linear.
- The unit is dB.

Suffix:

<range>	1...20
	range

Parameters:

<TransducerName>	'string' = name of the transducer
Example:	`ESP:RANG1:TRAN 'test'`
	Sets the transducer called test for range 1.
Manual operation:	See "Transd. Factor" on page 113

[SENSe:]ESPectrum:RRANge

This command returns the current position (number) of the reference range.

Example: ESP:RRAN?
                     Returns the current position (number) of the reference range.

[SENSe:]ESPectrum:RTYPe <Type>

This command sets the power reference type.

Parameters:

<Type>   PEAK | CPOWer

                     PEAK
                     Measures the highest peak within the reference range.

                     CPOWer
                     Measures the channel power within the reference range (integral bandwidth method).

                     *RST: CPOWer

Example: ESP:RTYP PEAK
                     Sets the peak power reference type.

Manual operation: See "Edit Reference Range" on page 115

7.6.2.3 SENSe:BANDwidth subsystem

[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 159.

Parameters:

<Bandwidth>   refer to data sheet

                     *RST: (AUTO is set to ON)

Example: BAND 1 MHz
                     Sets the resolution bandwidth to 1 MHz

| **Manual operation:** | See "Res BW" on page 121 |
| | See "Res BW Manual" on page 138 |

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command couples and decouples the resolution bandwidth to the span.

The automatic coupling adapts the resolution bandwidth to the current frequency span according to the relationship between frequency span and resolution bandwidth.

The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

Use `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` to define the ratio RBW/span.

Parameters:

| <State> | ON | OFF |
| | *RST: ON |

| **Example:** | `BAND:AUTO OFF` |
| | Switches off the coupling of the resolution bandwidth to the span. |

Manual operation:	See "Res BW Manual" on page 138
	See "Res BW Auto" on page 138
	See "Default Coupling" on page 143

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>

This command defines the filter mode of FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

This command is only available for sweep type "FFT".

Parameters:

<FilterMode>	**AUTO**
	The firmware determines whether to use wide or narrow filters to obtain the best measurement results.
	NARRow
	The FFT filters with the smaller partial span are used. This allows you to perform measurements near a carrier with a reduced reference level due to a narrower analog prefilter.
	*RST: AUTO

| **Example:** | `BAND:TYPE FFT` |
| | Select FFT filter. |

| **Example:** | `BAND:FFT NARR` |
| | Select narrow partial span for FFT filter. |

| **Manual operation:** | See "Auto" on page 141 |
| | See "Narrow" on page 141 |

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio between the resolution bandwidth (Hz) and the span (Hz).

Note that the ratio defined with the remote command (RBW/span) is reciprocal to that of the manual operation (span/RBW).

Parameters:

<Ratio>	Range:	0.0001 to 1
	*RST:	0.01

Example: `BAND:RAT 0.01`

Manual operation: See "Span/RBW Manual" on page 142

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command selects the type of resolution filter.

For detailed information on filters see chapter 6.4.5, "Selecting the Appropriate Filter Type", on page 159 and chapter 6.4.6, "List of Available RRC and Channel Filters", on page 160.

When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.

5 Pole filters are not available when using the sweep type "FFT".

Parameters:

<FilterType> **NORMal**
Gaussian filters

CFILter
channel filters

RRC
RRC filters

P5
5 Pole filters

*RST: NORMal

Example: `BAND:TYPE NORM`

Manual operation: See "Filter Type" on page 143

[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>

This command defines the video bandwidth. The available video bandwidths are specified in the data sheet.

Parameters:

<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND:VID 10 kHz`

Manual operation: See "Video BW Manual" on page 138

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>

This command couples and decouples the VBW to the RBW.

Use [SENSe:]BANDwidth|BWIDth:VIDeo:RATio to define the ratio VBW/RBW.

Parameters:

<State>	ON	OFF
	*RST: ON

Example: BAND:VID:AUTO OFF

Manual operation: See "Video BW Manual" on page 138
See "Video BW Auto" on page 139
See "Default Coupling" on page 143

[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>

This command defines the ratio between video bandwidth (Hz) and resolution bandwidth (Hz).

Note that the ratio defined with the remote command (VBW/RBW) is reciprocal to that of the manual operation (RBW/VBW).

Parameters:

<Ratio>	Range:	0.01 to 1000
	*RST:	3

Example: BAND:VID:RAT 3
Sets the coupling of video bandwidth to video bandwidth = 3*resolution bandwidth

Manual operation: See "RBW/VBW Sine [1/1]" on page 141
See "RBW/VBW Pulse [.1]" on page 142
See "RBW/VBW Noise [10]" on page 142
See "RBW/VBW Manual" on page 142
See "Span/RBW Auto [100]" on page 142

[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>

This command selects the position of the video filter in the signal path.

Changing the video filter position is possible only if the resolution bandwidth is ≤100 kHz.

Parameters:

<Mode>	**LINear**
	The video filter is applied in front of the logarithmic amplifier. In linear mode, measurements with a logarithmic level scale result in flatter falling edges compared to logarithmic mode. The reason is the conversion of linear power values into logarithmic level values: if you halve the linear power, the logarithmic level decreases by 3 dB.
	LOGarithmic
	The video filter is applied after the logarithmic amplifier.
	*RST: LINear
Example:	BAND:VID:TYPE LIN
	Video filter ahead of the logarithmic amplifier

7.6.2.4 SENSe:FREQuency subsystem

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency (frequency domain) or measuring frequency (time domain).

Parameters:

<Frequency>	Range: 0 to fmax
	*RST: fmax/2
	Default unit: Hz
	f_{max} is specified in the data sheet. min span is 10 Hz
Example:	FREQ:CENT 100 MHz
Manual operation:	See "Center" on page 62

[SENSe:]FREQuency:CENTer:STEP <StepSize>

This command defines the center frequency step size.

Parameters:

<StepSize>	Range: 1 to fmax
	*RST: 0.1 x <span value>
	Default unit: Hz

Example:	FREQ:CENT:STEP 120 MHz
Manual operation:	See "CF Stepsize" on page 80
	See "Manual" on page 129

[SENSe:]FREQuency:CENTer:STEP:AUTO <State>

This command couples the step size of the center frequency to the span (ON) or sets the value of the center frequency entered via [SENSe:]FREQuency:CENTer (OFF).

Parameters:

<State>	ON | OFF	
	*RST:	ON

Example:	FREQ:CENT:STEP:AUTO ON
	Activates the coupling of the step size to the span.

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples and decouples the center frequency step size to the span or the resolution bandwidth.

Parameters:

<CouplingType>	**SPAN**
	Couples the step size to the span. Available for measurements in the frequency domain.
	RBW
	Couples the step size to the resolution bandwidth. Available for measurements in the time domain.
	OFF
	Decouples the step size (manual input).
	*RST:　　SPAN

Example:	FREQ:CENT:STEP:LINK SPAN
Manual operation:	See "0.1*Span (span > 0)" on page 127
	See "0.1*RBW (span > 0)" on page 128
	See "0.5*Span (span > 0)" on page 128
	See "0.5*RBW (span > 0)" on page 128
	See "x*Span (span > 0)" on page 128
	See "x*RBW (span > 0)" on page 128

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Factor>

This command defines a step size factor if the center frequency step size is coupled to the span or the resolution bandwidth.

Parameters:

<Factor>	Range:　　　1　to　100
	*RST:　　　　10
	Default unit: PCT

Example:	`FREQ:CENT:STEP:LINK:FACT 20PCT`
Manual operation:	See "0.1*Span (span > 0)" on page 127
	See "0.1*RBW (span > 0)" on page 128
	See "0.5*Span (span > 0)" on page 128
	See "0.5*RBW (span > 0)" on page 128

[SENSe:]FREQuency:OFFSet <Offset>

This command defines the frequency offset.

Parameters:

<Offset>	Range:	-100 GHz to 100 GHz
	*RST:	0 Hz
	Default unit: Hz	

Example:	`FREQ:OFFS 1GHZ`
Manual operation:	See "Frequency Offset" on page 62

[SENSe:]FREQuency:SPAN <Span>

This command defines the frequency span.

Parameters:

<Span>	min span to fmax
	*RST: fmax
	f_{max} is specified in the data sheet. min span is 10 Hz

Example:	`FREQ:SPAN 10MHz`
Manual operation:	See "Span Manual" on page 130

[SENSe:]FREQuency:SPAN:FULL

This command sets the frequency span to its maximum.

Example:	`FREQ:SPAN:FULL`
Manual operation:	See "Full Span" on page 130

[SENSe:]FREQuency:STARt <Frequency>

This command defines the start frequency for measurements in the frequency domain.

Parameters:

<Frequency>	0 to (fmax - min span)
	*RST: 0
	f_{max} is specified in the data sheet. min span is 10 Hz

Example:	`FREQ:STAR 20MHz`
Manual operation:	See "Start" on page 129

[SENSe:]FREQuency:STOP <Frequency>

This command defines the stop frequency for measurements in the frequency domain.

Parameters:

<Frequency>   min span to fmax

                        *RST: fmax

                        f_{max} is specified in the data sheet. min span is 10 Hz

Example: FREQ:STOP 2000 MHz

Manual operation: See "Stop" on page 129

7.6.2.5 SENSe:POWer subsystem

[SENSe:]POWer:ACHannel:ACPairs <ChannelPairs>

This command sets the number of adjacent channels (upper and lower channel in pairs).The figure 0 stands for pure channel power measurement.

Parameters:

<ChannelPairs>   0 to 12

                        *RST: 1

Example:	POW:ACH:ACP 3
	Sets the number of adjacent channels to 3, i.e. the adjacent channel and alternate adjacent channels 1 and 2 are switched on.
Manual operation:	See "# of Adj Chan" on page 102

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel<channel>] <Bandwidth>

This command sets the channel bandwidth of the specified TX channel in the radio communication system. The bandwidths of adjacent channels are not influenced by this modification.

With [SENSe<source>:]POWer:HSPeed set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 6.4.6, "List of Available RRC and Channel Filters", on page 160.

Parameters:

<Bandwidth>	100 Hz to 40 GHz
	*RST: 14 kHz
Example:	POW:ACH:BWID:CHAN2 30 kHz
	Sets the bandwidth of the TX channel 2 to 30 kHz.
Manual operation:	See "Bandwidth" on page 103
	See "Channel Bandwidth (span > 0)" on page 121

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <Bandwidth>

This command defines the channel bandwidth of the adjacent channel of the radio transmission system. If the bandwidth of the adjacent channel is changed, the bandwidths of all alternate adjacent channels are automatically set to the same value.

With [SENSe<source>:]POWer:HSPeed set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 6.4.6, "List of Available RRC and Channel Filters", on page 160 .

Parameters:

<Bandwidth>	100 Hz to 40 GHz
	*RST: 14 kHz
Example:	POW:ACH:BWID:ACH 30 kHz
	Sets the bandwidth of all adjacent channels to 30 kHz.
Manual operation:	See "Bandwidth" on page 103

[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<channel>
<Bandwidth>

This command defines the channel bandwidth of the specified alternate adjacent channels of the radio transmission system. If the channel bandwidth of one alternate adjacent channel is changed (e.g. channel 3), the bandwidth of all subsequent alternate adjacent channels (e.g. 4–11) is automatically set to the same value.

With `[SENSe<source>:]POWer:HSPeed` set to ON, steep-edged channel filters are available. For further information on filters refer to chapter 6.4.6, "List of Available RRC and Channel Filters", on page 160 .

Suffix:
<channel>   1...11
                             the alternate adjacent channel

Parameters:
<Bandwidth>   100 Hz to 40 GHz
                             *RST: 14 kHz

Example: POW:ACH:BWID:ALT2 30 kHz

Manual operation: See "Bandwidth" on page 103

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ACHannel <Alpha>

This command defines the roll-off factor for the weighting filter of the adjacent channel.

Parameters:
<Alpha>   <numeric value>
                             *RST: 0,22

Example: POW:ACH:FILT:ALPH:ACH 0,35

Manual operation: See "Weighting Filter" on page 105

[SENSe:]POWer:ACHannel:FILTer:ALPHa:ALTernate<channel> <Alpha>

This command defines the roll-off factor for the weighting filter of the specified alternate channel.

Suffix:
<channel>   1...11
                             the alternate channel

Parameters:
<Alpha>   <numeric value>
                             *RST: 0,22

Example: POW:ACH:FILT:ALPH:ALT3 0,35
                             Sets the alpha value for the weighting filter for the alternate channel 3 to 0,35.

Manual operation: See "Weighting Filter" on page 105

[SENSe:]POWer:ACHannel:FILTer:ALPHa:CHANnel<channel> <Alpha>

This command defines the roll-off factor for the weighting filter of the specified TX channel.

Suffix:

<channel>   1...11
                   the TX channel

Parameters:

<Alpha>   <numeric value>
                   *RST: 0,22

Example: POW:ACH:FILT:ALPH:CHAN3 0,35
                   Sets the alpha value for the weighting filter for the TX channel 3
                   to 0,35.

Manual operation: See "Weighting Filter" on page 105

[SENSe:]POWer:ACHannel:FILTer[:STATe]:ACHannel <State>

This command activates the weighting filter for the adjacent channel.

Parameters:

<State>   ON | OFF
                   *RST: OFF

Example: POW:ACH:FILT:ACH ON

Manual operation: See "Weighting Filter" on page 105

[SENSe:]POWer:ACHannel:FILTer[:STATe]:ALTernate<channel> <State>

This command activates the weighting filter for the specified alternate channel.

Suffix:

<channel>   1...11
                   the alternate adjacent channel

Parameters:

<State>   ON | OFF
                   *RST: OFF

Example: POW:ACH:FILT:ALT3 ON
                   Activates the weighting filter for alternate channel 3.

Manual operation: See "Weighting Filter" on page 105

[SENSe:]POWer:ACHannel:FILTer[:STATe]:CHANnel<channel> <State>

This command activates the weighting filter for the specified TX channel.

Suffix:

<channel>	1...18
	the TX channel

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	`POW:ACH:FILT:CHA3 ON`
	Activates the weighting filter for TX channel 3.

Manual operation:	See "Weighting Filter" on page 105

[SENSe:]POWer:ACHannel:MODE <Mode>

This command switches between absolute and relative adjacent channel measurement. The command is only available with span > 0 and if the number of adjacent channels is greater than 0.

For the relative measurement the reference value is set to the currently measured channel power using the command [SENSe:]POWer:ACHannel:REFerence: AUTO ONCE.

Parameters:

<Mode>	ABSolute | RELative
	ABSolute
	absolute adjacent channel measurement
	RELative
	relative adjacent channel measurement
	*RST: RELative

Example:	`POW:ACH:MODE REL`
	Sets the adjacent channel measurement mode to relative.

Manual operation:	See "ACLR (Abs/Rel)" on page 108

[SENSe:]POWer:ACHannel:NAME:ACHannel <Name>

This command defines a name for the adjacent channel. The name is displayed in the result diagram and the result table.

Parameters:

<Name>	*RST: Adj

Example:	`POW:ACH:NAME:ACH 'XYZ'`
	Defines the name of the adjacent channel as 'XYZ'.

Manual operation:	See "Names" on page 105

[SENSe:]POWer:ACHannel:NAME:ALTernate<channel> <Name>

This command defines a name for the specified alternate channel. The name is displayed in the result diagram and the result table.

Suffix:

<channel>	1...11
	the alternate channel

Parameters:

<Name>	*RST:	ALT<1...11>

Example:	`POW:ACH:NAME:ALT3 'XYZ'`
	Defines the name of the third alternate channel as 'XYZ'.

Manual operation: See "Names" on page 105

[SENSe:]POWer:ACHannel:NAME:CHANnel<channel> <Name>

This command defines a name for the specified TX channel. The name is displayed in the result diagram and the result table.

Suffix:

<channel>	1...12
	the TX channel

Parameters:

<Name>	*RST:	TX<1...12>

Example:	`POW:ACH:NAME:CHAN3 'XYZ'`
	Defines the name of the third transmission channel as 'XYZ'.

Manual operation: See "Names" on page 105

[SENSe:]POWer:ACHannel:PRESet <Setting>

This command adjusts the frequency span, the measurement bandwidths and the detector as required for the number of channels, the channel bandwidths and the channel spacings selected in the active power measurement. If necessary, adjacent-channel power measurement is switched on prior to the adjustment.

To obtain correct results, a complete sweep with synchronization to the end of the sweep must be performed after the adjustment. Synchronization is possible only in the single sweep mode.

The result is queried with the `CALCulate<n>:MARKer<m>:FUNCtion:POWer:RESult?` command.

Parameters:

<Setting>	ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

Example: `POW:ACH:PRES ACP`
                        Sets the frequency span, the measurement bandwidths and the
                        detector as required for the ACLR measurement.
                        `INIT:CONT OFF`
                        Switches over to single sweep mode.
                        `INIT;*WAI`
                        Starts a sweep and waits for the end of the sweep.
                        `CALC:MARK:FUNC:POW:RES? ACP`
                        Queries the result of the adjacent-channel power measurement.

Manual operation: See "Adjust Settings" on page 108

[SENSe:]POWer:ACHannel:PRESet:RLEVel

This command adapts the reference level to the measured channel power and – if
required – switches on previously the adjacent channel power measurement. This
ensures that the signal path of the instrument is not overloaded. Since the measure-
ment bandwidth is significantly smaller than the signal bandwidth in channel power
measurements, the signal path can be overloaded although the trace is still signifi-
cantly below the reference level. If the measured channel power equals the reference
level, the signal path is not overloaded.

Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the
end of the auto range process which would otherwise be aborted.

Example: `POW:ACH:PRES:RLEV;*WAI`
                        Adapts the reference level to the measured channel power.

Manual operation: See "Adjust Ref Lvl" on page 100
                        See "Adjust Ref Lvl (span > 0)" on page 121

[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE

This command sets the reference value to the currently measured channel power for
the relative measurement.

Example: `POW:ACH:REF:AUTO ONCE`

Manual operation: See "Set CP Reference" on page 109

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO <Channel>

This command activates the automatic selection of a transmission channel to be used
as a reference channel in relative adjacent-channel power measurements.

The transmission channel with the highest power, the transmission channel with the
lowest power, or the transmission channel nearest to the adjacent channels can be
defined as a reference channel.

The command is available only for multicarrier channel and adjacent-channel power
measurements with span > 0 (`CALCulate<n>:MARKer<m>:FUNCtion:POWer:`
`SELect` on page 189).

Parameters:

<Channel>   MINimum | MAXimum | LHIGhest

MINimum
Transmission channel with the lowest power

MAXimum
Transmission channel with the highest power

LHIGhest
Lowermost transmission channel for the lower adjacent channels, uppermost transmission channel for the upper adjacent channels

Example: `POW:ACH:REF:TXCH:AUTO MAX`
The transmission channel with the highest power is used as a reference channel.

Manual operation: See "ACLR Reference" on page 104

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual <ChannelNumber>

This command selects a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (`CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect` on page 189).

Parameters:

<ChannelNumber>   1 to 18

          *RST: 1

Example: `POW:ACH:REF:TXCH:MAN 3`
Transmission channel 3 is used as a reference channel.

Manual operation: See "ACLR Reference" on page 104

[SENSe:]POWer:ACHannel:SPACing[:ACHannel] <Spacing>

This command defines the spacing between the carrier signal and the adjacent channel (ADJ). The modification of the adjacent-channel spacing (ADJ) causes a change in all higher adjacent-channel spacings (ALT1, ALT2, ...): they are all multiplied by the same factor (new spacing value/old spacing value).

Parameters:

<Spacing>   100 Hz to 20 GHz

          *RST: 14 kHz

Example: `POW:ACH:SPAC 33kHz`
Sets the spacing between the carrier signal and the adjacent channel to 33 kHz, the alternate adjacent channel 1 to 66 kHz, the alternate adjacent channel 2 to 99 kHz, and so on.

Manual operation: See "Spacing" on page 104

[SENSe:]POWer:ACHannel:SPACing:ALTernate\<channel\> \<Spacing\>

This command defines the spacing between the alternate adjacent channels and the TX channel (ALT1, ALT2, ...). A modification of a higher adjacent-channel spacing causes a change by the same factor (new spacing value/old spacing value) in all higher adjacent-channel spacings, while the lower adjacent-channel spacings remain unchanged.

Suffix:

\<channel\>	1...11
	the alternate adjacent channel

Parameters:

\<Spacing\>	100 Hz to 20 GHz
	*RST: 40 kHz (ALT1), 60 kHz (ALT2), 80 kHz (ALT3), ...

Example: `POW:ACH:SPAC:ALT1 100 kHz`
Sets the spacing between TX channel and alternate adjacent channel 1 (ALT1) from 40 kHz to 100 kHz. In consequence, the spacing between the TX channel and all higher alternate adjacent channels is increased by the factor 100/40 = 2.5: ALT2 = 150 kHz, ALT3 = 200 kHz, ALT4 = 250 kHz.

Manual operation: See "Spacing" on page 104

[SENSe:]POWer:ACHannel:SPACing:CHANnel\<channel\> \<Spacing\>

This command defines the channel spacing for the carrier signals.

Suffix:

\<channel\>	1...11
	the TX channel

Parameters:

\<Spacing\>	14 kHz to 20 GHz
	*RST: 20 kHz

Example: `POW:ACH:SPAC:CHAN 25kHz`

Manual operation: See "Spacing" on page 104

[SENSe:]POWer:ACHannel:TXCHannel:COUNt \<Number\>

This command selects the number of carrier signals.

The command is available only for multicarrier channel and adjacent-channel power measurements with span > 0 (see `CALCulate<n>:MARKer<m>:FUNCtion:POWer:SELect` on page 189).

Parameters:

\<Number\>	1 to 18
	*RST: 1

Example: `POW:ACH:TXCH:COUN 3`

Manual operation: See "# of TX Chan" on page 102

[SENSe:]POWer:BANDwidth|BWIDth <Percentage>

This command defines the percentage of the power with respect to the total power.

This value is the basis for the occupied bandwidth measurement (see `[SENSe:]POWer:ACHannel:PRESet` on page 278).

Parameters:
<Percentage>   10 to 99.9PCT

                        *RST: 99PCT

Example: `POW:BWID 95PCT`

Manual operation: See "% Power Bandwidth (span > 0)" on page 120

[SENSe:]POWer:HSPeed <State>

This command switches on or off the high-speed channel/adjacent channel power measurement. The measurement itself is performed in zero span on the center frequencies of the individual channels. The command automatically switches to zero span and back.

Depending on the selected mobile radio standard, weighting filters with characteristic or very steep-sided channel filters are used for band limitation.

Parameters:
<State>   ON | OFF

                *RST: OFF

Example: `POW:HSP ON`

Manual operation: See "Fast ACLR (On/Off)" on page 109

[SENSe:]POWer:NCORrection <Mode>

This command turns noise cancellation on and off.

If noise cancellation is on, the R&S FSV performs a reference measurement to determine its inherent noise and subtracts the result from the channel power measurement result (first active trace only).

The inherent noise of the instrument depends on the selected center frequency, resolution bandwidth and level setting. Therefore, the correction function is disabled whenever one of these parameters is changed. A corresponding message is displayed on the screen. Noise correction must be turned on again manually after the change.

Parameters:

<Mode>	**ON**
	Performs noise correction.
	OFF
	Performs no noise correction.
	AUTO
	Performs noise correction.
	After a parameter change, noise correction is restarted automatically and a new correction measurement is performed.
	*RST: OFF

Example:	POW:NCOR ON

Manual operation:	See "Noise Correction" on page 110

[SENSe:]POWer:TRACe <TraceNumber>

This command assigns the channel/adjacent channel power measurement to the indicated trace. The corresponding trace must be active, i.e. its state must be different from blank.

Note: The measurement of the occupied bandwidth (OBW) is performed on the trace on which marker 1 is positioned. To evaluate another trace, marker 1 must be positioned to another trace with `CALCulate<n>:MARKer<m>:TRACe`.

Parameters:

<TraceNumber>	1 to 6

Example:	POW:TRAC 2
	Assigns the measurement to trace 2.

Manual operation:	See "Select Trace" on page 108

7.6.2.6   SENSe:SWEep subsystem

[SENSe:]SWEep:COUNt <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameters:

<NumberSweeps>	0 to 32767
	*RST: 0 (GSM: 200, PHN:1)

Example:	`SWE:COUN 64`
	Sets the number of sweeps to 64.
	`INIT:CONT OFF`
	Switches to single sweep mode.
	`INIT;*WAI`
	Starts a sweep and waits for its end.

Manual operation:	See "Sweep Count" on page 84

[SENSe:]SWEep:EGATe <State>

This command switches on/off the sweep control by an external gate signal. If the external gate is selected the trigger source is automatically switched to EXTernal as well.

In case of measurement with external gate, the measured values are recorded as long as the gate is opened. During a sweep the gate can be opened and closed several times. The synchronization mechanisms with *OPC, *OPC? and *WAI remain completely unaffected.

The sweep end is detected when the required number of measurement points (691 in "Spectrum" mode) has been recorded.

Parameters:

<State>	ON	OFF
	*RST: OFF

Example:	`SWE:EGAT ON`
	Switches on the external gate mode.
	`SWE:EGAT:TYPE EDGE`
	Switches on the edge-triggered mode.
	`SWE:EGAT:HOLD 100US`
	Sets the gate delay to 100 µs.
	`SWE:EGAT:LEN 500US`
	Sets the gate opening time to 500 µs.
	`INIT;*WAI`
	Starts a sweep and waits for its end.

Manual operation:	See "Gated Trigger (On/Off)" on page 125
	See "Gate Ranges" on page 125

[SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

This command defines the delay time between the external gate signal and the continuation of the sweep.

Note: Using gate mode "level" (see `[SENSe:]SWEep:EGATe:TYPE` on page 287) and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 309), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

Parameters:

<DelayTime>   0 s to 30 s

*RST: 0s

Example: SWE:EGAT:HOLD 100us

[SENSe:]SWEep:EGATe:LENGth <TimeInterval>

This command defines a gate length.

Parameters:

<TimeInterval>   125 ns to 30 s

*RST: 400µs

Example: SWE:EGAT:LENG 10ms

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:

<Polarity>   POSitive | NEGative

*RST: POSitive

Example: SWE:EGAT:POL POS

Manual operation: See "Trigger Polarity" on page 64

[SENSe:]SWEep:EGATe:SOURce <Source>

This command selects the signal source for gated measurements.

If an IF power signal is used, the gate is opened as soon as a signal at > -20 dBm is detected within the IF path bandwidth (10 MHz).

Parameters:

<Source>   EXTernal | IFPower | VIDeo | RFPower | PSEN

*RST: IFPower

Example: SWE:EGAT:SOUR IFP
Switches the gate source to IF power.

Manual operation: See "Gated Trigger (On/Off)" on page 125

[SENSe:]SWEep:EGATe:TRACe<k>:COMMent <Comment>

Defines a comment for one of the traces for gated triggering.

Suffix:
<k>   1...6
                         trace

Parameters:
<Comment>

Example: SWE:EGAT:TRAC1:COMM "SlotA"

Manual operation: See "Gate Ranges" on page 125

[SENSe:]SWEep:EGATe:TRACe<k>: PERiod <Value>

This command defines the length of the period to be traced using gated triggering.

Suffix:
<k>   1...6
                         trace

Parameters:
<Value>   <numeric value>
                         *RST: 0 s

Example: SWE:EGAT:TRAC1:PER 5ms
                         Defines the period for gated triggering to 5 ms.

Manual operation: See "Gate Ranges" on page 125

[SENSe:]SWEep:EGATe:TRACe<k>:STARt<range> <Value>

This command defines the starting point for the range to be traced using gated triggering.

Suffix:
<k>   1...6
                         trace

<range>   1...3
                         range

Parameters:
<Value>   <numeric value>
                         *RST: OFF

Example: SWE:EGAT:TRAC1:STAR1 3ms
                         Sets the Starting point for range 1 on trace 1 at 3 ms.

Manual operation: See "Gate Ranges" on page 125

[SENSe:]SWEep:EGATe:TRACe<k>[:STATe<range>] <State>

This command activates or deactivates tracing for a specific range using gated triggering.

Suffix:

<k>	1...6
	trace
<range>	1...3
	range

Parameters:

<State>	ON | OFF
	*RST: OFF

Example: `SWE:EGAT:TRAC1:STAT1 ON`
Activates tracing for range 1 of trace 1.

Manual operation: See "Gate Ranges" on page 125

[SENSe:]SWEep:EGATe:TYPE <Type>

This command sets the type of triggering by the external gate signal.

A delay between applying the gate signal and the start of recording measured values can be defined, see `[SENSe:]SWEep:EGATe:HOLDoff` on page 285.

Parameters:

<Type>   LEVel | EDGE

LEVel
The gate is level-triggered:
After detection of the gate signal, the gate remains open until the gate signal disappears. The gate opening time cannot be defined with the command `[SENSe:]SWEep:EGATe:HOLDoff`.
Note: Using gating with gate mode "level" and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 309), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

EDGE
The gate is edge-triggered:
After detection of the set gate signal edge, the gate remains open until the gate delay (`[SENSe:]SWEep:EGATe:HOLDoff`) has expired.
*RST: EDGE

Example: `SWE:EGAT:TYPE EDGE`

[SENSe:]SWEep:EGATe:TRACe<k>: STOP<range> <Value>

This command defines the stopping point for the range to be traced using gated triggering

Suffix:

\<k>	1...6
	trace
\<range>	1...3
	range

Parameters:

\<Value>	\<numeric value>
	*RST:　　1 µs

Example:	SWE:EGAT:TRAC1:STOP1 5ms
	Sets the stopping point for range 1 on trace 1 at 5 ms.
Manual operation:	See "Gate Ranges" on page 125

[SENSe:]SWEep:POINts \<NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

Parameters:

\<NumberPoints>	Range:	101 to 32001
	*RST:	691

Example:	SWE:POIN 251
Manual operation:	See "Sweep Points" on page 147

[SENSe:]SWEep:TIME \<Time>

This command defines the sweep time.

The range depends on the frequency span.

Parameters:

\<Time>	refer to data sheet
	*RST:　　　(automatic)

Example:	SWE:TIME 10s
Manual operation:	See "Sweep Time" on page 108
	See "Sweeptime Manual" on page 130

[SENSe:]SWEep:TIME:AUTO \<State>

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If [SENSe:]SWEep:TIME is used, automatic coupling is switched off.

Parameters:

<State>	ON | OFF
	*RST: ON

Example: `SWE:TIME:AUTO ON`
Activates automatic sweep time.

Manual operation: See "Sweeptime Manual" on page 130
See "Sweeptime Auto" on page 140
See "Default Coupling" on page 143

[SENSe:]SWEep:TYPE <Type>

This command selects the sweep type.

Parameters:

<Type>   **SWE**
Selects analog frequency sweeps.

AUTO
Automatically selects the sweep type (FFT or analog frequency sweep).

FFT
Selects FFT sweeps.

*RST: AUTO

Example: `SWE:TYPE FFT`
Selects FFT sweeps.

Manual operation: See "Sweep" on page 140
See "FFT" on page 140
See "Auto" on page 141

7.6.2.7 Other Commands in the SENSe Subsystem

[SENSe:]AVERage<n>:COUNt <NoMeasurements>

This command defines the number of measurements which contribute to the average value.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the `[SENSe<source>:]SWEep:COUNt` command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

Suffix:

<n>   Selects the measurement window.

Parameters:

<NoMeasurements>   0 to 32767

                             *RST: 0

Example: SWE:CONT OFF
                             Switching to single sweep mode.
                             AVER:COUN 16
                             Sets the number of measurements to 16.
                             AVER:STAT ON
                             Switches on the calculation of average.
                             INIT;*WAI
                             Starts the measurement and waits for the end of the 16 sweeps.

[SENSe:]AVERage<n>[:STATe<Trace>] <State>

This command turns averaging for a particular trace in a particular window on and off.

Suffix:

<n>   Selects the measurement window.

<Trace>   1...6
                             Selects the trace.

Parameters:

<State>   ON | OFF

                             *RST: OFF

Example: AVER OFF
                             Switches off the average calculation for trace 1.
                             AVER:STAT3 ON
                             Switches on the average calculation for trace 3.

7.7 STATus subsystem

STATus:QUEStionable:SYNC:CONDition?

This command reads the information on the error situation in the code domain power analysis.

Return values:

<Result>   If the result is ON, an error occurred. Details can be obtained
                             using STAT:QUES:SYNC:EVEN.

                             *RST: OFF

Example: STAT:QUES:SYNC:COND?

Usage:	Query only
Mode:	WCDMA, CDMA, EVDO

STATus:QUEStionable:SYNC[:EVENt]?

This command reads the information on the error situation in the code domain power analysis. The value can only be read once. The possible events are described in the table below.

Example:	`STAT:QUES:SYNC[:EVEN]?`
Usage:	Query only
Mode:	WCDMA, CDMA, EVDO

Bit	Definition
0	Not used.
1	Frame Sync failed This bit is set when synchronization is not possible within the application. Possible reasons: • Incorrectly set frequency • Incorrectly set level • Incorrectly set scrambling code • Incorrectly set values for Q-INVERT or SIDE BAND INVERT • Invalid signal at input
2	Not used.
3 to 4	Not used.
5	Incorrect Pilot Symbol This bit is set when one or more of the received pilot symbols are not equal to the specified pilot symbols of the 3GPP standard. Possible reasons: • Incorrectly sent pilot symbols in the received frame. • Low signal to noise ratio (SNR) of the WCDMA signal. • One or more code channels has a significantly lower power level compared to the total power. The incorrect pilots are detected in these channels because of low channel SNR. • One or more channels are sent with high power ramping. In slots with low relative power to total power, the pilot symbols might be detected incorrectly (check the signal quality by using the symbol constellation display).
6 to 14	Not used.
15	This bit is always 0.

7.8 TRACe Subsystem

The TRACe subsystem controls access to the instrument's internal trace memory.

TRACe<n>[:DATA]? <ResultType>

This command reads trace data from the R&S FSV.

For details on reading trace data for other than code domain measurements refer to the `TRACe:DATA` command in the base unit description.

Suffix:

<n>	1...4 irrelevant

Query parameters:

<ResultType>	TRACE1 | TRACE2 | TRACE3 | TRACE4 | CTABle
	TRACE1 | TRACE2 | TRACE3 | TRACE4 Reads out the trace data of measurement window 1 to 4.
	CTABle For the Channel Table result display, reads out the maximum values of the timing/phase offset between every assigned channel and the pilot channel (see also `[SENSe:]CDPower:TPMeas` on page 251 command).

Return values:

<Return values>	The measurement results are explained separately for each measurement and illustrated by a short example at the end of this command description. Code Domain Power Code Domain Error Power Channel Table Result Summary Power vs PCG Peak Code Domain Error Composite EVM EVM vs Symbol Channel Constellation Composite Constellation Channel Bitstream

Usage:

	Query only SCPI confirmed

Mode:

	CDMA

Manual operation:

	See "List Evaluation (On/Off)" on page 116

Code Domain Power

The command returns four values for each channel:

<code class>, <code number>, <signal level>, <power ID>, …

Value	Description	Range/Unit
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (4, symbol rate 307.2 ksps), 7 corresponds to the highest spreading factor (128, symbol rate 9.6 ksps)	{2...7}
<code number>	code number of the channel	{0...127}
<signal level>	absolute or relative power, depending on the setting (see Power Reference) Hadamard order: power values for each code BitReverse order: power values for combined channels	{-∞...∞} dB or dBm
<power ID>	power detection 0 - inactive channel, 1 - power of own antenna, 2 - alias power of own antenna, 3 - alias power of other antenna, 4 - alias power of own and other antenna to avoid alias power, set the base spreading factor correctly	

Note: To avoid alias power, set the base spreading factor correctly

The number of displayed data depends on the spreading factor. In addition, the structure of the output differs whether Hadamard or BitReverse code sorting order was selected.

In Hadamard order, the different codes are output in ascending order together with their code power. The number of output codes corresponds to the base spreading factor.

In BitReverse order, codes belonging to a channel are next to one another and are therefore output in the class of the channel together with the consolidated channel power. The maximum number of output codes or channels cannot be higher than the base spreading factor, but decreases with every concentrated channel.

For further information refer to "Base Spreading Factor" on page 70 and "Code Order" on page 76.

Code Domain Error Power

The command returns four values for each channel:

<code class>, <code number>, <error power>, <power ID>, …

Value	Description	Range/Unit
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (4, symbol rate 307.2 ksps), 7 corresponds to the highest spreading factor (128, symbol rate 9.6 ksps)	{2...7}
<code number>	code number of the channel	{0...127}

Value	Description	Range/Unit
<signal level>	error power	{-∞...∞} dB
<power ID>	power detection 0 - inactive channel, 1 - power of own antenna, 2 - alias power of own antenna, 3 - alias power of other antenna, 4 - alias power of own and other antenna	

Note: To avoid alias power, set the base spreading factor correctly

The number of displayed data depends on the spreading factor. In addition, the structure of the output differs whether Hadamard or BitReverse code sorting order was selected.

In Hadamard order, the different codes are output in ascending order.

In BitReverse order, codes belonging to a channel are next to one another. Because an error power is output with the code domain error power, a consolidation of the power values is not sensible.

For further information refer to "Base Spreading Factor" on page 70 and "Code Order" on page 76.

Channel Table

`TRACE1 | TRACE2 | TRACE3 | TRACE4` parameter

The command returns 8 values for each channel in the following order:

<channel type>, <code class>, <code number>, <radio configuration>, <absolute level>, <relative level>, <timing offset>, <phase offset>

Value	Description	Range	Unit
<channel type>	channel type: 0 - PICH, 1 - SYNC, 2 - PCH, 3 - TDPICH, 4 - APICH, 5 - ATD-PICH, 6 - BCH, 7 - CPCCH, 8 - CACH, 9 - CCCH, 10 - CHAN, 11 - INACTIVE, 12 - PDCCH, 13 - PDCH	{2...13}	
<code class>	code class of the channel: 2 corresponds to the lowest spreading factor (=4, symbol rate 307.2 ksps), 7 corresponds to the highest spreading factor (=128, symbol rate 9.6 ksps)	{2...7}	
<radio config>	radio configuration For deactivated Auto Search: 0 - special channels, 1 to 5 - data channels, 10 - QPSK, 20 - 8PSK, 30 - 16QAM For activated Auto Search: 1 - RC 1 and 2, 3 - RCs 3 to 5 and 10 - PDCH		
<absolute level>	absolute power level of the channel	{-∞...∞}	dBm
<relative level>	relative power level of the channel, referred to either Total or Pilot power	{-∞...∞}	dB

Value	Description	Range	Unit
<timing offset>	referred to the pilot channel		s
<phase offset>	referred to the pilot channel		rad

The sorting of the channels is according to these rules:

1. All detected special channels

2. Data channels, in ascending order by code class and within the code class in ascending order by code number.

3. Unassigned codes, with the code class of the base spreading factor

CTABle parameter

The command returns 7 values for each channel in the following order:

<max. time offset in s>, <code number for max. time>, <code class for max. time>, <max. phase offset in rad>, <code number for max. phase>, <code class for max. phase>, <reserved 1>, …, <reserved 6>

Value	Description	Range	Unit
<time offset>	maximum time offset		s
<code number>	code number of the channel with maximum time offset	{0...127}	
<code class>	code class of the channel with maximum time offset	{2...7}	
<phase offset>	maximum phase offset		rad
<code number>	code number of the channel with maximum phase offset	{0...127}	
<code class>	code class of the channel with maximum phase offset	{2...7}	
<reserved 1...6>	reserved		

Result Summary

The command returns 22 values for each channel in the following order:

<SLOT>, <PTOTal>, <PPICh>, <RHO>, <MACCuracy>, <PCDerror>, <ACTive>, <FERRor>, <FERPpm>, <TFRame>, <CERRor>, <IQOFfset>, <IQIMbalance>, <SRATe>, <CHANnel>, <SFACtor>, <TOFFset>, <POFFset>, <CDPRelative>, <CDPabsolute>, <EVMRms>, <EVMPeak>

Value	Description	Range	Unit
<SLOT>	Number of the PCG		
<PTOTal>	Total power	{-∞...∞}	dBm
<PPICh>	Pilot power	{-∞...∞}	dBm
<RHO>	RHO	{0...1}	
<MACCuracy>	Composite EVM		%
<PCDerror>	Peak Code Domain Error		dB

Value	Description	Range	Unit
<ACTive>	Number of active channels		
<FERRor>	Frequency error		Hz
<FERPpm>	Frequency error		ppm
<TFRame>	Trigger to Frame Returns a '9' if the trigger is set to Free Run		
<CERRor>	Chip rate error		ppm
<IQOFfset>	IQ offset		%
<IQIMbalance>	IQ imbalance		%
<SRATe>	Symbol rate		ksps
<CHANnel>	Channel number		
<SFACtor>	Spreading factor of the channel		
<TOFFset>	Timing offset returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50		s
<POFFset>	Phase offset returns a '9' if the timing/phase offset measurement is switched off or the number of active channel exceeds 50		rad
<CDPRelative>	Relative (to total or pilot power) channel power	{-∞…∞}	dBm
<CDPabsolute>	Absolute channel power	{-∞…∞}	dB
<EVMRms>	Error vector magnitude (RMS)		%
<EVMPeak>	Error vector magnitude peak		%

Tip: Read out the modulation type with the command: CALCulate<n>:MARKer<m>: FUNCtion:CDPower[:BTS]:RESult? on page 184

Power vs PCG

The command returns 2 values for each channel in the following order:

<slot number>, <level value in dB>, <slot number>, <level value in dB>, …

The number of displayed value pairs corresponds to the Capture Length.

Peak Code Domain Error

The command returns 2 values for each channel in the following order:

<slot number>, <level value in dB>, <slot number>, <level value in dB>, …

The number of displayed value pairs corresponds to the Capture Length.

Composite EVM

The command returns 2 values for each channel in the following order:

<slot number>, <level value in %>, <slot number>, <level value in %>, …

The number of displayed value pairs corresponds to the Capture Length.

EVM vs Symbol

The command returns one value for every symbol in the following order:

<value in % symbol 0>, <value in % symbol 1>,…

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

Power vs Symbol

The command returns one value for every symbol in the following order:

<value in dBm symbol 0>, <value in dBm symbol 1>,…

The number of values depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of values is reduced to half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

Channel Constellation

The command returns two values, the real and imaginary parts, for every symbol in the following order:

<re 0>,<im 0>,<re 1>,<im 1>,…,<re n>, <im n>, …

The number of value pairs depends on the number of symbols and therefore the spreading factor. With transmit diversity activated, the number of pairs is reduced to the half.

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

Composite Constellation

The command returns two values, the real and imaginary parts, for every chip in the following order:

<re chip 0>,<im chip 0>,<re chip 1>,<im chip 1>,…

The number of value pairs corresponds to the chip number of 1536 chips in a power control group.

Channel Bitstream

The command returns the bitstream of one slot, i.e. it returns one value for every bit (either 0 or 1) in a symbol in the following order:

<bit 1>, <bit 2>,…, <bit n>,…

The number of returned bits depends on the symbol rate and therefore the spreading factor of the channel. A PCG can contain a minimum of 12 and a maximum of 384 symbols.

BPSK modulation:

Spreading factor	Number of values
128	12
64	24
32	48
16	96
8	192
4	384

QPSK modulation:

Spreading factor	Number of values
128	24
64	48
32	96
16	192

| 8 | 384 |
| 4 | 768 |

8PSK modulation:

Spreading factor	Number of values
32	144

16QAM modulation:

Spreading factor	Number of values
32	192

Depending on the modulation type, a symbol consists of a different number of bits. For BPSK modulated signals there is one bit per symbol, for QPSK modulated signals there are 2 bits per symbol, for 8-PSK modulated signals there are 3 bits per symbol and for 16QAM modulated signal there are 4 bits per symbol.

With transmit diversity activated the values reduce to the half.

Magnitude Error vs Chip

The comand returns a list of magnitude error values of all chips at the selected PCG. The values are calculated as the magnitude difference between the received signal and the reference signal for each chip in %, and are normalized to the square root of the average power at the selected PCG.

Phase Error vs Chip

The comand returns a list of phase error values of all chips at the selected PCG. The values are calculated as the phase difference between the received signal and the reference signal for each chip in degrees, and are normalized to the square root of the average power at the selected PCG.

Symbol Magnitude Error

The comand returns the magnitude error in % of each symbol at the selected PCG. The number of the symbols depends on the spreading factor of the selected channel:

$NOFSymbols=10*2^{(8-CodeClass)}$

Symbol Phase Error

The comand returns the phase error in degrees of each symbol at the selected PCG. The number of the symbols depends on the spreading factor of the selected channel:

$NOFSymbols=10*2^{(8-CodeClass)}$

7.9 Other Commands Referenced in this Manual

The following commands are identical to those in the base unit and are included in this manual only because they are specifically referenced to here.

See also chapter 7.6.2, "Other SENSe Commands Referenced in this Manual", on page 252 and chapter 7.2.3, "Other CALCulate Commands Referenced in this Manual", on page 191

7.9.1 INPut commands

INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

The attenuation can be set in 5 dB steps (with option R&S FSV-B25: 1 dB steps). If the defined reference level cannot be set for the set RF attenuation, the reference level is adjusted accordingly.

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<Value>	*RST:	10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`

Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Mode: all

Manual operation: See "RF Atten Manual/Mech Att Manual" on page 82

INPut:ATTenuation:AUTO <State>

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<State>	ON | OFF	
	*RST:	ON

Example:	INP:ATT:AUTO ON
	Couples the attenuation set on the attenuator to the reference level.
Manual operation:	See "RF Atten Auto/Mech Att Auto" on page 82

INPut:COUPling <CouplingType>

Toggles the RF input of the R&S FSV between AC and DC coupling.

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:

<CouplingType>	AC	DC
	*RST: AC

Example:	INP:COUP DC
Manual operation:	See "Input (AC/DC)" on page 84

INPut:DIQ:CDEVice

This command queries the current configuration and the status of the digital baseband input from the optional R&S Digital I/Q Interface (option R&S FSV-B17).

For details see the section "Interface Status Information" for the R&S Digital I/Q Interface (R&S FSV-B17) in the description of the base unit.

Return values:

<ConnState>	Defines whether a device is connected or not.
	0
	No device is connected.
	1
	A device is connected.
<DeviceName>	Device ID of the connected device
<SerialNumber>	Serial number of the connected device
<PortName>	Port name used by the connected device
<SampleRate>	Maximum or currently used sampling rate of the connected device in Hz (depends on the used connection protocol version; indicated by <SampleRateType> parameter)
<MaxTransferRate>	Maximum data transfer rate of the connected device in Hz

<ConnProtState>	State of the connection protocol which is used to identify the connected device.
	Not Started
	Has to be Started
	Started
	Passed
	Failed
	Done
<PRBSTestState>	State of the PRBS test.
	Not Started
	Has to be Started
	Started
	Passed
	Failed
	Done
<SampleRateType>	**0**
	Maximum sampling rate is displayed
	1
	Current sampling rate is displayed
<Placeholder>	for future use; currently "0"
Example:	`INP:DIQ:CDEV?`
	Result:
	`1,SMU200A,103634,Out`
	`A,70000000,100000000,Passed,Not Started,0,0`
Mode:	IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS
Manual operation:	See "Connected Device" on page 94
	See "Digital IQ Info" on page 94

INPut:DIQ:RANGe:AUTO <State>

If enabled, the digital input fullscale level is automatically set to the value provided by the connected device (if available).

This command is only available if the optional Digital Baseband interface (option R&S FSV-B17) is installed.

For details see the Digital Baseband Interface (R&S FSV-B17) description of the base unit.

Parameters:

<State>	ON | OFF
	*RST: OFF
Example:	`INP:DIQ:RANG:AUTO ON`

Mode:	IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:DIQ:RANGe:COUPling <State>

If enabled, the reference level for digital input is adjusted to the full scale level automatically if the fullscale level changes.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	INP:DIQ:RANG:COUP OFF
Mode:	IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS
Manual operation:	See "Adjust Reference Level to Full Scale Level" on page 94

INPut:DIQ:RANGe[:UPPer] <Level>

Defines or queries the "Full Scale Level", i.e. the level that should correspond to an I/Q sample with the magnitude "1".

It can be defined either in dBm or Volt (see "Full Scale Level" on page 94).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level>	<numeric value>
	Range: 70.711 nV to 7.071 V
	*RST: 1 V

Example:	INP:DIQ:RANG 1V
Mode:	A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN
Manual operation:	See "Full Scale Level" on page 94

INPut:DIQ:RANGe[:UPPer]:UNIT <Unit>

Defines the unit of the full scale level (see "Level Unit" on page 94). The availability of units depends on the measurement application you are using.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<Level>	V | dBm | dBpW | W | dBmV | dBuV | dBuA | A
	*RST: Volt

Example:	INP:DIQ:RANG:UNIT A
Mode:	IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS
Manual operation:	See "Level Unit" on page 94

INPut:DIQ:SRATe <SampleRate>

This command specifies or queries the sample rate of the input signal from the R&S Digital I/Q Interface (see "Input Sample Rate" on page 94).

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (R&S FSV-B17) description of the base unit.

Parameters:

<SampleRate>	Range:	1 Hz to 10 GHz
	*RST:	32 MHz

Example:	INP:DIQ:SRAT 200 MHz
Mode:	A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN
Manual operation:	See "Input Sample Rate" on page 94

INPut:DIQ:SRATe:AUTO <State>

If enabled, the sample rate of the digital baseband IQ input signal is set automatically by the connected device, if the currently used sample rate is provided (indicated by the <SampleRateType> parameter in the result of the `INPut:DIQ:CDEVice` command.

This command is only available if the optional R&S Digital I/Q Interface (option R&S FSV-B17) is installed.

For details see the R&S Digital I/Q Interface (B17) description of the base unit.

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	INP:DIQ:SRAT:AUTO ON
Mode:	IQ, VSA, EVDO, CDMA, WCDMA, GSM, ADEMOD, TDS

INPut:EATT <Attenuation>

This command defines the electronic attenuation.

If necessary, the command also turns the electronic attenuator on.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

The attenuation can be varied in 1 dB steps from 0 to 25 dB. Other entries are rounded to the next lower integer value.

If the defined reference level cannot be set for the given RF attenuation, the reference level is adjusted accordingly and the warning "Limit reached" is output.

Parameters:

<Attenuation>	0...25
	*RST: 0 dB (OFF)
Example:	INP1:EATT 10 dB
Mode:	all
Manual operation:	See "El Atten Mode (Auto/Man)" on page 83

INPut:EATT:AUTO <State>

This command switches the automatic behaviour of the electronic attenuator on or off. If activated, electronic attenuation is used to reduce the operation of the mechanical attenuation whenever possible.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:

<State>	ON	OFF
	*RST: ON
Example:	INP1:EATT:AUTO OFF
Mode:	all
Manual operation:	See "El Atten On/Off" on page 83 See "El Atten Mode (Auto/Man)" on page 83

INPut:EATT:STATe <State>

This command turns the electronic attenuator on or off.

This command is only available with option R&S FSV-B25, but not if R&S FSV-B17 is active.

Parameters:

<State>	ON	OFF
	*RST: OFF

Example: INP:EATT:STAT ON

Switches the electronic attenuator into the signal path.

INPut:GAIN:STATe <State>

This command turns the 20 dB preamplifier on and off.

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using R&S Digital I/Q Interface (R&S FSV-B17).

Parameters:
<State>   ON | OFF

                      *RST: OFF

Example: INP:GAIN:STAT ON

Turns the preamplifier on.

Manual operation: See "Preamp On/Off" on page 63

INPut:IMPedance <Impedance>

This command selects the nominal input impedance.

75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω/50Ω).

This function is not available if the R&S Digital I/Q Interface (R&S FSV-B17) is active.

Parameters:
<Impedance>   50 | 75

                      *RST: 50 Ω

Example: INP:IMP 75

Manual operation: See "Input 50 Ω/75 Ω " on page 137

INPut:SELect <Source>

This command selects the signal source for measurements.

Parameters:
<Source>   RF | DIQ

                      RF
                      Radio Frequency ("RF INPUT" connector)

                      DIQ
                      Digital IQ (only available with R&S Digital I/Q Interface, option R&S FSV-B17)

                      *RST: RF

Example: INP:SEL RF

Mode:	A, IQ, NF, TDS, VSA, CDMA, EVDO, WCDMA, ADEMOD, GSM, OFDM, OFDMA/WiBro, WLAN
Manual operation:	See "Input Path" on page 94

7.9.2 TRIGger Commands

TRIGger<n>[:SEQuence]:LEVel:BBPower <Level>

This command sets the level of the baseband power trigger source (for digital input via the R&S Digital I/Q Interface, R&S FSV-B17).

Suffix:

<n>   irrelevant

Parameters:

<Level>	Range: -50 dBm to +20 dBm
	*RST: -20 DBM

Example:	`TRIG:LEV:BB -30DBM`
Mode:	All

TRIGger<n>[:SEQuence]:BBPower:HOLDoff <Value>

This command sets the holding time before the next BB power trigger event (for digital input via the R&S Digital I/Q Interface, R&S FSV-B17).

Suffix:

<n>   irrelevant

Parameters:

<Value>	*RST: 150 ns

Example:	`TRIG:SOUR BBP`
	Sets the baseband power trigger source.
	`TRIG:BBP:HOLD 200 ns`
	Sets the holding time to 200 ns.

Mode:	all

TRIGger<n>[:SEQuence]:IFPower:HOLDoff <Value>

This command sets the holding time before the next IF power trigger event.

Suffix:

<n>   irrelevant

Parameters:

<Value>	*RST: 150 ns

Example:	TRIG:SOUR IFP
	Sets the IF power trigger source.
	TRIG:IFP:HOLD 200 ns
	Sets the holding time to 200 ns.

TRIGger<n>[:SEQuence]:IFPower:HYSTeresis <Value>

This command sets the limit that the hysteresis value for the IF power trigger has to fall below in order to trigger the next measurement.

Suffix:

<n>	irrelevant

Parameters:

<Value>	*RST:	3 dB

Example:	TRIG:SOUR IFP
	Sets the IF power trigger source.
	TRIG:IFP:HYST 10DB
	Sets the hysteresis limit value.

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

Suffix:

<n>	irrelevant

Parameters:

<Delay>	Range:	zero span: -sweeptime (see data sheet) to 30 s; span: 0 to 30 s
	*RST:	0 s

Example:	TRIG:HOLD 500us

Manual operation:	See "Trigger Offset" on page 65

TRIGger<n>[:SEQuence]:LEVel[:EXTernal] <TriggerLevel>

This command sets the level of the external trigger source in Volt.

Suffix:

<n>	irrelevant

Parameters:

<TriggerLevel>	Range:	0.5 V to 3.5 V
	*RST:	1.4 V

Example:	TRIG:LEV 2V

TRIGger<n>[:SEQuence]:SLOPe <Type>

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Suffix:

<n>   irrelevant

Parameters:

<Type>   POSitive | NEGative

                                 *RST: POSitive

Example: TRIG:SLOP NEG

Manual operation: See "Trigger Polarity" on page 64

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source.

IF power and RF power triggers are not available together with the bandwidth extension option R&S FSV-B160.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:

<n>   irrelevant

Parameters:

<Source>   **IMMediate**
                                 Free Run

                                 EXTern
                                 External trigger

                                 IFPower
                                 Power trigger at the second intermediate frequency

                                 RFPower
                                 Power trigger at the first intermediate frequency

                                 TIME
                                 Time interval

                                 PSEN
                                 External power sensor (requires R&S FSV-K9 option)

                                 *RST: IMMediate

Example: TRIG:SOUR EXT
                                 Selects the external trigger input as source of the trigger signal

Manual operation: See "Trigger Source Free Run" on page 64
                                 See "Trigger Source External" on page 64

7.9.3 Other Referenced Commands

ABORt

This command aborts a current measurement and resets the trigger system.

Example:	ABOR;INIT:IMM
Mode:	all
Manual operation:	See "Meas Start/Stop" on page 120

DIAGnostic<n>:SERVice:NSOurce <State>

This command switches the 28 V supply of the noise source on the front panel on or off.

Suffix:

<n>	irrelevant

Parameters:

<State>	ON | OFF
	*RST: OFF

Example:	DIAG:SERV:NSO ON
Manual operation:	See "Noise Source" on page 93

FORMat:DEXPort:DSEParator <Separator>

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

Parameters:

<Separator>	POINt | COMMA
	*RST: (factory setting is POINt; *RST does not affect setting)

Example:	FORM:DEXP:DSEP POIN
	Sets the decimal point as separator.
Manual operation:	See "ASCII File Export" on page 116
	See "Decim Sep" on page 117

INITiate<n>:CONMeas

This command restarts a measurement that has been stopped in single sweep mode.

The measurement is restarted at the first sweep point.

As opposed to INITiate<n>[:IMMediate], this command does not reset traces in maxhold, minhold or average mode. Therefore it can be used to continue measurements using max hold or averaging functions.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

Suffix:

<n>	irrelevant

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.
`INIT:CONM;*WAI`
Continues the measurement (next 20 sequences) and waits for the end.

Manual operation: See "Continue Single Sweep" on page 84

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

The sweep is started immediately.

Suffix:

<n>	irrelevant

Parameters:

<State>	ON | OFF
	*RST: ON

Example: `INIT:CONT OFF`
Switches the sequence to single sweep.
`INIT:CONT ON`
Switches the sequence to continuous sweep.

Mode: all

Manual operation: See "Continuous Sweep" on page 84
See "Single Sweep" on page 84

INITiate<n>:ESPectrum

This command starts a Spectrum Emission Mask measurement.

Suffix:

<n>	irrelevant

Example:	`INIT:ESP`
	Starts a Spectrum Emission Mask measurement.
Manual operation:	See "Meas Start/Stop" on page 120

INITiate<n>[:IMMediate]

The command initiates a new measurement sequence.

With sweep count > 0 or average count > 0, this means a restart of the indicated number of measurements. With trace functions MAXHold, MINHold and AVERage, the previous results are reset on restarting the measurement.

In single sweep mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous sweep mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous sweep mode in remote control, as results like trace data or markers are only valid after a single sweep end synchronization.

Suffix:	
<n>	irrelevant
Example:	`INIT:CONT OFF`
	Switches to single sweep mode.
	`DISP:WIND:TRAC:MODE AVER`
	Switches on trace averaging.
	`SWE:COUN 20`
	Setting the sweep counter to 20 sweeps.
	`INIT;*WAI`
	Starts the measurement and waits for the end of the 20 sweeps.
Mode:	all

MMEMory:STORe<n>:LIST <FileName>

This command stores the current list evaluation results in a `<file name>.dat` file. The file consists of a data section containing the list evaluation results.

Suffix:	
<n>	irrelevant
Parameters:	
<FileName>	<file name>
Example:	`MMEM:STOR:LIST 'test'`
	Stores the current list evaluation results in the `test.dat` file.
Manual operation:	See "Save Evaluation List" on page 116
	See "ASCII File Export" on page 116

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command stores the selected trace in the specified window in a file with ASCII format. The file format is described in chapter 6.4.7, "ASCII File Export Format", on page 161

The decimal separator (decimal point or comma) for floating-point numerals contained in the file is defined with the `FORMat:DEXPort:DSEParator` command (see FORMat:DEXPort:DSEParator on page 310).

Suffix:

<n>	window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<Trace>	1 to 6
	selected measurement trace
<FileName>	DOS file name
	The file name includes indication of the path and the drive name. Indication of the path complies with DOS conventions.

Example:	`MMEM:STOR:TRAC 3,'TEST.ASC'`
	Stores trace 3 in the file TEST.ASC.

OUTPut:IF[:SOURce] <Source>

This command selects the source of the IF output.

Parameters:

<Source>	**IF**
	intermediate frequency output
	VIDeo
	video output, 200 mV
	*RST: IF

Example:	`OUTP:IF VID`
	Selects the video signal for the IF output connector.
Manual operation:	See "Video Output" on page 150

OUTPut:TRIGger <PortLevel>

This command selects level of the Trigger Out port. Thus, you can trigger an additional device via the external trigger port, for example.

Parameters:

<PortLevel>	LOW	HIGH
	*RST: LOW

Example:	`OUTP:TRIG HIGH`
Manual operation:	See "Trigger Out" on page 150

SYSTem: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

8 Status Reporting System of the CDMA2000 BTS Analysis (option K82)

Detailed information on the status registers of the base system is given in the base unit description. In this section, only the new and altered status registers/its for the CDMA2000 BTS Analysis option (K82) are described.

The R&S FSV-K82 uses the STATus:QUEStionable:SYNC register.

Although this register is provided by the base system, the CDMA2000 BTS Analysis option (K82) uses different bits and definitions.

The STATus:QUEStionable:SYNC register contains information on the error situation in the code domain analysis of the CDMA2000 BTS Analysis option. The bits can be queried with commands STATus:QUEStionable:SYNC:CONDition? and STATus:QUEStionable:SYNC[:EVENt]?.

Bit No	Meaning
0	This bit is not used.
1	Frame Sync failed. This bit is set when synchronization is not possible within the application. Possible reasons: Incorrectly set frequency Incorrectly set level Incorrectly set PN Offset Incorrectly set values for Swap IQ Invalid signal at input
2 to 14	These bits are not used.
15	This bit is always 0.

9 Glossary

For a more comprehensive glossary refer to the CDMA2000 standard.

APICH	auxiliary pilot channel
ATDPCH	auxiliary transmit diversity pilot channel
BCH	broadcast channel.
CACH	common assignment channel
CCCH	common control channel
CDEP	code domain error power
CDP	code domain power
Composite EVM	in accordance with the 3GPP2 specifications, determines the square root of the squared error between the real and the imaginary parts of the test signal and an ideally generated reference signal (EVM referred to the total signal) in a composite EVM measurement.
CPCCH	common power control channel
Crest factor	ratio of peak to average value of the signal
Inactive Channel Threshold	minimum power that a single channel must have compared with the total signal to be recognized as an active channel.
MC1	multi-carrier1 (one carrier system 1X).
MC2	multi-carrier3 (three carrier system 3X).
OTD	orthogonal transmit diversity, two antennas used
PCG	power control group: name in CDMA2000 system for 1536 chips or 1.25 ms interval; transmitter power is constant during a power control group
PCH	paging channel
PDCH	packet data channel
PDCCH	packet data control channel
PICH	pilot channel 0.64
RC	radio configuration; definition of sampling rate, permissible data rates, modulation types and use of special channels, and transmit diversity
Set	a group of 64 consecutive PCGs
SF	spreading factor
SYNC	synchronisation channel 32.64
TD	transmit diversity, two antennas used
TDPICH	transmit diversity pilot channel 16.128
x.y	Walsh code x.y, with code number x and spreading factor y of the channel

10 Appendix

Hadamard and BitReverse Code Tables

The following tables show the code sequences with Hadamard and BitReverse orders for the Code Domain Power and Code Domain Error Power result displays.

As an example, the corresponding cells for channel 8.32 (channel number 8 for spreading factor 32) are marked to show where the different codes of this channel are located.

HADAMARD									BITREVERSE								
0	000000	0	0	0	0	0	0	0	0	0	0	0	0	000000	0
1	000001	0	0	0	0	0	1	1	0	0	0	0	0	100000	32
2	000010	0	0	0	0	1	0	0	1	0	0	0	0	010000	16
3	000011	0	0	0	0	1	1	1	1	0	0	0	0	110000	48
4	000100	0	0	0	1	0	0	0	0	1	0	0	0	001000	8
5	000101	0	0	0	1	0	1	1	0	1	0	0	0	101000	40
6	000110	0	0	0	1	1	0	0	1	1	0	0	0	011000	24
7	000111	0	0	0	1	1	1	1	1	1	0	0	0	111000	56
8	001000	0	0	1	0	0	0	0	0	0	1	0	0	000100	4
9	001001	0	0	1	0	0	1	1	0	0	1	0	0	100100	36
10	001010	0	0	1	0	1	0	0	1	0	1	0	0	010100	20
11	001011	0	0	1	0	1	1	1	1	0	1	0	0	110100	52
12	001100	0	0	1	1	0	0	0	0	1	1	0	0	001100	12
13	001101	0	0	1	1	0	1	1	0	1	1	0	0	101100	44
14	001110	0	0	1	1	1	0	0	1	1	1	0	0	011100	28
15	001111	0	0	1	1	1	1	1	1	1	1	0	0	111100	60
16	010000	0	1	0	0	0	0	0	0	0	0	1	0	000010	2
17	010001	0	1	0	0	0	1	1	0	0	0	1	0	100010	34
18	010010	0	1	0	0	1	0	0	1	0	0	1	0	010010	18
19	010011	0	1	0	0	1	1	1	1	0	0	1	0	110010	50
20	010100	0	1	0	1	0	0	0	0	1	0	1	0	001010	10
21	010101	0	1	0	1	0	1	1	0	1	0	1	0	101010	42
22	010110	0	1	0	1	1	0	0	1	1	0	1	0	011010	26
23	010111	0	1	0	1	1	1	1	1	1	0	1	0	111010	58
24	011000	0	1	1	0	0	0	0	0	0	1	1	0	000110	6
25	011001	0	1	1	0	0	1	1	0	0	1	1	0	100110	38
26	011010	0	1	1	0	1	0	0	1	0	1	1	0	010110	22
27	011011	0	1	1	0	1	1	1	1	0	1	1	0	110110	54
28	011100	0	1	1	1	0	0	0	0	1	1	1	0	001110	14
29	011101	0	1	1	1	0	1	1	0	1	1	1	0	101110	46
30	011110	0	1	1	1	1	0	0	1	1	1	1	0	011110	30
31	011111	0	1	1	1	1	1	1	1	1	1	1	0	111110	62
32	100000	1	0	0	0	0	0	0	0	0	0	0	1	000001	1
33	100001	1	0	0	0	0	1	1	0	0	0	0	1	100001	33
34	100010	1	0	0	0	1	0	0	1	0	0	0	1	010001	17
35	100011	1	0	0	0	1	1	1	1	0	0	0	1	110001	49
36	100100	1	0	0	1	0	0	0	0	1	0	0	1	001001	9
37	100101	1	0	0	1	0	1	1	0	1	0	0	1	101001	41
38	100110	1	0	0	1	1	0	0	1	1	0	0	1	011001	25
39	100111	1	0	0	1	1	1	1	1	1	0	0	1	111001	57
40	101000	1	0	1	0	0	0	0	0	0	1	0	1	000101	5
41	101001	1	0	1	0	0	1	1	0	0	1	0	1	100101	37
42	101010	1	0	1	0	1	0	0	1	0	1	0	1	010101	21
43	101011	1	0	1	0	1	1	1	1	0	1	0	1	110101	53
44	101100	1	0	1	1	0	0	0	0	1	1	0	1	001101	13
45	101101	1	0	1	1	0	1	1	0	1	1	0	1	101101	45
46	101110	1	0	1	1	1	0	0	1	1	1	0	1	011101	29
47	101111	1	0	1	1	1	1	1	1	1	1	0	1	111101	61
48	110000	1	1	0	0	0	0	0	0	0	0	1	1	000011	3
49	110001	1	1	0	0	0	1	1	0	0	0	1	1	100011	35
50	110010	1	1	0	0	1	0	0	1	0	0	1	1	010011	19
51	110011	1	1	0	0	1	1	1	1	0	0	1	1	110011	51
52	110100	1	1	0	1	0	0	0	0	1	0	1	1	001011	11
53	110101	1	1	0	1	0	1	1	0	1	0	1	1	101011	43
54	110110	1	1	0	1	1	0	0	1	1	0	1	1	011011	27
55	110111	1	1	0	1	1	1	1	1	1	0	1	1	111011	59
56	111000	1	1	1	0	0	0	0	0	0	1	1	1	000111	7
57	111001	1	1	1	0	0	1	1	0	0	1	1	1	100111	39
58	111010	1	1	1	0	1	0	0	1	0	1	1	1	010111	23
59	111011	1	1	1	0	1	1	1	1	0	1	1	1	110111	55
60	111100	1	1	1	1	0	0	0	0	1	1	1	1	001111	15
61	111101	1	1	1	1	0	1	1	0	1	1	1	1	101111	47
62	111110	1	1	1	1	1	0	0	1	1	1	1	1	011111	31
63	111111	1	1	1	1	1	1	1	1	1	1	1	1	111111	63

Fig. 10-1: Codetable for base spreading factor 64

Index	HADAMARD	BITREVERSE	Decimal
0	0000000	0000000	0
1	0000001	1000000	64
2	0000010	0100000	32
3	0000011	1100000	96
4	0000100	0010000	16
5	0000101	1010000	80
6	0000110	0110000	48
7	0000111	1110000	112
8	0001000	0001000	8
9	0001001	1001000	72
10	0001010	0101000	40
11	0001011	1101000	104
12	0001100	0011000	24
13	0001101	1011000	88
14	0001110	0111000	56
15	0001111	1111000	120
16	0010000	0000100	4
17	0010001	1000100	68
18	0010010	0100100	36
19	0010011	1100100	100
20	0010100	0010100	20
21	0010101	1010100	84
22	0010110	0110100	52
23	0010111	1110100	116
24	0011000	0001100	12
25	0011001	1001100	76
26	0011010	0101100	44
27	0011011	1101100	108
28	0011100	0011100	28
29	0011101	1011100	92
30	0011110	0111100	60
31	0011111	1111100	124
32	0100000	0000010	2
33	0100001	1000010	66
34	0100010	0100010	34
35	0100011	1100010	98
36	0100100	0010010	18
37	0100101	1010010	82
38	0100110	0110010	50
39	0100111	1110010	114
40	0101000	0001010	10
41	0101001	1001010	74
42	0101010	0101010	42
43	0101011	1101010	106
44	0101100	0011010	26
45	0101101	1011010	90
46	0101110	0111010	58
47	0101111	1111010	122
48	0110000	0000110	6
49	0110001	1000110	70
50	0110010	0100110	38
51	0110011	1100110	102
52	0110100	0010110	22
53	0110101	1010110	86
54	0110110	0110110	54
55	0110111	1110110	118
56	0111000	0001110	14
57	0111001	1001110	78
58	0111010	0101110	46
59	0111011	1101110	110
60	0111100	0011110	30
61	0111101	1011110	94
62	0111110	0111110	62
63	0111111	1111110	126

Fig. 10-2: Code table for base spreading factor 128 (part1)

No.	HADAMARD	BITREVERSE	No.
64	1 0 0 0 0 0 0	0 0 0 0 0 0 1	1
65	1 0 0 0 0 0 1	1 0 0 0 0 0 1	65
66	1 0 0 0 0 1 0	0 1 0 0 0 0 1	33
67	1 0 0 0 0 1 1	1 1 0 0 0 0 1	97
68	1 0 0 0 1 0 0	0 0 1 0 0 0 1	17
69	1 0 0 0 1 0 1	1 0 1 0 0 0 1	81
70	1 0 0 0 1 1 0	0 1 1 0 0 0 1	49
71	1 0 0 0 1 1 1	1 1 1 0 0 0 1	113
72	**1 0 0 1 0 0 0**	0 0 0 1 0 0 1	9
73	1 0 0 1 0 0 1	1 0 0 1 0 0 1	73
74	1 0 0 1 0 1 0	0 1 0 1 0 0 1	41
75	1 0 0 1 0 1 1	1 1 0 1 0 0 1	105
76	1 0 0 1 1 0 0	0 0 1 1 0 0 1	25
77	1 0 0 1 1 0 1	1 0 1 1 0 0 1	89
78	1 0 0 1 1 1 0	0 1 1 1 0 0 1	57
79	1 0 0 1 1 1 1	1 1 1 1 0 0 1	121
80	1 0 1 0 0 0 0	0 0 0 0 1 0 1	5
81	1 0 1 0 0 0 1	1 0 0 0 1 0 1	69
82	1 0 1 0 0 1 0	0 1 0 0 1 0 1	37
83	1 0 1 0 0 1 1	1 1 0 0 1 0 1	101
84	1 0 1 0 1 0 0	0 0 1 0 1 0 1	21
85	1 0 1 0 1 0 1	1 0 1 0 1 0 1	85
86	1 0 1 0 1 1 0	0 1 1 0 1 0 1	53
87	1 0 1 0 1 1 1	1 1 1 0 1 0 1	117
88	1 0 1 1 0 0 0	0 0 0 1 1 0 1	13
89	1 0 1 1 0 0 1	1 0 0 1 1 0 1	77
90	1 0 1 1 0 1 0	0 1 0 1 1 0 1	45
91	1 0 1 1 0 1 1	1 1 0 1 1 0 1	109
92	1 0 1 1 1 0 0	0 0 1 1 1 0 1	29
93	1 0 1 1 1 0 1	1 0 1 1 1 0 1	93
94	1 0 1 1 1 1 0	0 1 1 1 1 0 1	61
95	1 0 1 1 1 1 1	1 1 1 1 1 0 1	125
96	1 1 0 0 0 0 0	0 0 0 0 0 1 1	3
97	1 1 0 0 0 0 1	1 0 0 0 0 1 1	67
98	1 1 0 0 0 1 0	0 1 0 0 0 1 1	35
99	1 1 0 0 0 1 1	1 1 0 0 0 1 1	99
100	1 1 0 0 1 0 0	0 0 1 0 0 1 1	19
101	1 1 0 0 1 0 1	1 0 1 0 0 1 1	83
102	1 1 0 0 1 1 0	0 1 1 0 0 1 1	51
103	1 1 0 0 1 1 1	1 1 1 0 0 1 1	115
104	**1 1 0 1 0 0 0**	0 0 0 1 0 1 1	11
105	1 1 0 1 0 0 1	1 0 0 1 0 1 1	75
106	1 1 0 1 0 1 0	0 1 0 1 0 1 1	43
107	1 1 0 1 0 1 1	1 1 0 1 0 1 1	107
108	1 1 0 1 1 0 0	0 0 1 1 0 1 1	27
109	1 1 0 1 1 0 1	1 0 1 1 0 1 1	91
110	1 1 0 1 1 1 0	0 1 1 1 0 1 1	59
111	1 1 0 1 1 1 1	1 1 1 1 0 1 1	123
112	1 1 1 0 0 0 0	0 0 0 0 1 1 1	7
113	1 1 1 0 0 0 1	1 0 0 0 1 1 1	71
114	1 1 1 0 0 1 0	0 1 0 0 1 1 1	39
115	1 1 1 0 0 1 1	1 1 0 0 1 1 1	103
116	1 1 1 0 1 0 0	0 0 1 0 1 1 1	23
117	1 1 1 0 1 0 1	1 0 1 0 1 1 1	87
118	1 1 1 0 1 1 0	0 1 1 0 1 1 1	55
119	1 1 1 0 1 1 1	1 1 1 0 1 1 1	119
120	1 1 1 1 0 0 0	0 0 0 1 1 1 1	15
121	1 1 1 1 0 0 1	1 0 0 1 1 1 1	79
122	1 1 1 1 0 1 0	0 1 0 1 1 1 1	47
123	1 1 1 1 0 1 1	1 1 0 1 1 1 1	111
124	1 1 1 1 1 0 0	0 0 1 1 1 1 1	31
125	1 1 1 1 1 0 1	1 0 1 1 1 1 1	95
126	1 1 1 1 1 1 0	0 1 1 1 1 1 1	63
127	1 1 1 1 1 1 1	1 1 1 1 1 1 1	127

Fig. 10-3: Code table for base spreading factor 128 (part 2)

List of Commands

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