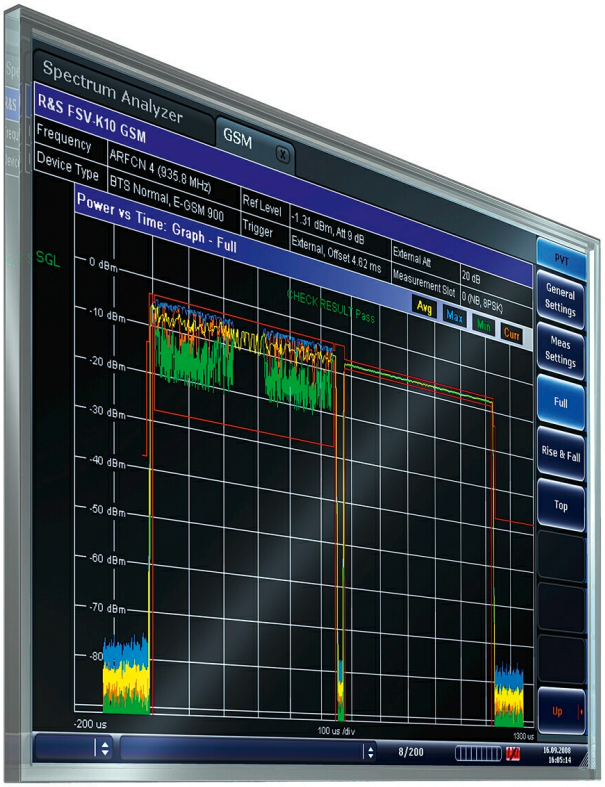
R&S® FSV-K10
Firmware Option GSM Measurement
Operating Manual



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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

This manual describes the following options:

- R&S FSV-K10 (1310.8055.02)

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

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

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

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

Contents

1 Preface

1.1 Documentation Overview

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

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

Quick Start Guide

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

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

Operating Manuals

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

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

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

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

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

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

Service Manual

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

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

Online Help

The online help contains context-specific help on operating the R&S FSVR and all available options. It describes both manual and remote operation. The online help is

installed on the R&S FSVR by default, and is also available as an executable .chm file on the CD delivered with the instrument.

Release Notes

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

1.2 Conventions Used in the Documentation

1.2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

1.2.2 Conventions for Procedure Descriptions

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

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

1.3 How to Use the Help System

Calling context-sensitive and general help

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

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

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

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

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

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

Contents of the help dialog box

The help dialog box contains four tabs:

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

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

Navigating in the table of contents

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

Navigating in the help topics

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

Searching for a topic

1. Change to the "Index" tab.

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

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

Changing the zoom

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

Closing the help window

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

2 Introduction

This document contains all information required for operation of an R&S FSVR equipped with Application Firmware R&S FSV-K10. It covers operation via menus and the remote control commands for GSM/EDGE, EDGE Evolution (EGPRS2) and VAMOS (**V**oice services over **A**daptive **M**ulti-user channels on **O**ne **S**lot) measurements.

This part of the documentation consists of the following chapters:

- chapter 3, "Instrument Functions GSM", on page 11
  describes the overall instrument functions and provides further information
- chapter 4, "Remote Commands (GSM)", on page 91
  describes all remote control commands defined for the GSM/EDGE, EDGE Evolution (EGPRS2) and VAMOS measurements.
- chapter 5, "Status Reporting System", on page 251
  provides a description of the status registers

This part of the documentation includes only functions of the Application Firmware R&S FSV-K10. For all other descriptions, refer to the description of the base unit.

3 Instrument Functions GSM

The R&S FSVR equipped with the GSM option performs measurements on downlink or uplink signals according to the Third Generation Partnership Project (3GPP) standards for GSM/EDGE, EDGE Evolution (EGPRS2) and Voice services over Adaptive Multi-user Channels on One Slot (VAMOS) in different domains (Time, Frequency, IQ). Signals with GMSK, AQPSK, QPSK, 8PSK, 16QAM and 32QAM modulation, normal or higher symbol rate and different TX filters (e.g narrow and wide pulse) can be measured. The measurements for Power vs Time, Modulation Accuracy and Modulation and Transient Spectrum as required in the standard can be performed.

The measurements and the physical layer – the layer of the GSM network on which modulation, transmission of RF signals, reception of RF signals, and demodulation take place – is defined in the standards:

Table 3-1: GSM standards

• 3GPP TS 45.004	Details on Modulation
• 3GPP TS 45.005	General measurement specifications and limit values
• 3GPP TS 45.010	Details on Synchronization and Timing
• 3GPP TS 51.010	Detailed measurement specifications and limit values for mobile stations (MS)
• 3GPP TS 51.021	Detailed measurement specifications and limit values for base transceiver stations (BTS)

To open the GSM menu

- If the "GSM" mode is not the active measurement mode, press the MODE key and activate the "GSM" option by selecting "GSM".
- If the "GSM" mode is already active, press the HOME key.
  The "GSM" menu is displayed.

Menu and softkey description

For a description of the GSM-specific softkeys see chapter 3.3, "Softkeys and Settings of the GSM Menu", on page 54.

The "Span", "BW", "Mkr Func", "Lines" menus are not available in GSM mode.

The UNDO/REDO functions are not available in GSM mode.

For all menus not described here, see the description of the R&S FSVR base unit.

To display help to a softkey, press the HELP key and then the softkey for which you want to display help. To close the help window, press the ESC key. For further information refer to section "How to use the Help System".

3.1 Measurements and Result Displays

This chapter provides information about the measurement and result displays of the GSM application.

Multiple measurement mode

The multiple measurement mode allows you to perform several measurements on the same captured I/Q data in parallel. In this case, the results of the selected measurements are available immediately, without starting a new measurement. Simply select the softkey for the performed measurement.

To retrieve the results for other measurement types, you must perform a new measurement first. The softkeys for the measurements not included in the multiple measurement selection only become available again when you deactivate multiple measurement mode or include the measurement in the multiple measurement selection.

3.1.1 Screen Layout

Within the GSM measurement option, each measurement has its own screen layout (see e.g. chapter 3.1.8, "Power vs Time", on page 20). This is typically a combination of a graph in the upper screen part and a table in the lower screen part.

You can switch between the screens and select a split screen layout (to see all displays) or a full screen layout (to see only the graph or the table in more detail).

Table content in split screen mode

Due to the reduced space available for each result in split screen mode, the content of the tables may be reduced.

Via remote control, all results are available in any table state.

3.1.2 Modulation Accuracy

The fundamental characteristics of the signal to be analyzed in the vector (IQ) domain are error vector magnitude (EVM), magnitude and phase error, IQ imbalance, etc. The numerical readings are displayed in the "Modulation Accuracy" table.

B: Modulation Accuracy

		Current	Average	Peak	Std Dev	Unit
EVM	RMS	0.30	0.42	1.02	0.11	%
	Peak	0.73	1.14	2.36	0.26	%
Mag Error	RMS	0.06	0.06	0.07	0.00	%
	Peak	0.19	0.19	0.24	0.02	%
Phase Error	RMS	0.17	0.24	0.58	0.06	deg
	Peak	- 0.42	0.65	1.35	0.15	deg
Origin Offset Suppression		63.11	65.56	53.88	4.54	dB
IQ Offset		0.07	0.06	0.20	0.03	%
IQ Imbalance		0.03	0.05	0.12	0.02	%
Frequency Error		14.80	13.64	16.87	1.90	Hz
Burst Power		- 0.57	- 0.56	- 0.56	0.00	dBm
Amplitude Droop		- 0.00	- 0.00	- 0.01	0.00	dB

95%tile	EVM 0.86 %	Mag Error 0.15 %	Phase Error 0.49 deg

Fig. 3-1: Modulation Accuracy

To display a "Modulation Accuracy" table, select: "Demod > Modulation Accuracy" (see "Modulation Accuracy" on page 80) and then start a measurement (RUN SINGLE/RUN CONT key).

Modulation Accuracy results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "Modulation Accuracy" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Modulation Accuracy" table.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 65).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" ("Statistic Count" on page 60).
Limit Check	None

Amplitude Droop

The "Amplitude Droop" value shown in the result table indicates the total change in amplitude (in dB) over the estimation range. The estimation range is set according to the 3GPP standard:

Burst type	Modulation type	Estimation Range
Normal burst	GMSK	147 normal symbol periods
Normal burst	8PSK, 16QAM and 32 QAM (EGPRS2 Level A)	142 normal symbol periods
Higher Symbol Rate burst	QPSK, 16QAM and 32QAM (EGPRS2 Level B)	169 reduced symbol periods

Origin Offset Suppression

The relation between the current values of the I/Q offset and the Origin Offset Suppression (OOS) is as follows:

$$OOS_{dB} = -20 \bullet \log_{10}\left(\frac{I/Q - offset[\%]}{100\%}\right)$$

The Origin Offset Suppression value in the "Peak" column displays the minimum value (not the maximum as for other items), which is the worst case value.

3.1.3 Phase Error vs Time

This measurement displays the phase error over time. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table (see chapter 3.1.2, "Modulation Accuracy", on page 13).

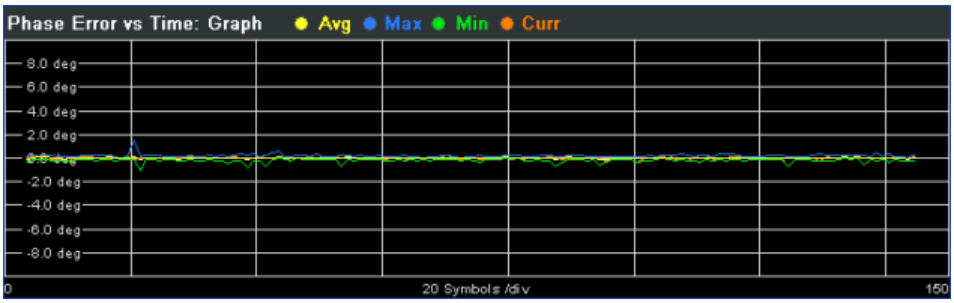


Fig. 3-2: Phase Error vs Time graph

Modulation Accuracy: List						
Item		Current	Average	Peak	Std Dev	Unit
Phase Error	RMS	0.18	0.21	0.35	0.05	deg
	Peak	0.56	0.62	0.92	0.13	deg
Origin Offset Suppression		6.42	5.44	4.51	0.84	dB
IQ Offset		0.06	0.26	0.55	0.16	%
IQ Imbalance		0.06	0.06	0.11	0.03	%
Frequency Error		- 1.09	4.48	- 7.18	1.42	Hz
Burst Power		- 77.00	- 77.00	- 77.00	- 77.00	dBm

Fig. 3-3: Phase Error values in Modulation Accuracy list

To start a "Phase Error vs Time" measurement, select: "Demod > Phase Error" (see "Phase Error" on page 81) and then start a measurement (RUN SINGLE/RUN CONT key).

Phase Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "Phase Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Phase Error vs Time" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 65).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings""Statistic Count" on page 60.
Limit Check	None

3.1.4 EVM vs Time

This measurement displays the error vector magnitude over time. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table (see chapter 3.1.2, "Modulation Accuracy", on page 13).

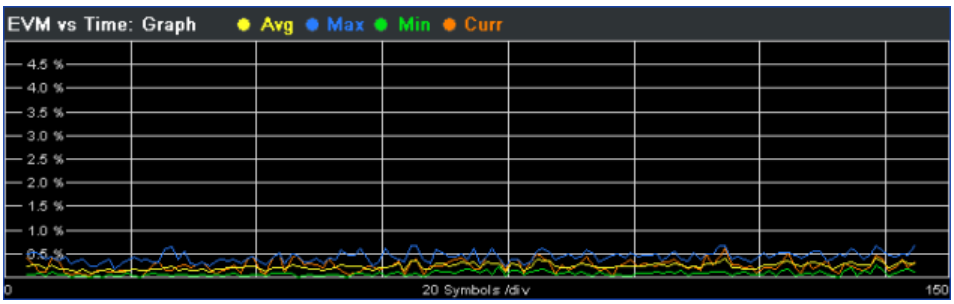


Fig. 3-4: EVM vs Time graph

Modulation Accuracy: List						
Item		Current	Average	Peak	Std Dev	Unit
EVM	RMS	0.39	0.65	1.28	0.36	%
	Peak	6.39	6.71	7.38	0.39	%
Origin Offset Suppression		6.42	5.44	4.51	0.84	dB
IQ Offset		0.06	0.26	0.55	0.16	%
IQ Imbalance		0.06	0.06	0.11	0.03	%
Frequency Error		- 1.09	4.48	- 7.18	1.42	Hz
Burst Power		- 77.00	- 77.00	- 77.00	- 77.00	dBm

Fig. 3-5: EVM vs Time values in Modulation Accuracy list

To start a "EVM vs Time" measurement, select: "Demod > EVM" (see "EVM" on page 81) and then start a measurement (RUN SINGLE/RUN CONT key).

EVM vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "EVM vs Time" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "EVM vs Time" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 65).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 60).
Limit Check	None

3.1.5 Magnitude Error vs Time

This measurement displays the magnitude error over time. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table (see chapter 3.1.2, "Modulation Accuracy", on page 13).

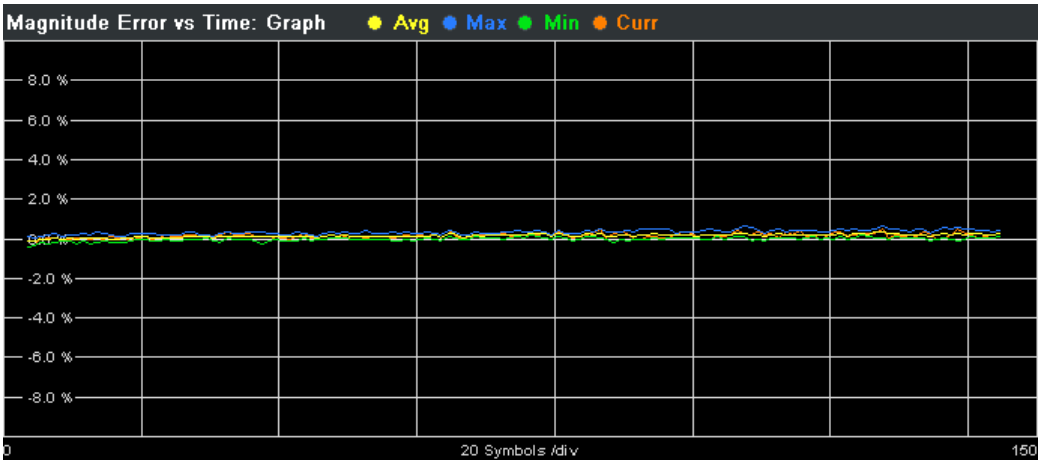


Fig. 3-6: Magnitude Error vs Time graph

Magnitude Error vs Time: Modulation Accuracy						
		Current	Average	Peak	Std Dev	Unit
Mag Error	RMS	0.20	0.20	0.24	0.02	%
	Peak	0.50	0.52	0.63	0.05	%
Burst Power		- 30.40	- 30.56	- 30.40	0.17	dBm
Amplitude Droop		0.00	0.00	0.00	0.00	dB

Fig. 3-7: Magnitude Error values in Modulation Accuracy list

To start a "Magnitude Error vs Time" measurement, select: "Demod > Magnitude Error" (see "Magnitude Error" on page 81) and then start a measurement (RUN SINGLE/RUN CONT key).

Magnitude Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "Magnitude Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Magnitude Error vs Time" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 65).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 60).
Limit Check	None

3.1.6 Constellation

This measurement displays the constellation diagram. The measurement consists of a graph and a table which is a condensed version of the "Modulation Accuracy" table (see chapter 3.1.2, "Modulation Accuracy", on page 13).

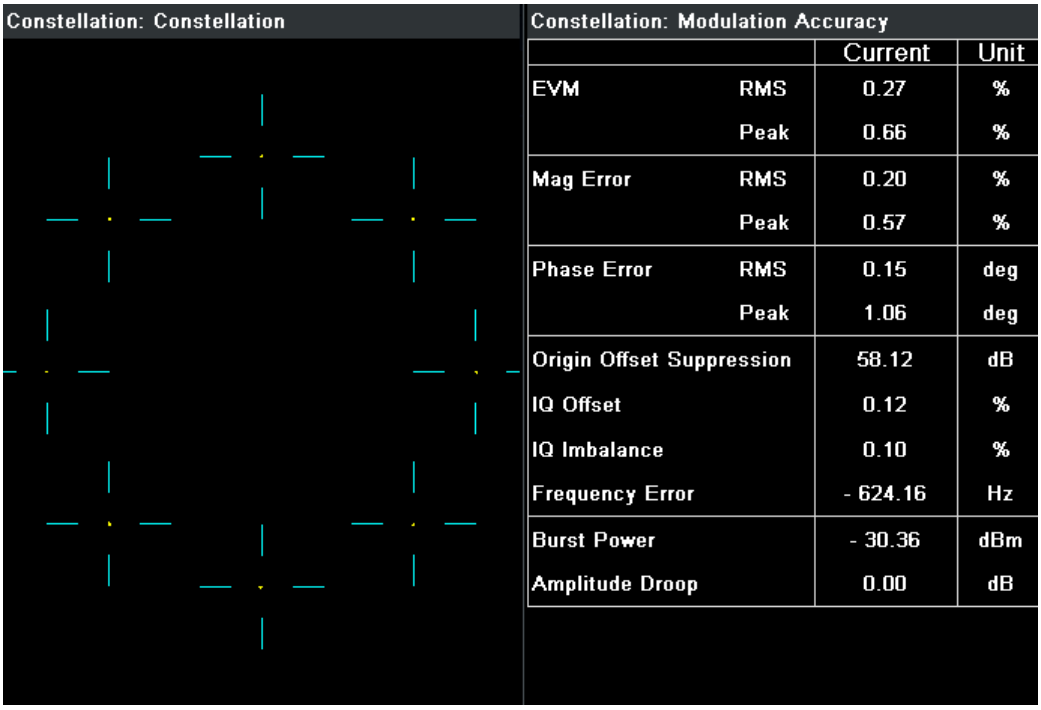


Fig. 3-8: Constellation

To display a "Constellation" diagram, select: "Demod > Constell" (see "Constell" on page 81) and then start a measurement (RUN SINGLE/RUN CONT key).

Constellation diagrams can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "Constell" softkey is not available, include "Constellation" in the multiple measurement selection or disable the multiple measurement mode.

The Multicarrier BTS option (see "Multicarrier BTS" on page 78) activates an additional multicarrier filter into the demodulation path. For normal bursts with GMSK modulation, the constellation diagram then becomes similar to a 12PSK constellation.

The following default settings are used for a "Constellation" display.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 65).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 60).
Limit Check	None

3.1.7 Trigger to Sync

This measurement measures the time between an external trigger event and the start of the first symbol of the training sequence. The start of the first symbol corresponds to the time 0 of the symbol period (see chapter 3.2.10, "Definition of the Symbol Period", on page 48).

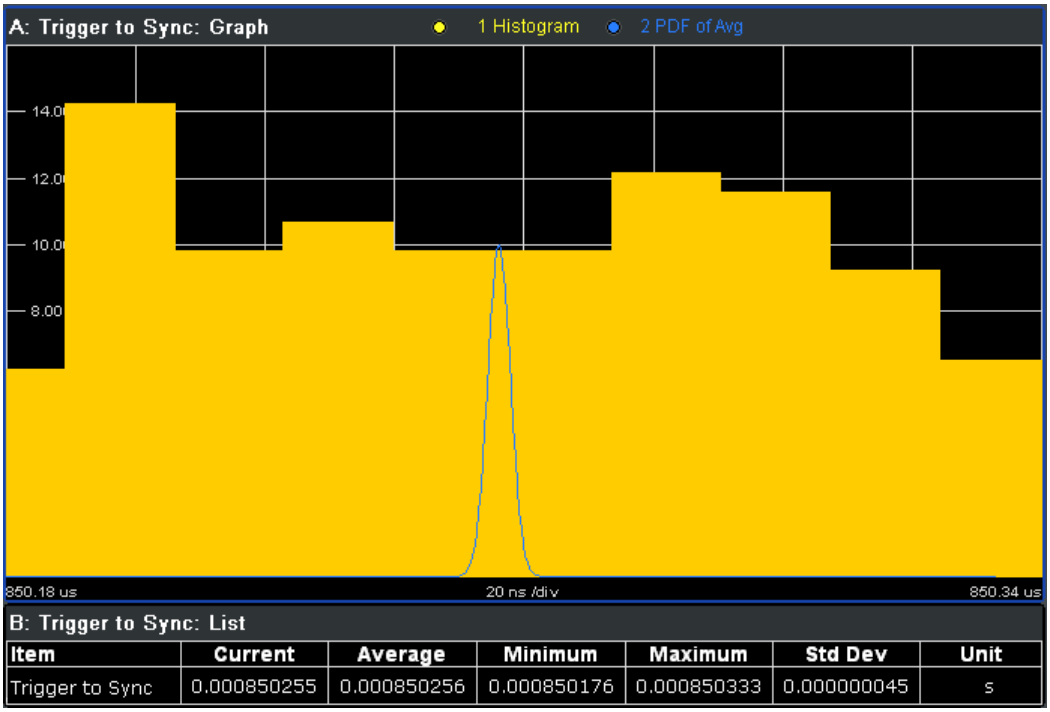


Fig. 3-9: Trigger to Sync

To start a "Trigger to Sync" measurement, select "Demod > More > Trigger to Sync" (see "Trigger to Sync" on page 82). Then start a measurement (RUN SINGLE/RUN CONT key).

Trigger to Sync measurements only provide one value per I/Q capture. In order to improve the measurement speed, set the capture time to 10 ms (see "Capture Time" on page 59).

3.1.8 Power vs Time

The "Power vs Time" (PvT) measurement is the most important GSM measurement in the time domain. It displays the power of all slots (bursts) in the selected slot scope (see chapter 3.2.8, "Defining the Scope of the Measurement", on page 43) and runs an evaluation against the specified template mask.

The measurement consists of a graph showing the "Power vs Time" trace including the limit lines, and a table that displays the slot powers of all slots in the slot scope.

In the graph display, it is possible to focus on different parts of the signal:

- "Full" on page 82: Displays all bursts in the slot scope
- "Rising" on page 82: Displays rising edges only (the rest of the burst is removed)
- "Falling" on page 83: Displays fallling edges only (the rest of the burst is removed)
- "Rise & Fall" on page 83: Rising and falling edges zoomed
- "Top" on page 83: Useful part high resolution (same as "Full" on page 82, but y-axis zoomed)

To start a "Power vs Time" measurement, select "PvT" and then the required measurement type. Then start a measurement (RUN SINGLE/RUN CONT key).

Power vs. Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "PvT" softkey is not available, include "Power vs. Time" in the multiple measurement selection or disable the multiple measurement mode.

Fig. 3-10: Full Burst view in Power vs Time

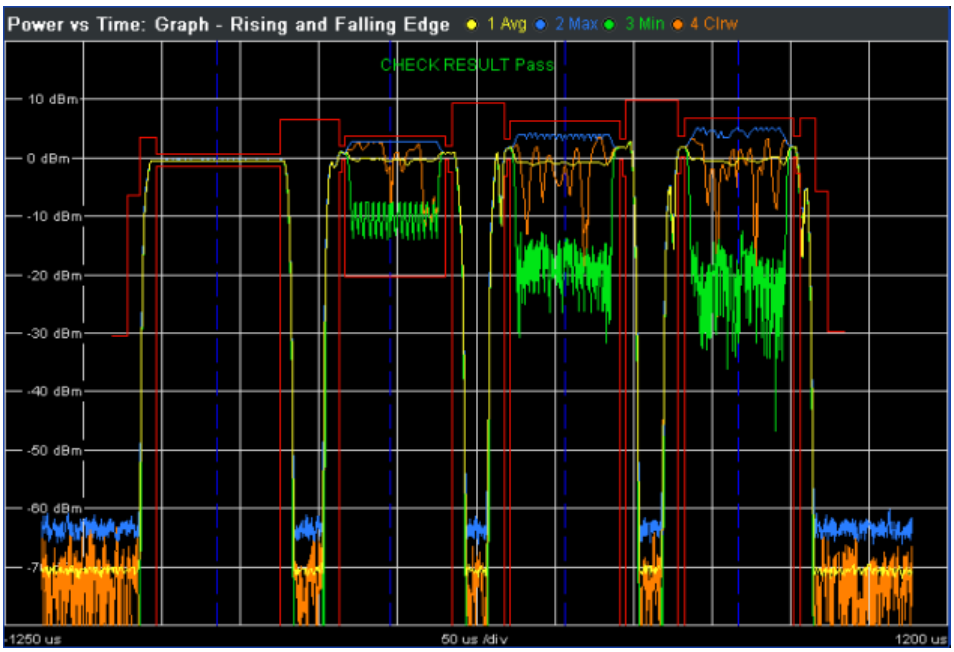


Fig. 3-11: Rising and Falling Edge view in Power vs Time

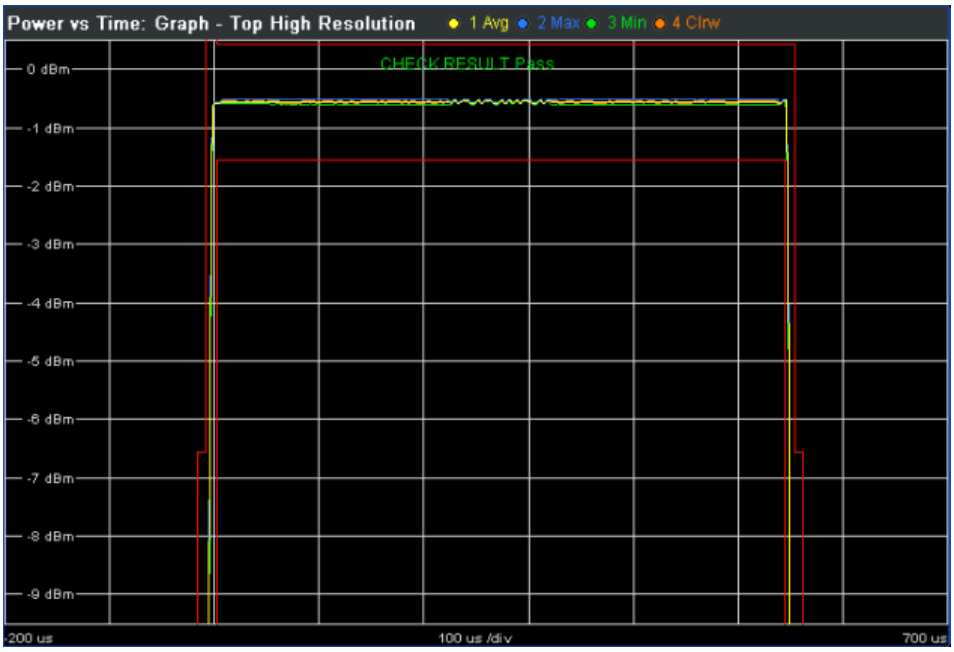


Fig. 3-12: Top High Resolution view in Power vs Time

To zoom into the trace in the Power vs Time Full Burst view, activate a marker and use the marker zoom (see "Marker Zoom" on page 88).

The table displays the following information (see figure 3-13):

- The slot powers of all slots in the slot scope (see chapter 3.2.8, "Defining the Scope of the Measurement", on page 43. The average power, the peak power and the crest factor on a per-slot basis are displayed. The table contains results of the current ("Curr") frame as well as the statistics done over all ("All") analyzed frames according to the set statistic count.
- The "Delta to Sync" values correspond to the distance between the center of the Training Sequence TSC in a given slot and the center of the TSC in the Slot to Measure. The unit is normal symbol periods (NSP = 1 / Normal Symbol Rate = 6 / 1625000 s = 3.69 us). These values are either assumed to be constant (according to the 3GPP standard) or measured, depending on the setting of the Limit Time Alignment parameter ("Slot to measure" or "Per Slot").

B: Power vs Time: List

Slot		0	1	2	3	4	5	6	7	Unit
Power	Avg			- 0.7	0.2	0.1	- 73.6	- 0.6		dBm
Curr	Peak			2.6	4.4	4.7	- 63.9	- 0.6		dBm
	Crest			3.3	4.2	4.6	9.7	0.0		dB
Power	Avg			- 0.6	0.0	- 0.1	- 73.9	- 0.6		dBm
All	Peak			2.6	4.5	4.9	- 61.6	- 0.6		dBm
	Crest			3.5	4.8	5.6	13.6	0.1		dB
Delta to	Sync			- 156.00	0.00	156.00		469.00		NSP

Fig. 3-13: Power vs Time list display

According to the standard (see "Timeslot length" in 3GPP TS 45.010), there are either eight slots of equal length (156.25 NSP), or slot 0 and slot 4 have a length of 157 NSP while all other slots have a length of 156 NSP. For details see chapter 3.2.11, "Timeslot Alignment", on page 51.

The timeslot length is defined as the distance between the centers of the TSCs in successive slots. By setting the "Limit Time Alignment" parameter to "Per Slot" the "Delta to Sync" values can be measured and used in order to verify the timeslot lenghts.

Setting the Limit Time Alignment to "Slot to measure" displays the expected values (according to the standard and depending on the value of Equal Timeslot Length). These values are summarized in table 3-2 (Slot to measure = 0, No. of slots = 8 and First slot to measure = 0).

Table 3-2: Expected "Delta to Sync" values in normal symbol periods

Slot Number	0 = Slot to measure	1	2	3	4	5	6	7
Equal Timeslot Length = On	0	156.25	312.50	468.75	625.00	781.25	937.50	1093.75
Equal Timeslot Length = Off	0	157	313	469	625	782	938	1094

Default measurement settings

The following default settings are used for the "Power vs Time" measurement:

Setting	Default
Measurement Scope	The slot scope defined by First Slot to measure and Number of Slots to measure in "Measurement Settings" (see chapter 3.2.8, "Defining the Scope of the Measurement", on page 43).
Averaging Configuration	Number of frames as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 60)..
Limit Check	According to standard. • The maximum (Max) trace is checked agains the upper limit. • The minimum (Min) trace is checked against the lower limit. • The limit masks are generated adaptively from the measured signal according to the following parameters: – Frequency band (special masks for PCS1900 and DCS1800 BTS with GMSK) – Burst type – Modulation – Filter – The reference burst power is measured and the "0 dB line" of the limit mask is assigned to it. – For MS, the "-6 dB line" of the limit mask depends on the PCL. The PCL is derived from the measured burst power.

Measurement and Zoom

When switching between Full, Rising, Falling, Rise & Fall, and Top, neither the measurement itself, nor the limit checking is changed. The only change is that the displayed signal data is cropped.

Remote commands

The results of the "Power vs Time" measurement can be queried using the following remote commands:

`FETCh:BURSt:SPOWer:SLOT<s>:ALL:AVERage?` on page 179

`FETCh:BURSt:SPOWer:SLOT<s>:ALL:CRESt?` on page 180

`FETCh:BURSt:SPOWer:SLOT<s>:ALL:MAXimum?` on page 181

`FETCh:BURSt:SPOWer:SLOT<s>:CURRent:AVERage?` on page 182

`FETCh:BURSt:SPOWer:SLOT<s>:CURRent:CRESt?` on page 183

`FETCh:BURSt:SPOWer:SLOT<s>:CURRent:MAXimum?` on page 184

`FETCh:BURSt:SPOWer:SLOT<s>:DELTatosync?` on page 185

3.1.9 Modulation Spectrum

The "Modulation Spectrum" measurement evaluates the spectral property (shape and values at certain fixed frequency offsets) of a certain part of the burst (50 to 90 % of the useful part, excluding the training sequence TSC) by measuring the average power

in this part over several bursts. The results of this measurement can be displayed in a graph or list.

The full list of measured frequency and filter bandwidths is provided in table 3-3.

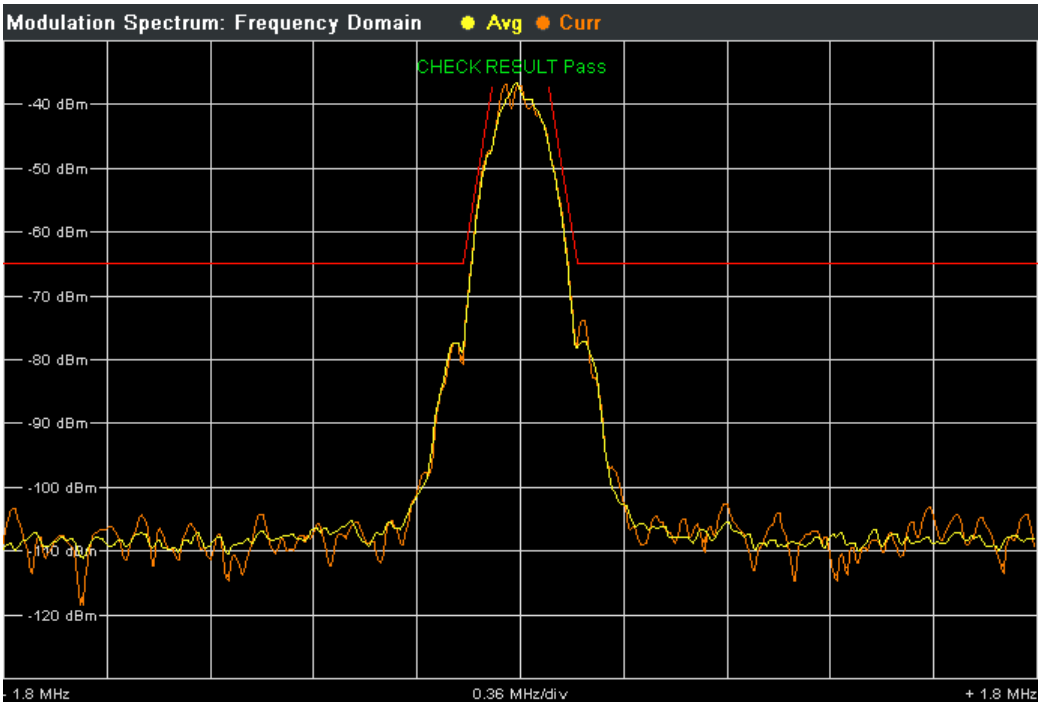


Fig. 3-14: Frequency Domain of modulation spectrum with traces and limits (red)

Modulation Spectrum: List

Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
100	- 7.3	- 45.7	7.83	- 8.0	- 46.4	8.53
200	- 37.1	- 75.5	10.45	- 37.2	- 75.6	10.59
250	- 41.2	- 79.5	14.55	- 42.5	- 80.8	15.83
400	- 65.6	- 104.0	38.96	- 66.7	- 105.1	40.08
600	- 69.3	- 107.6	42.65	- 70.2	- 108.6	43.60
800	- 69.7	- 108.0	43.03	- 70.1	- 108.4	43.45
1000	- 70.7	- 109.0	44.04	- 70.5	- 108.8	43.85
1200	- 69.5	- 107.8	42.83	- 70.0	- 108.4	43.39
1400	- 70.5	- 108.9	43.86	- 69.4	- 107.8	42.81
1600	- 69.9	- 108.3	43.32	- 70.0	- 108.4	43.41
1800	- 70.7	- 109.0	44.05	- 70.7	- 109.1	44.12

Fig. 3-15: Results Table in Modulation Spectrum

To start a "Modulation Spectrum" measurement, select: "Spectrum > Modulation Spectrum" (see "Modulation Spectrum" on page 83) and then start a measurement (RUN SINGLE/RUN CONT key).

Modulation Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "Modulation Spectrum" softkey is not available, include "Modulation Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for a "Modulation Spectrum" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 65).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 60)..
Limit Check	According to standard. • Frequency Domain: Limit check of average (Avg) trace • List: Limit check of absolute and relative scalar values • The limits depend on the following parameters: – Frequency band – Device Type (only BTS type, not MS type) – Burst Type / Modulation / Filter - limits are different for Higher Symbol Rate and Wide Pulse Filter (case 2) and others (case 1), see 3GPP TS 45.005, chapter 4.2.1.3 – The measured reference power (30 kHz bandwidth) – No. of active Carriers for multi-carrier BTS. The limit is relaxed by 10*log10(N) dB for offset frequencies ≥1.8 MHz, see 3GPP TS 45.005 chapter 4.2.1.2

Table 3-3: Frequencies and filter bandwidths in modulation spectrum measurements

Offset Frequency (kHz)	RBW (kHz)	VBW (kHz)
± 100	30	30
± 200	30	30
± 250	30	30
± 400	30	30
± 600	30	30
± 800	30	30
± 1000	30	30
± 1200	30	30
± 1400	30	30
± 1600	30	30
± 1800	30	30

Remote commands

The "Modulation Spectrum" measurement is started using the `CONFigure:SPECtrum:MODulation[:IMMediate]` command.

The gating parameters of the "Modulation Spectrum" measurement can be queried using `READ:WSPectrum:MODulation:GATing?`.

The results of the "Modulation Spectrum" measurement can be queried using `READ:WSPectrum:MODulation[:ALL]?`.

3.1.10 Transient Spectrum

The "Transient Spectrum" measurement is done in a very similar way to the modulation spectrum measurement.

The differences to the modulation spectrum measurement are:

- Instead of measuring only in the useful part of the burst (in the "Slot to measure", see "Slot to Measure" on page 65), the measurement is performed over the interval defined by the "Number of slots to measure" (see "Number of Slots to measure" on page 65) and the "First Slot to measure" (see "First Slot to measure" on page 65) in the "Measurement Settings", i.e. one measurement per frame. See also chapter 3.2.8, "Defining the Scope of the Measurement", on page 43. Therefore, the rising and falling edges affect the measurement result.
- Instead of the average power, the peak power is measured.
- The number of fixed offset frequencies is lower.

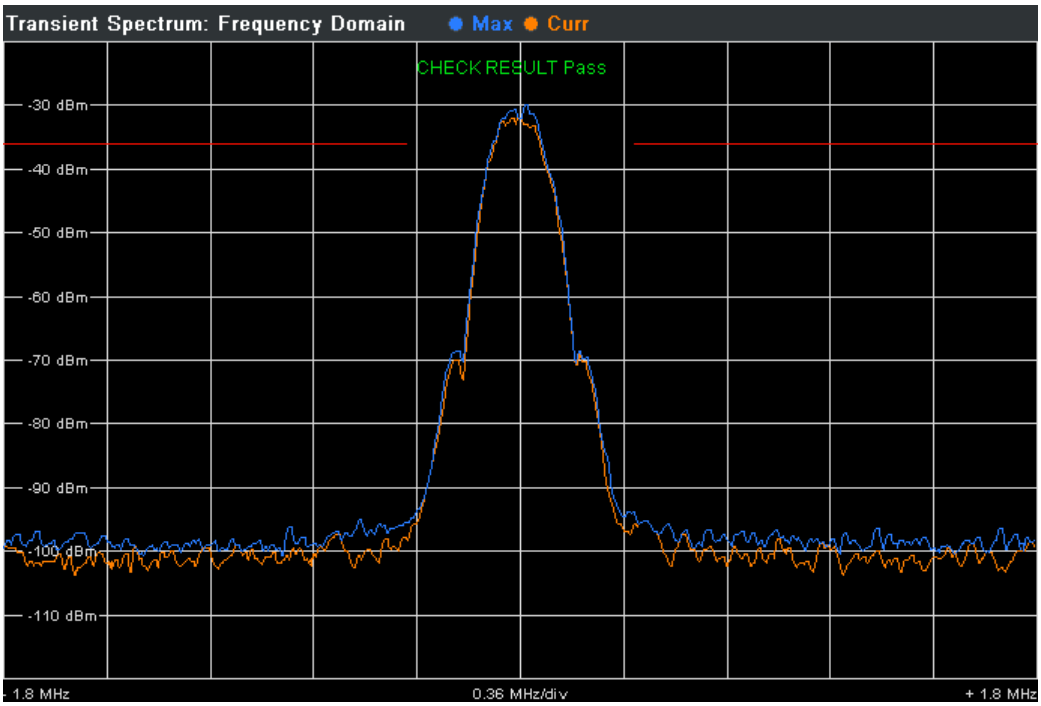


Fig. 3-16: Frequency Domain of Transient Spectrum with traces and limits (red)

Transient Spectrum: List						
Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
400	- 65.2	- 95.8	59.83	- 64.1	- 94.7	58.67
600	- 67.6	- 98.2	62.23	- 68.1	- 98.8	62.76
1200	- 68.2	- 98.8	62.85	- 67.7	- 98.3	62.35
1800	- 67.6	- 98.2	62.24	- 68.2	- 98.8	62.80

Fig. 3-17: Result Table in Transient Spectrum

To start a "Transient Spectrum" measurement, select: "Spectrum > Transient Spectrum" (see "Transient Spectrum" on page 83) and then start a measurement (RUN SINGLE/RUN CONT key).

Transient Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "Transient Spectrum" softkey is not available, include "Transient Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

The following default settings are used for "Transient Spectrum" measurements.

Setting	Default
Measurement Scope	The slot scope defined by First Slot to measure and Number of Slots to measure in "Measurement Settings" (see chapter 3.2.8, "Defining the Scope of the Measurement", on page 43).
Averaging Configuration	Number of frames as selected in "Statistic Count" in "General Settings" (see "Statistic Count" on page 60).
Limit Check	According to standard. • Frequency Domain: Limit check of maximum (Max) trace • List: Limit check of absolute and relative scalar values • The limit masks are generated adaptively from the measured signal. • The limits depend on the following parameters: – Frequency band (not for MS) – Burst Type / Modulation / Filter (not for MS) – The measured reference (burst) power

3.1.11 Wide Modulation Spectrum

The "Wide Modulation Spectrum" measurement measures the spectrum due to modulation at offset frequencies up to 6 MHz from the carrier. In principle, this measurement provides the same functionality as the existing "Modulation Spectrum List" measurement (see chapter 3.1.9, "Modulation Spectrum", on page 23), however the measured offset frequencies are extended past the current limit of 1.8 MHz up to 6 MHz. The full list of measured frequencies and filter bandwidths are listed in table 3-4.

Contrary to the "Modulation Spectrum" measurement, the "Wide Modulation Spectrum" measurement uses a series of gated zero-span measurements. This approach provides improved measurement dynamics compared to the "Modulation Spectrum" approach that is based on captured I/Q data.

To start a "Wide Modulation Spectrum" measurement, select "Wide Spectrum > Wide Mod Spectrum" (see "Wide Mod Spectrum" on page 84).

Wide modulation spectrum measurements are not available for signals from the Digital Baseband Interface (R&S FSV-B17).

Table 3-4: Frequencies and filter bandwidths in wide modulation spectrum measurements

Offset Frequency (kHz)	RBW (kHz)	VBW (kHz)
± 100	30	30
± 200	30	30
± 250	30	30
± 400	30	30
± 600	30	30
± 800	30	30
± 1000	30	30
± 1200	30	30
± 1400	30	30
± 1600	30	30
± 1800	30	30
± 2000	100	100
± 2200	100	100
± 2400	100	100
± 2600	100	100
± 2800	100	100
± 3000	100	100
± 3200	100	100
± 3400	100	100
± 3600	100	100
± 3800	100	100
± 4000	100	100
± 4200	100	100
± 4400	100	100
± 4600	100	100
± 4800	100	100
± 5000	100	100
± 5200	100	100
± 5400	100	100

Offset Frequency (kHz)	RBW (kHz)	VBW (kHz)
± 5600	100	100
± 5800	100	100
± 6000	100	100

The measurement can be performed using either the "External" or "Power" trigger modes (see chapter 3.2.6, "Trigger settings", on page 38). The trigger signal must be received once per GSM frame.

When using a power trigger, every active burst in the frame is measured. It is therefore important that all active bursts in the frame have the same modulation and filter type, otherwise the measurement results are not standard conformant.

Power trigger operation is not recommended for modulation formats that have zero-crossings (i.e. all except GMSK, QPSK and 8PSK). Therefore, the power trigger should only be used for GMSK,QPSK and 8PSK bursts. For 16QAM and 32QAM bursts an external trigger should be used.

It is recommended that you use the "Auto Set > Trigger" functionality of the R&S FSV-K10 application before starting the wide modulation list measurement. This automatically determines the appropriate "Trigger Offset" for the given frame configuration and the signal under test (see "Trigger Offset" on page 60).

Contrary to "Modulation Spectrum", the Wide Modulation Spectrum measurement is performed in gated zero-span mode, where the gating parameters (offset and length) are calculated based on the user-defined "Trigger Offset" and "Frame Configuration" settings. 50-90% of the active part of the "Slot to Measure" (excluding TSC) are measured. This approach provides improved measurement dynamics compared to the "Modulation Spectrum" approach that is based on captured I/Q data.

Wide Modulation Spectrum: List

Offset	Lower			Upper		
/kHz	/dB	/dBm	Δ to Lim	/dB	/dBm	Δ to Lim
2600	- 81.5	- 90.5	25.54	- 81.6	- 90.6	25.58
2800	- 81.9	- 90.9	25.86	- 81.6	- 90.6	25.61
3000	- 81.7	- 90.7	25.74	- 82.1	- 91.1	26.13
3200	- 82.2	- 91.2	26.18	- 81.9	- 90.9	25.95
3400	- 82.1	- 91.1	26.14	- 82.5	- 91.5	26.55
3600	- 82.5	- 91.5	26.47	- 82.7	- 91.8	26.75
3800	- 82.8	- 91.8	26.77	- 82.3	- 91.4	26.36
4000	- 82.8	- 91.8	26.76	- 82.3	- 91.3	26.28
4200	- 82.6	- 91.6	26.64	- 82.7	- 91.7	26.71
4400	- 83.3	- 92.3	27.31	- 82.7	- 91.7	26.67
4600	- 83.4	- 92.4	27.40	- 83.3	- 92.3	27.30
4800	- 83.2	- 92.2	27.21	- 83.4	- 92.4	27.37
5000	- 83.6	- 92.6	27.62	- 83.1	- 92.1	27.07
5200	- 83.5	- 92.5	27.52	- 83.2	- 92.2	27.19
5400	- 83.6	- 92.6	27.59	- 83.7	- 92.8	27.76
5600	- 83.0	- 92.0	27.04	- 83.4	- 92.4	27.39
5800	- 83.4	- 92.4	27.41	- 83.2	- 92.2	27.23

Fig. 3-18: Results Table in Wide Modulation Spectrum

The following default settings are used for a "Wide Modulation Spectrum" measurement.

Setting	Default
Measurement Scope	The slot selected as "Slot to measure" in "Measurement Settings" (see "Slot to Measure" on page 65).
Averaging Configuration	Number of bursts as selected in "Statistic Count" in "General Settings""Statistic Count" on page 60.
Limit Check	According to standard. • List: Limit check of absolute and relative scalar values • The limits depend on the following parameters: – Frequency band – Device Type (only BTS type, not MS type) – Burst Type / Modulation / Filter - limits are different for Higher Symbol Rate and Wide Pulse Filter (case 2) and others (case 1), see 3GPP TS 45.005, chapter 4.2.1.3 – The measured reference power (30 kHz bandwidth) – Number of carriers for multi-carrier BTS. The limit is relaxed by 10*log10(N) dB for offset frequencies ≥1.8 MHz, see 3GPP TS 45.005 chapter 4.2.1.2

Remote commands

The "Wide Modulation Spectrum" measurement is started using the `CONFigure:WSPectrum:MODulation[:IMMediate]` command.

The gating parameters of the "Wide Modulation Spectrum" measurement can be queried using `READ:WSPectrum:MODulation:GATing?`.

The results of the "Wide Modulation Spectrum" measurement can be queried using `READ:WSPectrum:MODulation[:ALL]?` on page 236.

3.2 Further Information

This chapter provides further information on the GSM standard, the corresponding measurement settings and results for the R&S FSV-K10 application.

3.2.1 List of abbreviations

16QAM	16-ary Quadrature Amplitude Modulation
32QAM	32-ary Quadrature Amplitude Modulation
3GPP	3rd Generation Partnership Project
8PSK	Phase Shift Keying with 8 phase states
AQPSK	Adaptive Quadrature Amplitude Modulation
ARFCN	Absolute Radio Frequency Channel Number
BTS	Base Transceiver Station
DL	Downlink (MS to BTS)
DUT	Device Under Test
EDGE	Enhanced Data Rates for GSM Evolution
EGPRS	Enhanced General Packet Radio, synonym for EDGE.
EGPRS2	Enhanced General Packet Radio and support of additional modulation/coding schemes and higher symbol rate.
FDMA	Frequency Division Multiplex Access
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
HSCSD	High-Speed Circuit-Switch Data

IF	Intermediate Frequency
MS	Mobile Station
OOS	Origin Offset Suppression
PCL	Power Control Level
PvT	Power vs Time
QPSK	Quadrature Phase Shift Keying
SCPIR	Subchannel Power Imbalance Ratio
SFH	Slow Frequency Hopping
TDMA	Time Division Multiplex Access
TSC	Training Sequence Code
UL	Uplink (BTS to MS)
VAMOS	Voice services over Adaptive Multi-user Channels on One Slot
YIG	Yttrium Iron Garnet

3.2.2 Short description of GSM (GMSK, EDGE and EDGE Evolution)

The GSM (Global System for Mobile Communication) standard describes the GSM mobile radio network that is in widespread use today. In a first step to enhance this network, 8PSK modulation has been defined in addition to the existing GMSK (Gaussian Minimum Shift Keying) modulation. With 8PSK, the mobile or base station operates in the EDGE mode. While the 8PSK modulation transmits 3 bits within a symbol, GMSK can only transmit 1 bit within a symbol.

In a second step to enhance this network, higher symbol rate (HSR), QPSK, 16QAM, and 32QAM modulation, narrow and wide pulse shapes for the TX filter have been defined. Here, EDGE Evolution and EGPRS2 are synonyms for this second enhancement.

This means that GSM includes different modes: GMSK, EDGE and EDGE Evolution. The terms EDGE and EDGE Evolution are used here only when there are significant differences between the modes. In all other cases, the term GSM is used.

A TDMA (Time Division Multiple Access) and FDMA (Frequency Division Multiple Access) scheme is used to transfer data in the GSM network. This means that the digital information is transmitted discretely in the time domain (mainly used to distinguish between different users) as well as in the frequency domain (mainly used to distinguish between BTS).

The time domain is divided into slots with a duration of 576.923 µs (exact: 3/5200 s). 8 slots (with number 0 to 7) are combined into 1 frame with a duration of approx. 4.6154 ms (exactly: 3/650 s).

Multiframes and superframes

Frames can be grouped into a multiframe consisting of either 26 (for support traffic and associated control channels) or 51 (for all other purposes) frames. Multiframes can be grouped to superframes consisting of either 51 26-frame or 26 51-frame multiframes.

Multiframes and superframes are not of relevance for the physical measurements on the GSM system and thus not discussed in detail here.

A mobile phone, therefore, does not communicate continuously with the base station; instead, it communicates discretely in individual slots assigned by the base station during connection and call establishment. In the simplest case, 8 mobiles share the 8 slots of a frame (TDMA).

The frequency range assigned to GSM is divided into frequency bands, and each band, in turn, is subdivided into channels.

Each frequency channel is identified by its center frequency and a number, known as the ARFCN (Absolute Radio Frequency Channel Number), which identifies the frequency channel within the specific frequency band. The GSM channel spacing is 200 kHz.

Communication between a mobile and a base station can be either frequency-continuous or frequency-discrete – distributed across various frequency channels (FDMA). In the standard, the abbreviation "SFH" (slow frequency hopping) is used to designate the latter mode of communication.

Base stations and mobiles communicate in different frequency ranges; the mobile sends in the "uplink" (UL), and the base station in the "downlink" (DL).

The frequencies specified in the standard plus their channel numbers (ARFCN) are shown in the figure and table below.

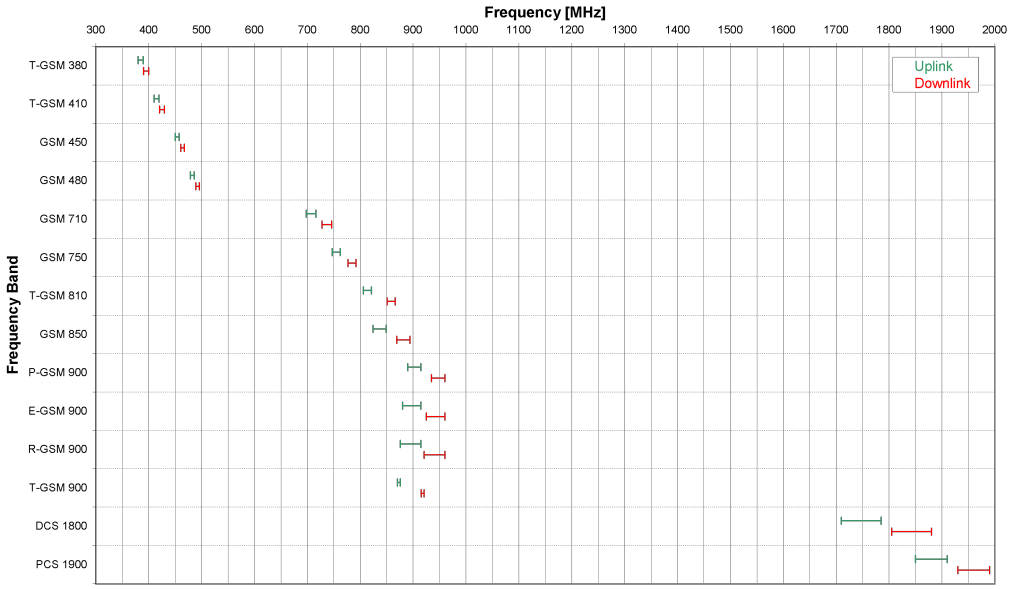


Fig. 3-19: The frequencies specified in the GSM standard

Table 3-5: Frequencies and channel numbers (ARFCN) in the GSM standard

Band Class	UL [MHz]	Frequency	DL [MHz]	Frequency	Frequency Middle	Band	UL-DL Shift	ARFCN	
	Low.	Up.	Low.	Up.	UL	DL		Range 1	Range 2
T-GSM 380	380.2	389.8	390.2	399.8	385.0	395.0	10 MHz	0 … 48 [1]	–
T-GSM 410	410.2	419.8	420.2	429.8	415.0	425.0	10 MHz	0 … 48 [1]	–
GSM 450	450.4	457.6	460.4	467.6	454.0	464.0	10 MHz	259 … 293	–
GSM 480	478.8	486.0	488.8	496.0	482.4	492.4	10 MHz	306 … 340	–
GSM 710	698.0	716.0	728.0	746.0	707.0	737.0	30 MHz	0 … 90 [1]	–
GSM 750	747.0	762.0	777.0	792.0	754.5	784.5	30 MHz	438 … 511	–
T-GSM 810	806.0	821.0	851.0	866.0	813.5	858.5	45 MHz	0 … 75 [1]	–
GSM 850	824.0	849.0	869.0	894.0	836.5	881.5	45 MHz	128 … 251	–
P-GSM 900	890.0	915.0	935.0	960.0	902.5	947.5	45 MHz	1 … 124	–
E-GSM 900	880.0	915.0	925.0	960.0	897.5	942.5	45 MHz	0 … 124	975 … 1023
R-GSM 900	876.0	915.0	921.0	960.0	895.5	940.5	45 MHz	0 … 124	955 … 1023
T-GSM 900	870.4	876.0	915.4	921.0	873.2	918.2	45 MHz	0 … 28 [1]	–
DCS 1800	1710.0	1785.0	1805.0	1880.0	1747.5	1842.5	95 MHz	512 … 885	–
PCS 1900	1850.0	1910.0	1930.0	1990.0	1880.0	1960.0	80 MHz	512 … 810	–

[1] For these frequency bands, there is no fixed ARFCN to frequency assignment, instead it is calculated with a formula taking an OFFSET parameter which is signaled by a higher layer of the network. The given ARFCNs assume an OFFSET value of 0.

Different modulation modes are used in the GSM mobile radio network. The original GSM modulation is GMSK, with the normal symbol rate (NSR) of approx. 270.833 ksymb/s (exact: 1625/6 ksymb/s). This corresponds to a bit rate of 270.833 kbit/s. The details are specified in chapter 2 of "3GPP TS 45.004" (see table 3-1).

The 8PSK (Phase Shift Keying) modulation, which is used within EDGE, was introduced to increase the data rate on the physical link. It uses the same symbol rate (the

normal symbol rate) as GMSK (270.833 ksymb/s), but has a bit rate of 3 × 270.833 kbit/s (exact: 812.5 kbit/s).

In this method, three bits represent a symbol. The details are specified in chapter 3 "3GPP TS 45.004" (see table 3-1).

The 16QAM and 32QAM (Quadrature Amplitude Modulation) modulation, which are used in EDGE Evolution, were introduced to further increase the data rate on the physical link. They use the normal symbol rate (270.833 ksymb/s), but have bit rates of 4 × 270.833 kbit/s or 5 × 270.833 kbit/s, respectively. The details are specified in chapter 4 "3GPP TS 45.004" (see table 3-1).

The QPSK, 16QAM and 32QAM modulation at higher symbol rate, which are used in EDGE Evolution, were introduced to further increase the data rate on the physical link. They use a higher symbol rate (325 ksymb/s), but have bit rates of 2 × 325 kbit/s, 4 × 325 kbit/s or 5 × 325 kbit/s, respectively. The details are specified in chapter 5 "3GPP TS 45.004" (see table 3-1).

The figure below shows the modulation spectrum for both GMSK and 8PSK.

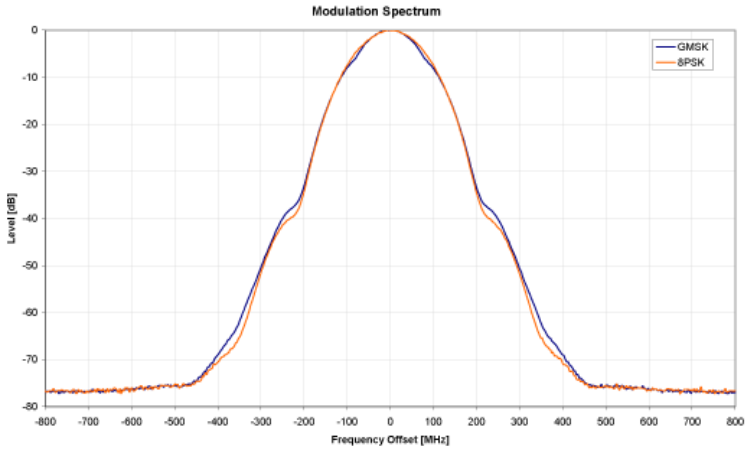


Fig. 3-20: GMSK and 8PSK modulation spectrum

The customers' demand for higher telecommunication speeds increases the demand for bandwidth. Therefore, the GSM standard has to evolve constantly. An example of this development is the introduction of the EDGE/EDGE Evolution specification and the GPRS/EGPRS2 and HSCSD modes.

Until now, each mobile could use only one slot per frame, but the new HSCSD (High Speed Circuit Switched Data) and GPRS (General Packet Radio Service) methods will allow permanent assignment of more than one slot per mobile, plus dynamic utilization of multiple slots.

The concept behind GPRS is dynamic assignment of up to 8 slots to each mobile for data transmission, depending on demand (and availability in the network).

HSCSD allows permanent assignment of up to 4 slots to a mobile.

The modulation modes GMSK, QPSK, 8PSK, 16QAM and 32QAM can be used with either normal or higher symbol rate and different TX filters.

What is significant for the R&S FSV-K10 application firmware in this respect is that the mobile can send power on a frequency in more than one slot.

3.2.3 Short Introduction to VAMOS

The "Voice services over Adaptive Multi-user Channels on One Slot" (VAMOS) extension to the GSM standard allows transmission of two GMSK users simultaneously within a single timeslot.

The standard specifies the downlink signal using Adaptive QPSK (AQPSK) modulation (see 3GPP TS 45.004), where two "subchannel" binary sequences are multiplexed to form a single QPSK sequence. The ratio of powers for the subchannels is referred to as the "Subchannel Power Imbalance Ratio" (SCPIR). One of the subchannels is interpreted as interference. The value of SCPIR affects the shape of the AQPSK constellation. For an SCPIR of 0dB the constellation is square (as in "normal" QSPK), while for other values of the SCPIR the constellation becomes rectangular.

A new set of training sequences (TSCs) has also been proposed (see 3GPP TS 45.002) for GMSK signals. The previous TSCs for GMSK bursts are listed as "Set 1", while the new TSCs are listed as "Set 2". AQPSK signals can be formed using TSCs from Set 1 on the first subchannel and TSCs from either Set 1 or Set 2 on the second subchannel. In case a TSC from Set 2 is used, it should match the TSC from Set 1, i.e. TSC<n> from Set 1 on subchannel 1 should match TSC<n> from Set 2 on subchannel 2, for n = 0..7.

The R&S FSV-K10 supports measurement of the following signals:

- GMSK bursts using the TSCs from Set 1 or Set 2
- AQPSK bursts with any combination of TSCs from Set 1 and 2 on the subchannels
- AQPSK bursts with a user-specified SCPIR

The following measurement of the above signals are supported:

- Auto Trigger-Offset
- Power vs Time
- Demod (Modulation Accuracy, EVM vs Time, Phase Error vs Time, Magnitude Error vs Time, Constellation)
- Spectrum (modulation, transient) including limit check
- Wide Spectrum (modulation) including limit check

Restriction

Auto Frame configuration only detects AQPSK normal bursts where the subchannels have a TSC according to table 3-6. The SCPIR value is detected with a resolution of 1 dB. To obtain reliable measurement results on AQPSK normal bursts, compare the auto-detected slot settings with the settings of your device under test.

Table 3-6: Required subchannel - TSC assignment for AQPSK auto frame configuration

AQPSK			Subchannel 2															
			TSC j (Set 1)								TSC j (Set 2)							
			0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Subchannel 1	TSC i (Set 1)	0			x	x				x	x							
		1			x	x				x		x						
		2	x	x				x					x					
		3	x	x			x							x				
		4				x			x						x			
		5			x				x							x		
		6					x	x									x	
		7	x	x														x

3.2.4 AQPSK Modulation

The AQPSK modulation scheme as proposed for use in GSM systems is illustrated in figure 3-21. First, the bits from two users (subchannels 1 and 2) are interleaved. The combined bit sequence is then mapped to an AQPSK constellation which depends on the SCPIR value. The AQPSK symbols are then modulated using the linearized GMSK pulse (see 3GPP TS 45.004).

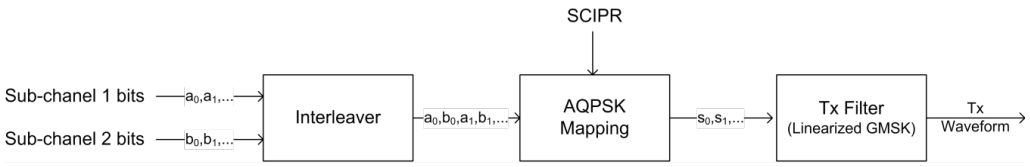


Fig. 3-21: AQPSK modulation scheme for GSM systems

The proposed AQPSK mapping (as assumed in the R&S FSV-K10 software) is given in table 3-7 and illustrated in figure 3-22, where the first (leftmost) bit corresponds to sub-channel 1 and the second (rightmost) bit corresponds to subchannel 2.

Table 3-7: AQPSK symbol mappings [reproduced from 3GPP TS 45.004]

Modulating bits for a_i, b_i	AQPSK symbol in polar notation s_i
(0,0)	$e^{j\alpha}$
(0,1)	$e^{-j\alpha}$
(1,0)	$-e^{-j\alpha}$
(1,1)	$-e^{j\alpha}$

The AQPSK modulation constellation diagram is shown in figure 3-22, where the value α is an angle related to the SCPIR as follows:

$SCPIR_{dB} = 20*\log_{10}[\tan(\alpha)\ ]$ dB

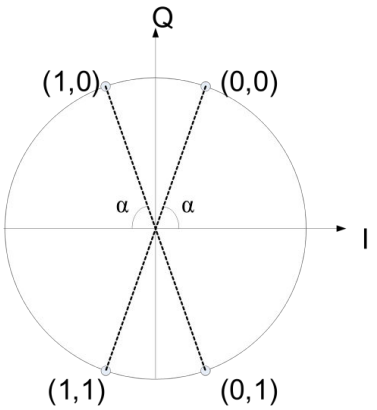


Fig. 3-22: AQPSK constellation [reproduced from 3GPP change request document GP-100275].

3.2.5 Transducer factors

Transducer factors (frequency response correction of external components like power splitters, cables or attenuator pads) are not supported within the R&S FSV-K10 option.

3.2.6 Trigger settings

The GSM measurements can be performed in "Free Run" (untriggered) mode, however, an external trigger or a power trigger can speed up measurements. To perform measurements the R&S FSV-K10 needs the frame start as a time reference. The R&S FSV-K10 searches for a frame start after every IQ data capture. The required search effort depends on the trigger mode.

Note the following trigger mode settings:

- In "Free Run" mode, i.e. without any trigger, the GSM application totally relies on the frame/slot configuration to find the frame start. The start of a measurement is not triggered. Once a measurement is completed, another is started immediately. For an unambiguous frame configuration, the GSM application searches for the frame start inside the captured IQ data. This is the slowest frame search mode.
- With a "Power Trigger", the measurement is triggered by the power ramp of the received GSM bursts. Nevertheless the GSM application still relies on the frame/slot configuration to find the frame start inside the captured I/Q data. Once a measurement is completed, the GSM application waits for the next trigger event to start the next measurement. The search for the frame start is as in "Free Run" mode, except that I/Q capture is triggered.
- With the "External Trigger", the measurement is triggered by an external signal (connected to the "EXT TRIGGER" input of the R&S FSVR). The GSM application assumes that the frame start directly follows the trigger event. An external trigger requires a correct setting of the trigger offset. The search is faster compared to the free run and power trigger modes. Use an external trigger to maximize the mea-

surement speed or if the frame configuration is ambiguous (i.e. if the slot properties are cyclic with a cycle less than the frame duration).

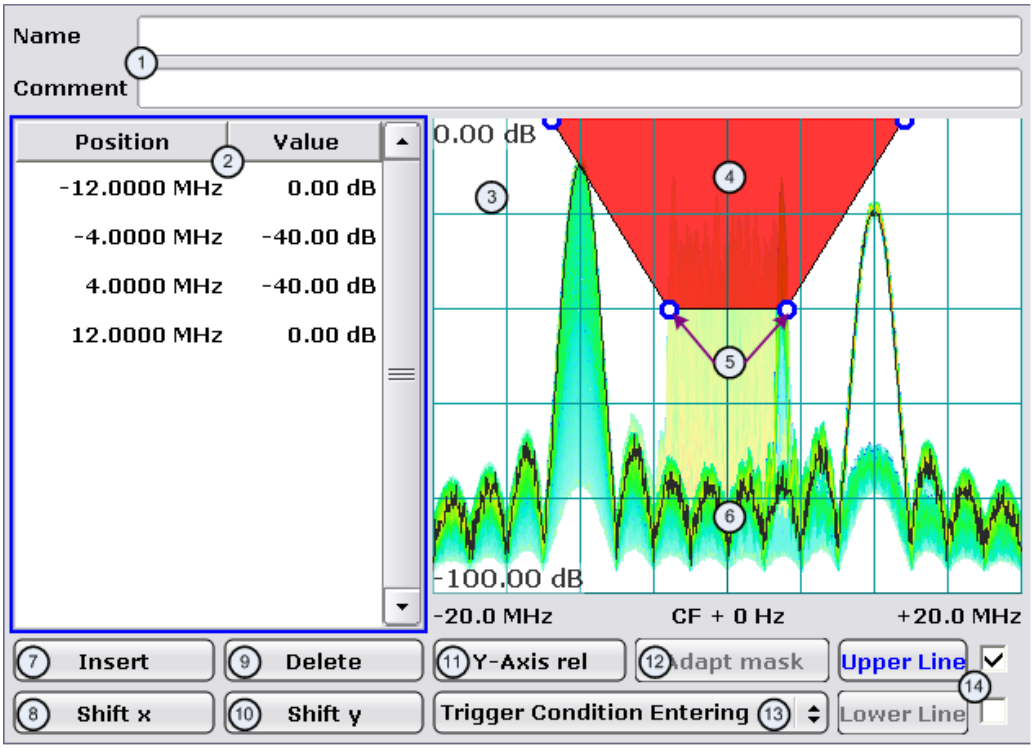
Refer to section "General Settings" on page 56 to learn more about appropriate trigger settings and the frame/slot configuration. Refer to section "Auto Set tab" on page 79 to learn more about auto setting the trigger offset.

3.2.7 Working with the Frequency Mask Trigger

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

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

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



1 = Name and description of the frequency mask
2 = Mask point table: table containing all mask points
3 = Preview pane
4 = Frequency mask preview: the area the frequency mask currently covers is red
5 = Frequency mask data points: define the shape of the frequency mask
6 = Preview of the current measurement trace; type and shape depend on currently selected measurement
7 = Insert button: insert a new data points
8 = Shift X button: shifts the complete frequency mask horizontally
9 = Delete button: deletes an existing data points
10 = Shift Y button: shifts the complete frequency mask vertically
11 = Y-Axis Rel/Abs button: switches between relative (dB) and absolute (dBm) amplitude values

12 = Adapt Mask button: creates a frequency mask automatically
13 = Trigger Condition menu: sets the trigger condition
14 = Activate Line buttons: select the upper and lower frequency mask; check marks next to the buttons activate and deactivate a line

3.2.7.1 Creating a Frequency Mask

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

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

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

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

Remote command:
`CALCulate<n>:MASK:COMMent` on page 100
`CALCulate<n>:MASK:NAME` on page 102

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

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

Remote command:
`CALCulate<n>:MASK:SPAN` on page 103

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

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

Remote command:
`CALCulate<n>:MASK:LOWer[:STATe]` on page 101
`CALCulate<n>:MASK:UPPer[:STATe]` on page 104

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

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

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

Remote command:
`TRIGger<n>[:SEQuence]:MASK:CONDition` on page 247

3.2.7.2 Editing Mask Points

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

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

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

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

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

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

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

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

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

Remote command:
CALCulate<n>:MASK:LOWer[:DATA] on page 102
CALCulate<n>:MASK:UPPer[:DATA] on page 104

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

Remote command:
CALCulate<n>:MASK:LOWer:SHIFt:X on page 101
CALCulate<n>:MASK:LOWer:SHIFt:Y on page 101
CALCulate<n>:MASK:UPPer:SHIFt:X on page 103
CALCulate<n>:MASK:UPPer:SHIFt:Y on page 103

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

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

Remote command:
CALCulate<n>:MASK:UPPer[:DATA] on page 104

3.2.7.3 Managing Frequency Masks

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

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

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

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

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

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

Remote command:
Path selection:
CALCulate<n>:MASK:CDIRectory on page 100
Load mask:
CALCulate<n>:MASK:NAME on page 102

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

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

Remote command:
CALCulate<n>:MASK:DELete on page 101

3.2.8 Defining the Scope of the Measurement

The R&S FSV-K10 is a slot-based application. It can measure up to 8 consecutive GSM slots (1 frame) and store the power results for all slots ("Power vs Time" measurement, see chapter 3.1.8, "Power vs Time", on page 20).

Within this measurement interval (defined by First Slot to measure and Number of Slots to measure), a single slot ("Slot to Measure" on page 65) is selected for a more detailed analysis (e.g. "Modulation Accuracy" measurement, see chapter 3.1.2, "Modulation Accuracy", on page 13). The Slot to Measure provides:

- The reference power and time reference for the "Power vs Time" measurement (see chapter 3.1.8, "Power vs Time", on page 20). The masks for all slots are time-aligned according to the timing of the Slot to Measure.
- The results of all "Modulation Spectrum" diagrams are based on the "Slot to Measure" on page 65 (see chapter 3.1.9, "Modulation Spectrum", on page 23). (The results of all "Transient Spectrum" diagrams are based on the slot scope, i.e. on the interval defined by the First Slot to measure and the Number of Slots to measure, see chapter 3.1.10, "Transient Spectrum", on page 26).
- All results that require demodulation of one slot and their statistical analysis (e.g. Modulation Accuracy, Phase Error vs Time, and EVM vs Time).

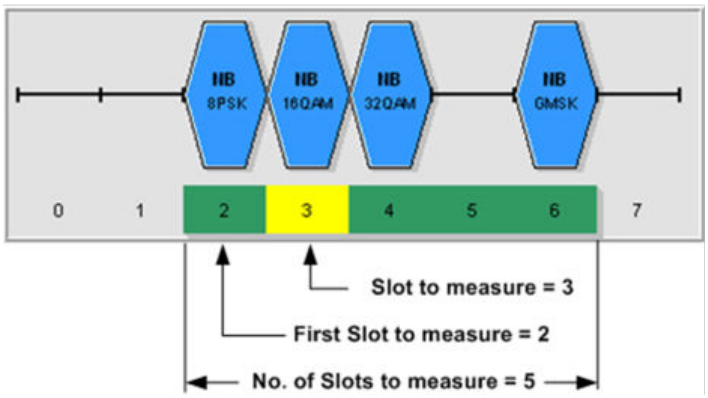
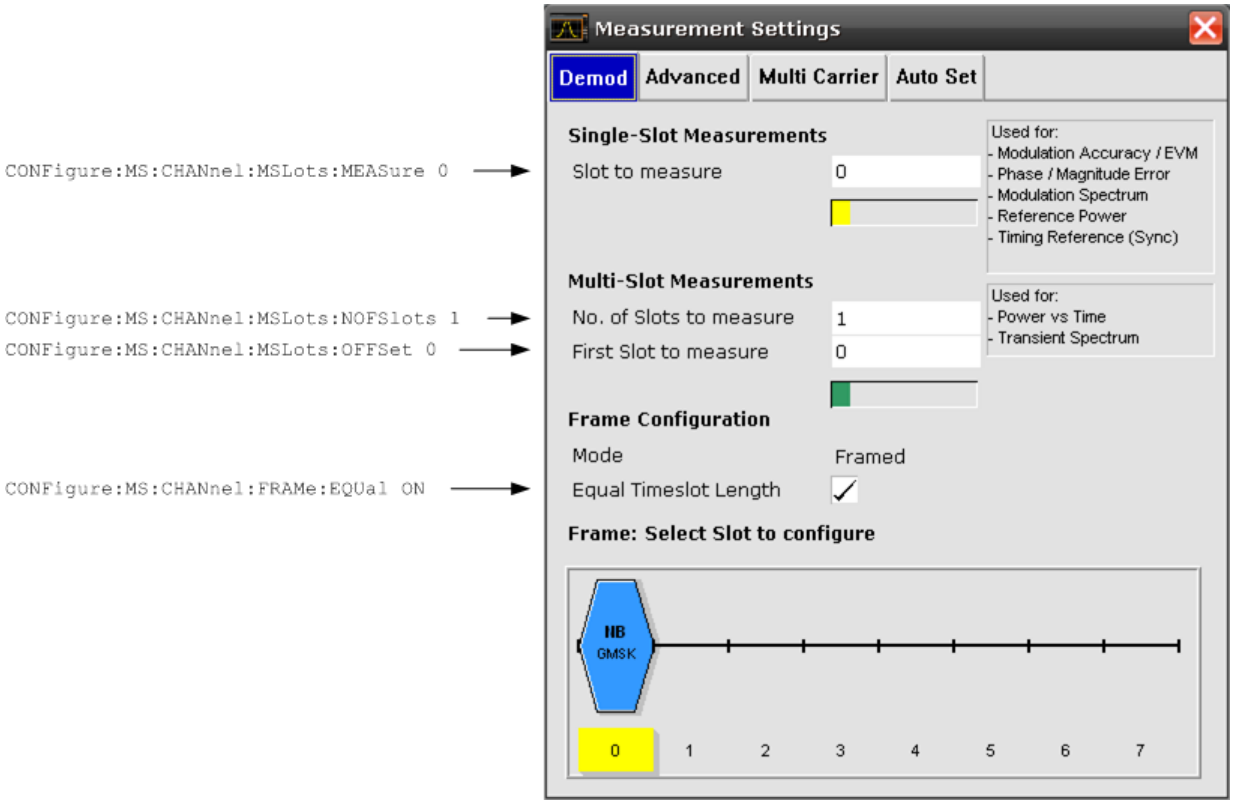


Fig. 3-23: Concept of "First Slot to measure", "Number of Slots to measure" and "Slot to Measure"

The measurement interval is set in the Demod tab of the Meas Settings dialog, and it is visualized above by a filled green box and the parameter Slot to Measure is visualized by a filled yellow box.



3.2.9 Overview of filters in R&S FSV-K10

The R&S FSV-K10 measurement application requires a number of filters for different stages of signal processing. These include the "Multi Carrier" filter (for Multi Carrier base station measurements only), the "Power vs Time" filter and the "Measurement"

filter. A signal flow diagram is shown in figure 3-24 to illustrate where the different filters are used.

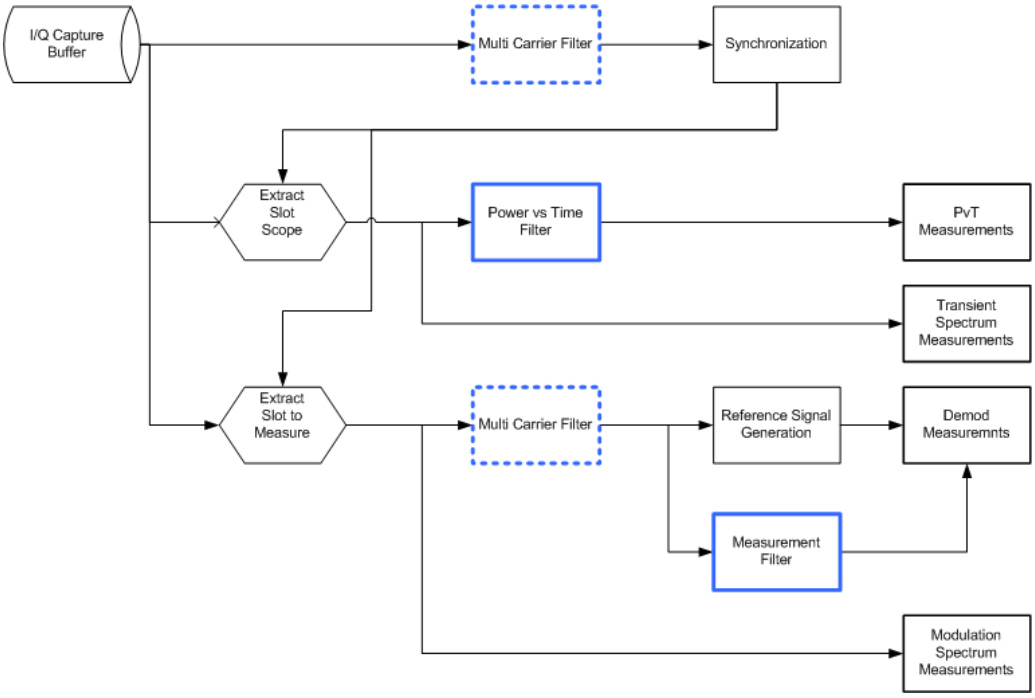


Fig. 3-24: Signal flow diagram highlighting filtering operations

3.2.9.1 Multi Carrier Filter

The "Multi Carrier" filter is only applied to the captured data if the "Multi Carrier BTS" option is selected (see "Multicarrier BTS" on page 78). This filter is used to suppress neighboring channels which may disturb measurement of the channel of interest. The output from the "Multi Carrier" filter is used to perform synchronization and demodulation. This filter is not applied for Power vs Time or Spectrum measurements. For suppression of neighboring channels in the Power vs Time measurement, see the Power vs Time Filter. The frequency response of the "Multi Carrier" filter is shown in figure 3-25.

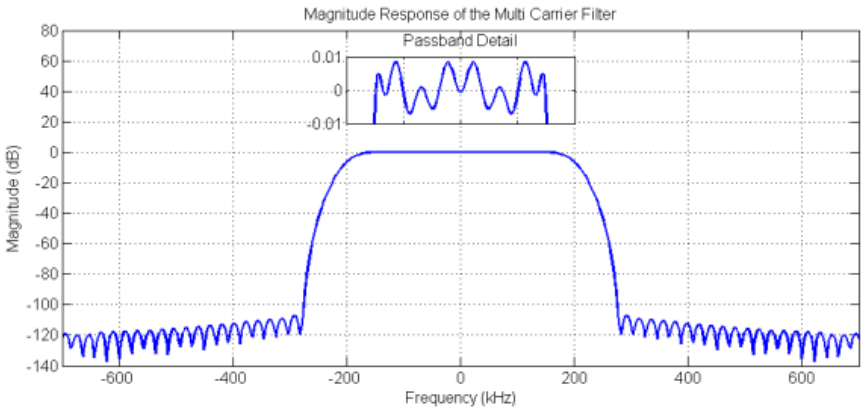


Fig. 3-25: Frequency Response of the Multi Carrier Filter

3.2.9.2 Power vs Time Filter

The "Power vs Time" filter is used to suppress out-of-band interference in the Power vs Time measurement.

The following filters are available:

- 1 MHz Gauss
- 500 kHz Gauss
- 600 kHz
- 400 kHz MC
- 300 kHz MC

The last two "MC" filters are only available for Multi Carrier BTS measurements, i.e. if the "Multi Carrier BTS" option is selected (see "Multicarrier BTS" on page 78). The magnitude and step responses of the different "Power vs Time" filters are shown in figure 3-26 and figure 3-27, respectively. In general, the smaller the filter bandwidth, the worse the step response becomes (in terms of "ringing" effects) and the better the suppression of interference at higher frequencies. Gaussian type filters are especially useful for signals with "sharp" edges as the step response does not exhibit overshoot.

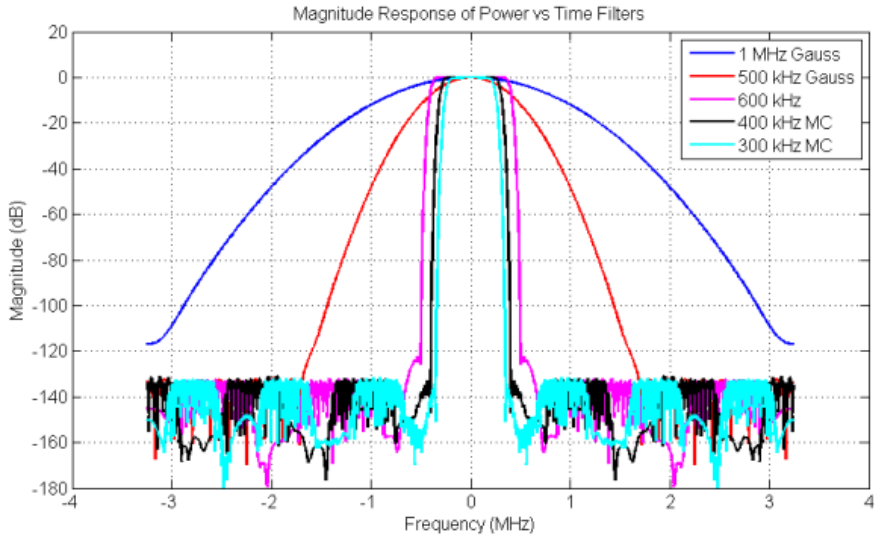


Fig. 3-26: Magnitude Response of the Power vs Time Filters

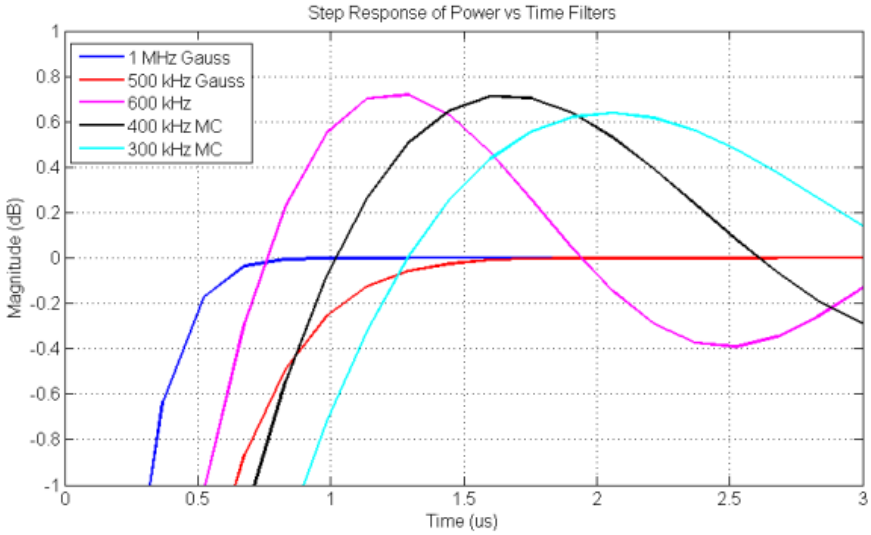


Fig. 3-27: Step Response of the Power vs Time Filters

3.2.9.3 Measurement Filter

The "Measurement" filter is used to limit the bandwidth of the demodulation measurements and is described in the 3GPP Standard document *TS 45.005 V8.5.0* (2009-05) for QPSK, 8PSK, 16QAM and 32QAM as follows:

- a raised-cosine filter with roll-off 0.25 and single side-band 6 dB bandwidth 90 kHz for normal symbol rate and for higher symbol-rate using narrow bandwidth pulse-shaping filter
- a raised-cosine filter with roll-off 0.25 and single side-band 6 dB bandwidth 108 kHz for higher symbol-rate using wide bandwidth pulse-shaping filter

In addition to these filters, a "Measurement" filter for GMSK is used in the R&S FSV-K10 option to limit the effects of out-of-band interference due to the high sampling rate of 6.5 MHz which is used. The magnitude responses of all the "Measurement" filters are shown in figure 3-28.

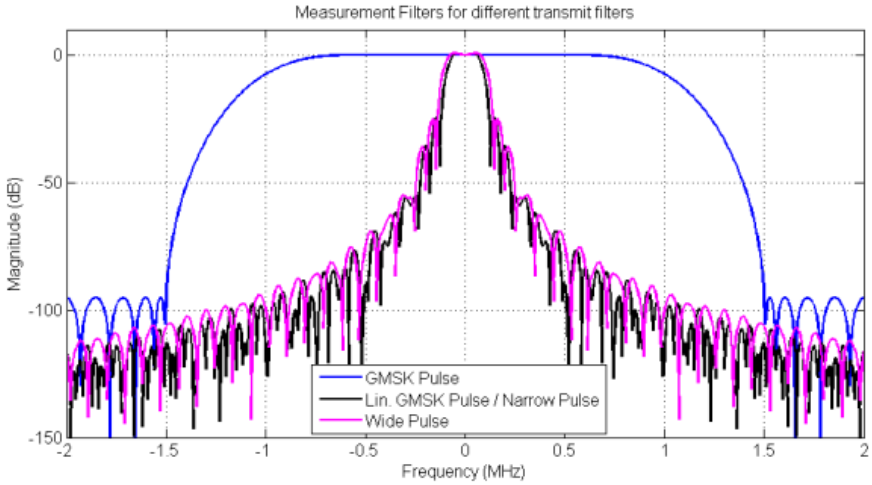


Fig. 3-28: Magnitude Responses of Measurement Filters for Demodulation Measurements

3.2.10 Definition of the Symbol Period

The following sections define the symbol period for various modulation types.

3.2.10.1 GMSK Modulation (Normal Symbol Rate)

The GMSK frequency pulse is defined in the standard document "3GPP TS 45.004" as a Gaussian pulse convolved with a rectangular pulse, as illustrated at the top of figure 3-29. With the frequency pulse denoted g(t), the phase of a GMSK signal due to a sequence of symbols {α} is defined in the standard as:

$$\varphi(t') = \sum_i \alpha_i \, \pi h \int_{-\infty}^{t'-iT} g(u)\, du$$

where T is the normal symbol period, and the modulating index is chosen such that the maximum phase change of π/2 radians per data interval is achieved.

Note that the standard specifies:

"The time reference t' = 0 is the start of the active part of the burst as shown in figure 3-29. This is also the start of the bit period of bit number 0 (the first tail bit) as defined in 3GPP TS 45.002."

The phase change due to the first tail symbol is illustrated at the bottom of figure 3-29, where you can see that the "decision instant" corresponding to the center of the frequency pulse occurs at the beginning of the first symbol period, i.e. at t' = 0.

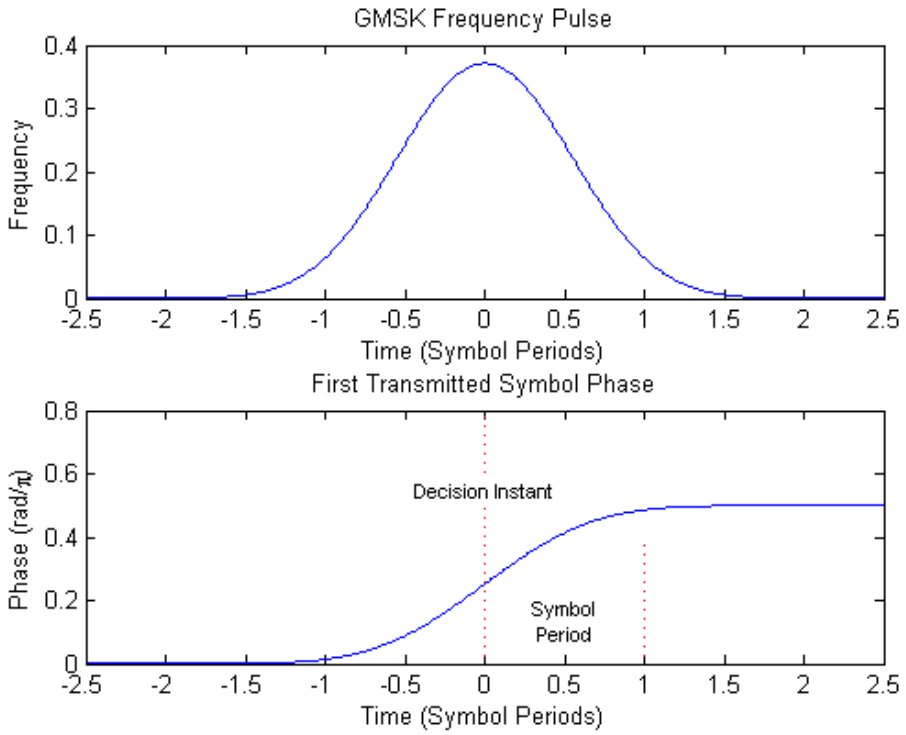


Fig. 3-29: GMSK Frequency Pulse (top) and phase of the first tail symbol (bottom)

3.2.10.2 8PSK, 16QAM and 32QAM Modulation (Normal Symbol Rate)

The EDGE transmit pulse is defined in the standard document "3GPP TS 45.004" as a linearised GMSK pulse, as illustrated at the top of figure 3-30. Note that according to the definition in the standard, the center of the pulse occurs at 2.5 T, where T is the normal symbol period. With the transmit pulse denoted as $c_0(t)$, the baseband signal due to a sequence of symbols $\{\hat{s}_i\}$ is defined in the standard as:

$$y(t') = \sum_i \hat{s}_i \cdot c_0(t' - iT + 2T)$$

Note that the standard specifies:

"The time reference t' = 0 is the start of the active part of the burst as shown in figure 3-30. This is also the start of the symbol period of symbol number 0 (containing the first tail bit) as defined in 3GPP TS 45.002."

The transmitted pulse for the first tail symbol is illustrated in the lower part of figure 3-30, where it can be seen that the "decision instant" corresponding to the center of the transmit pulse occurs in the center of the first symbol period, i.e. at t'=0.5T.

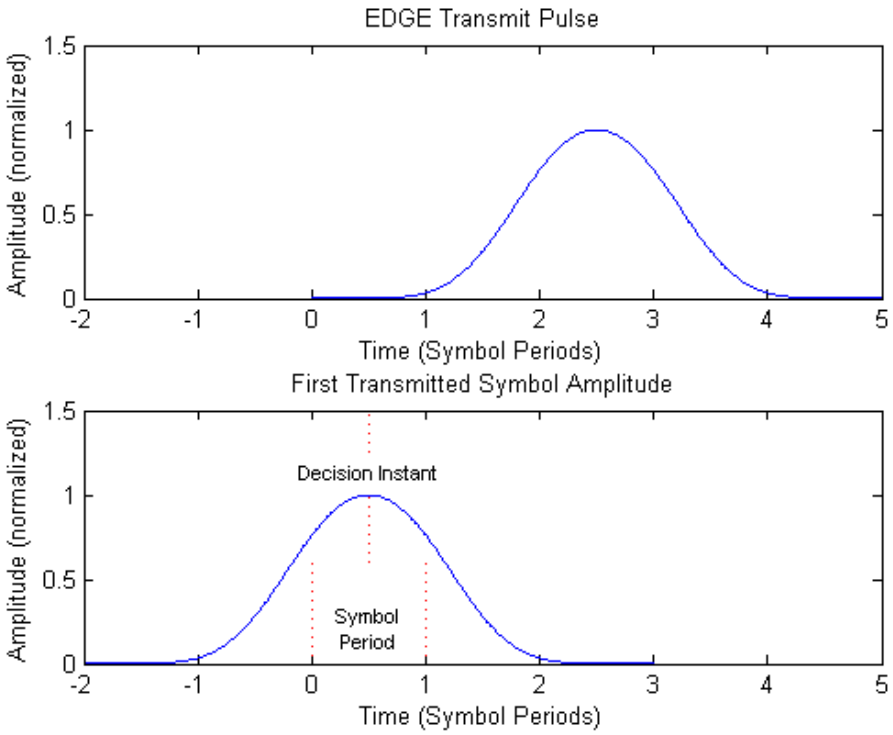


Fig. 3-30: EDGE transmit pulse (top) and the first transmitted symbol (bottom)

The description above also applies to the 16QAM and 32QAM modulations defined for EDGE Evolution, using the "normal" symbol rate.

3.2.10.3 QPSK, 16QAM and 32QAM Modulation (Higher Symbol Rate)

For the newer "reduced" symbol period (higher symbol rate) the standard document "3GPP TS 45.004" defines two transmit pulse shapes; the so-called "narrow" and "wide" pulses. The narrow pulse is the same linearised GMSK pulse as described in chapter 3.2.10.2, "8PSK, 16QAM and 32QAM Modulation (Normal Symbol Rate)", on page 49, while the wide pulse was designed based on a numerically optimized set of discrete filter coefficients. Both narrow and wide pulse shapes are illustrated at the top of figure 3-31, where you can see that the center of the pulse occurs at 3T, with T being the reduced symbol period. Let us denote the transmit pulse by c(t) (which may be either the narrow or wide pulse), then for a sequence of symbols $\{\hat{s}_i\}$ the transmitted signal is defined in the standard as:

$$y(t') = \sum_i \hat{s}_i \cdot c(t' - iT + 2.5T)$$

Note that the standard specifies:

"The time reference t' = 0 is the start of the active part of the burst as shown in figure 3-31. This is also the start of the symbol period of symbol number 0 (containing the first tail bit) as defined in 3GPP TS 45.002."

The transmitted pulse for the first tail symbol is illustrated at the bottom of figure 3-31, where you can see that the "decision instant" corresponding to the center of the transmit pulse occurs in the center of the first symbol period, i.e. at t'=0.5T.

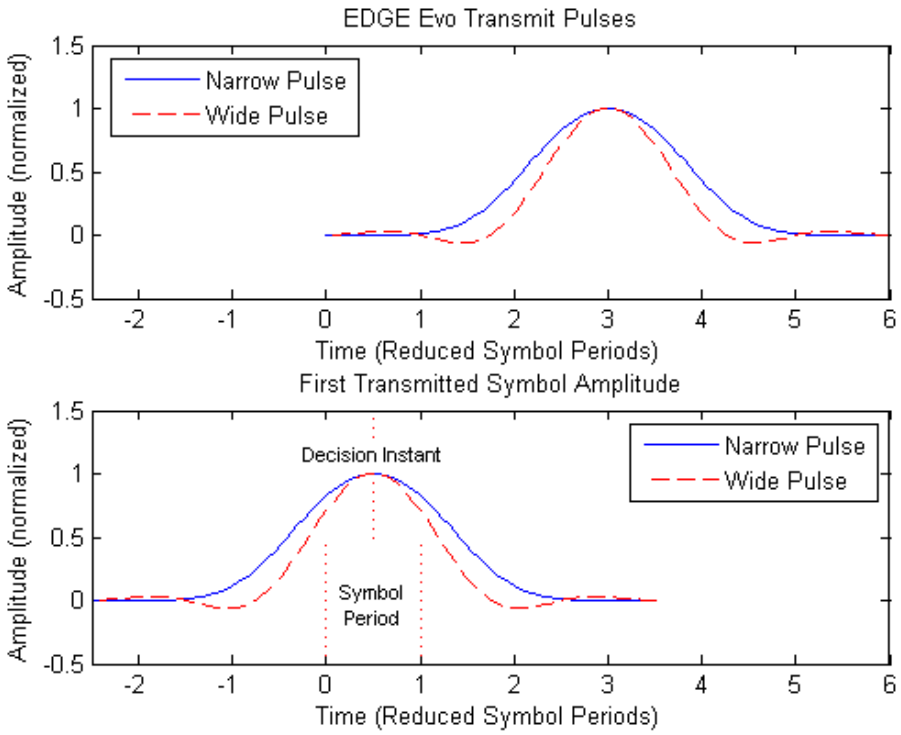


Fig. 3-31: EDGE Evolution transmit pulses (top) and the first transmitted symbols (bottom)

3.2.11 Timeslot Alignment

Reference Time

The definition of a "reference time" is necessary for the following description of timeslot alignment. In the standard document "3GPP TS 45.010", in Section 5.7 it is stated that:

"Irrespective of the symbol duration used, the center of the training sequence shall occur at the same point in time. "

This is illustrated in Figure 5.7.3 of the standard document "3GPP TS 45.010" which is reproduced below for convenience (figure 3-32). Due to this requirement, the "middle of midamble" or "center of Active Part" shall be used as the reference time when specifying timeslot alignment. Additionally, the "middle of midamble" is used for the alignment of the Power vs Time limit masks (see also "Limit Time Alignment" on page 72).

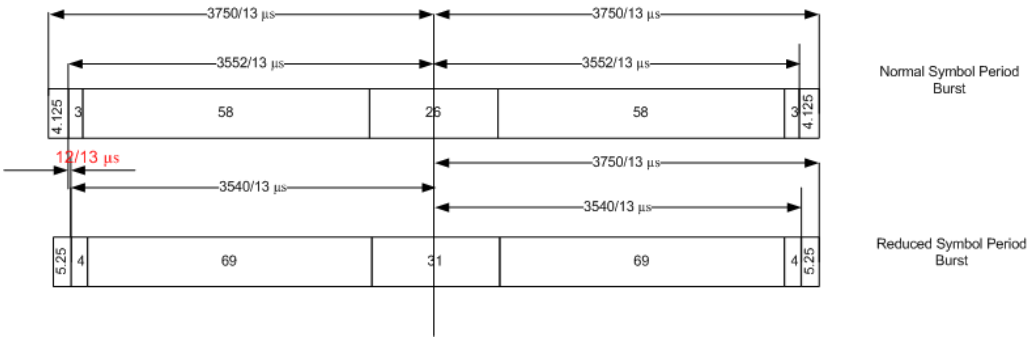


Fig. 3-32: Timing alignment between normal symbol period and reduced symbol period bursts

As described in chapter 3.2.10, "Definition of the Symbol Period", on page 48, the middle of midamble can be defined with respect to symbol periods and symbol decision instants. This is illustrated in figure 3-33. You can see that for normal symbol period bursts (Normal bursts), the middle of midamble for GMSK occurs exactly at the decision instant of symbol 74. However, for EDGE it occurs between the decision instants of symbols 73 and 74, while for reduced symbol period bursts (Higher Symbol Rate bursts), it occurs exactly at the decision instant of symbol 88.

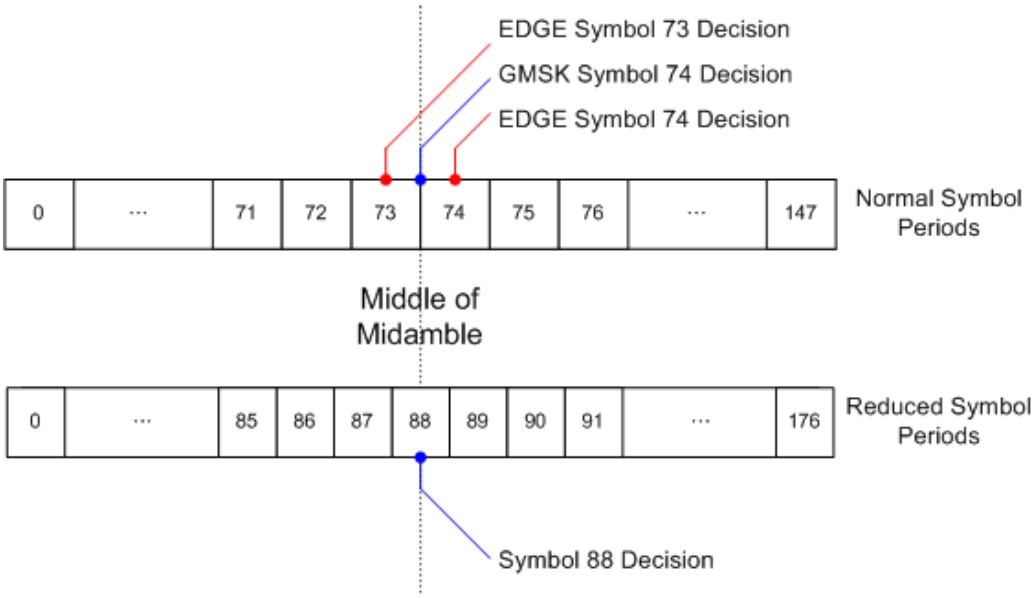


Fig. 3-33: Middle of midamble for normal and reduced symbol period bursts.

Timeslot Alignment

The standard document "3GPP TS 45.010" provides details on the alignment of slots within the GSM frame:

"Optionally, the BTS may use a timeslot length of 157 normal symbol periods on timeslots with TN = 0 and 4, and 156 normal symbol periods on timeslots with TN = 1, 2, 3, 5, 6, 7, rather than 156.25 normal symbol periods on all timeslots"

The alignment of slots therefore falls under the "Not Equal Timeslot Length" (Equal Timeslot Length = off) or the "Equal Timeslot Length" (Equal Timeslot Length = on) cri-

terion (see also "Equal Timeslot Length" on page 66), which are illustrated in figure 3-34.

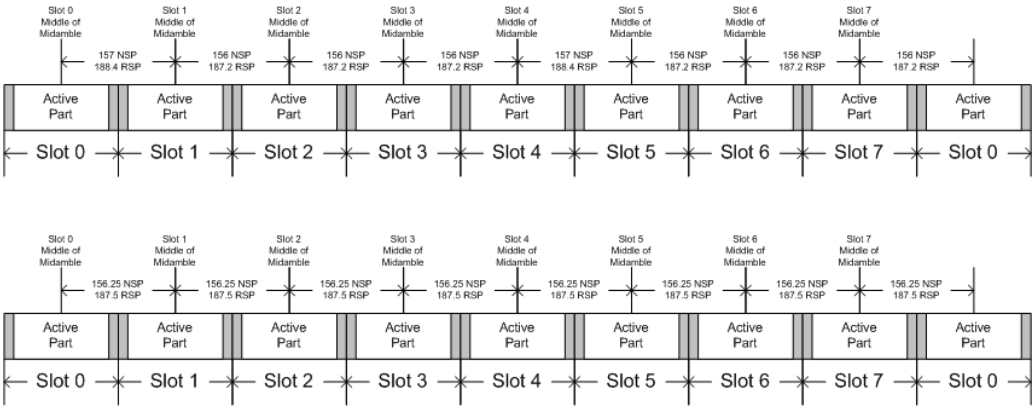


Fig. 3-34: "Not equal"(top) and "equal" (bottom) timeslot length criteria

Note that, since the reference point at the "middle of midamble" of each slot must coincide, the length of the guard interval between successive bursts will depend on both the timeslot length and the symbol rate of bursts in successive slots. As stated in the standard "3GPP TS 45.010", for the "Equal Timeslot Length" case:

"… if there is a pair of different symbol period bursts on adjacent timeslots, then the guard period between the two bursts shall be 8.5 normal symbol periods which equals 10.2 reduced symbol periods."

For the "Not Equal Timeslot Length" case, deriving the guard interval length is somewhat more complicated, and the possible values are summarized in Table 5.7.2 of "3GPP TS 45.010", reproduced below as table 3-8, for convenience:

Table 3-8: Guard period lengths between different timeslots

Burst Transition	Guard Period Between Timeslots (In terms of normal symbol periods)		Guard Period Between Timeslots (In terms of reduced symbol periods)	
	TS0 and TS1 or TS4 and TS5	Any other timeslot pair	TS0 and TS1 or TS4 and TS5	Any other timeslot pair
normal symbol period to normal symbol period	9	8	10.8	9.6
normal symbol period to reduced symbol period	9.25	8.25	11.1	9.9

Burst Transition	Guard Period Between Timeslots (In terms of normal symbol periods)		Guard Period Between Timeslots (In terms of reduced symbol periods)	
	TS0 and TS1 or TS4 and TS5	Any other time-slot pair	TS0 and TS1 or TS4 and TS5	Any other timeslot pair
reduced symbol period to normal symbol period	9.25	8.25	11.1	9.9
reduced symbol period to reduced symbol period	9.5	8.5	11.4	10.2

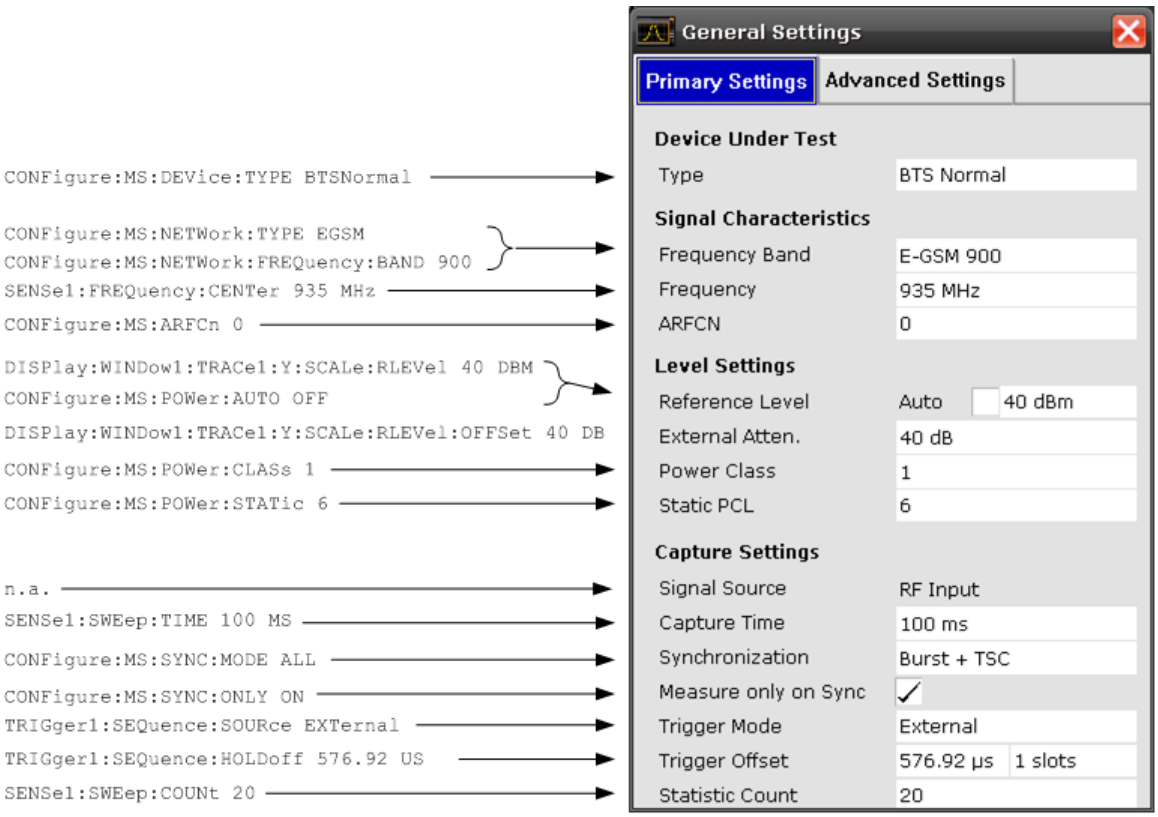
3.3 Softkeys and Settings of the GSM Menu

The following table shows all softkeys and settings available from the main menu of the GSM application.

Press the MEAS key to open this menu.

General Settings
Opens the "General Settings" dialog box.

Primary Settings ← General Settings
This tab contains the basic measurement settings.



Device Under Test: Type ← Primary Settings ← General Settings
To change the type of device under test (DUT), enter one of the following types:

- BTS Normal
- BTS Micro
- BTS Pico
- MS Normal
- MS Small

The default device type is "BTS Normal".

Remote command:
`CONFigure[:MS]:DEVice:TYPE` on page 123

Frequency Band ← Primary Settings ← General Settings
The following frequency bands are supported:

- T-GSM 380
- T-GSM 410
- GSM 450
- GSM 480
- GSM 710
- GSM 750
- T-GSM 810
- GSM 850
- P-GSM 900
- E-GSM 900
- R-GSM 900

- T-GSM 900
- DCS 1800
- PCS 1900

The default frequency band is E-GSM 900.

Remote command:
CONFigure[:MS]:NETWork[:TYPE] on page 130
CONFigure[:MS]:NETWork:FREQuency:BAND on page 131

Frequency ← Primary Settings ← General Settings
Specifies the center frequency of the signal to be measured. If the frequency is modified, the "ARFCN" is updated accordingly (see "ARFCN" on page 58).

Remote command:
[SENSe:]FREQuency:CENTer on page 239

ARFCN ← Primary Settings ← General Settings
To set the Absolute Radio Frequency Channel Number (ARFCN), enter the desired number in this field. Setting the ARFCN will update the Frequency.

Possible values are in the range from 0 to 1023, however, some values may not be allowed depending on the selected frequency band.

Remote command:
CONFigure[:MS]:ARFCn on page 106

Reference Level ← Primary Settings ← General Settings
Defines the reference level in dBm.

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

"AUTO" enables continuous auto levelling. In this case, the optimal reference level for the current measurement is defined automatically.

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel[:RF] on page 154
CONFigure[:MS]:POWer:AUTO on page 134

External Attenuation ← Primary Settings ← General Settings
Specifies the external attenuation or gain applied to the RF signal. A positive value indicates attenuation, a negative value indicates gain. Displayed power level values are shifted by this value.

This setting is not available for signals from the Digital Baseband Interface (R&S FSV-B17).

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet on page 154

Power Class ← Primary Settings ← General Settings
The following power classes are supported:

- 1, …, 8 (BTS)
- 1, …,5 (MS: GMSK)

- E1, E2, E3 (MS: all except GMSK)
- M1, M2, M3 (Micro BTS)
- P1 (Pico BTS)

The default power class is 2.

Remote command:
`CONFigure[:MS]:POWer:CLASs` on page 132

Signal Source ← Primary Settings ← General Settings
The following signal sources are supported:

- RF Input
- Digital Baseband (only with Digital Baseband Interface, R&S FSV-B17)

Remote command:
`INPut:SELect` on page 195

Capture Time ← Primary Settings ← General Settings
Specifies the time (and therefore the amount of IQ data) to be captured in a single measurement. If the capture time is too short, demodulation will fail. Choose e.g. 100 ms to run a measurement. Here the capture time can be entered in seconds.

Note: The duration of one GSM slot equals 15/26 ms = 0.576923 ms. The duration of one GSM frame (8 slots) equals 60/13 ms = 4.615384 ms.

Remote command:
`[SENSe:]SWEep:TIME` on page 240

Synchronization ← Primary Settings ← General Settings
Sets the synchronization mode of the R&S FSV-K10.

"Burst+TSC"	First search for the power profile (burst search) according to the frame configuration in the capture buffer. Second, inside the found bursts search for the TSC of the "Slot to measure" as given in the frame configuration. "Burst +TSC" is usually faster than "TSC" for bursted signals.
"TSC"	Search the capture buffer for the TSC of the "Slot to measure" as given in the frame configuration. This mode corresponds to a correlation with the given TSC. This mode can be used for continous (but framed) signals or bursted signals.
"Burst"	Search for the power profile (burst search) according to the frame configuration in the capture buffer. Note: For "Burst" no demodulation measurements (e.g. "Modulation Accuracy") are supported. Only "Power vs Time", "Modulation Spectrum", "Transient Spectrum" measurements are supported.

"None" Do not synchronize at all. If an external or power trigger is chosen, the trigger instant corresponds to the frame start.
Tip: Manually adjust the trigger offset to move the burst to be analyzed under the mask in the "Power vs Time" measurement.
Note: For "None" no demodulation measurements (e.g. "Modulation Accuracy") are supported. Only "Power vs Time", "Modulation Spectrum", "Transient Spectrum" measurements are supported.

Remote command:
`CONFigure[:MS]:SYNC:MODE` on page 136

Measure only on Sync ← Primary Settings ← General Settings
If activated (default), only results from frames (slots) where the "Slot to measure" was found are displayed and taken into account in the averaging of the results. The behavior of this option depends on the value of the Synchronization parameter.

Note: This parameter does not affect the "Wide Modulation Spectrum" measurement (see chapter 3.1.11, "Wide Modulation Spectrum", on page 27).

Remote command:
`CONFigure[:MS]:SYNC:ONLY` on page 137

Trigger Mode ← Primary Settings ← General Settings
The following trigger modes are supported:

- Free Run
- External
- Power
- Frequency Mask

The default mode is Free Run.

For further information refer to chapter 3.2.6, "Trigger settings", on page 38.

For more information on the Frequency Mask Trigger see chapter 3.2.7, "Working with the Frequency Mask Trigger", on page 39.

Remote command:
`TRIGger<n>[:SEQuence]:SOURce` on page 247

Trigger Offset ← Primary Settings ← General Settings
Specifies the time offset between the trigger event (e.g. for an external or power trigger) and the frame start of the GSM signal. The value can be entered either in seconds or in slots. For details refer to chapter 3.2.6, "Trigger settings", on page 38.

Note: The duration of one GSM slot equals 15/26 ms = 0.576923 ms. The duration of one GSM frame (8 slots) equals 60/13 ms = 4.615384 ms.

Remote command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 246

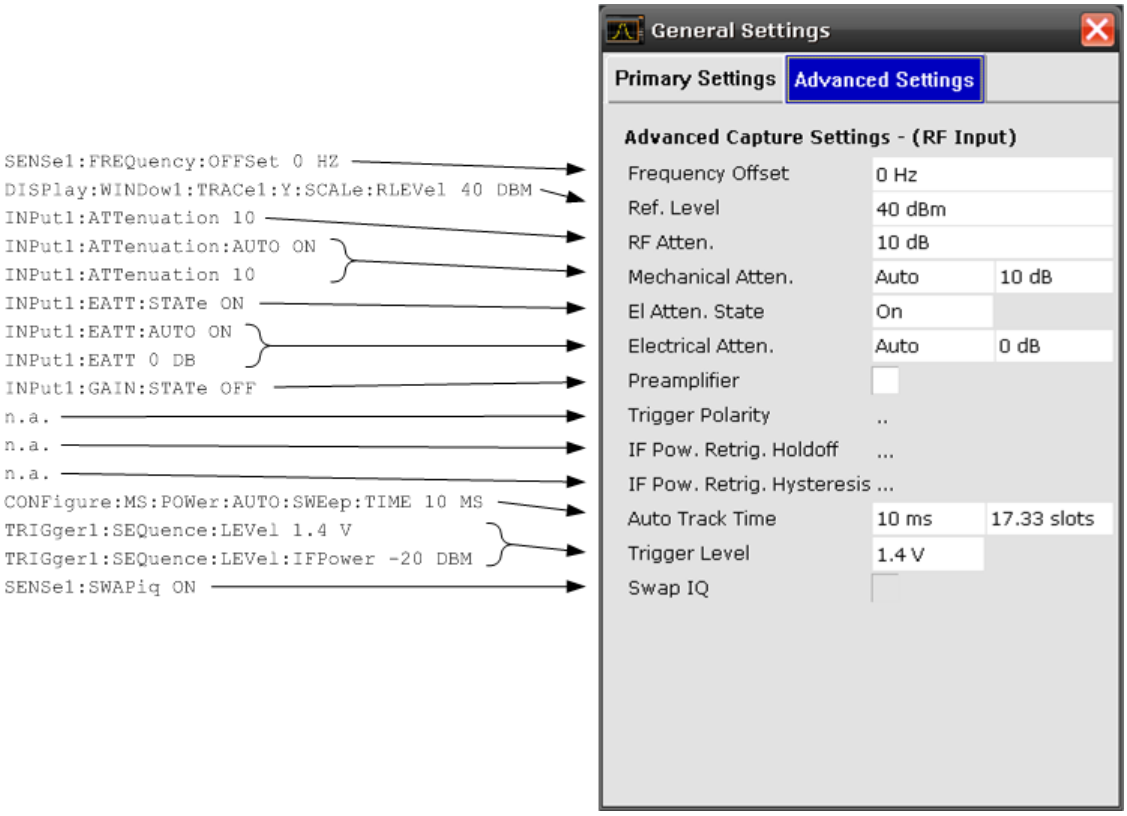
Statistic Count ← Primary Settings ← General Settings
In this field, the number of frames to be measured can be set. For measurements on the Slot to Measure, the statistic count corresponds to the number of bursts (slots).

The default value is 200 in accordance with the GSM standard.

Remote command:
[SENSe:]SWEep:COUNt on page 240

Advanced Settings tab ← General Settings
To modify advanced settings in more detail (e.g. to meet special measurement requirements), modify the values for this group of parameters.

Depending on the selected signal source the available parameters vary.



RF Input ← Advanced Settings tab ← General Settings
Settings for RF Input

Frequency Offset ← RF Input ← Advanced Settings tab ← General Settings
The frequency offset shifts the displayed frequency range by the specified offset.

Remote command:
[SENSe:]FREQuency:OFFSet on page 239

Ref. Level ← RF Input ← Advanced Settings tab ← General Settings
Defines the reference level in dBm.

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

Remote command:
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel[:RF] on page 154

RF Atten ← RF Input ← Advanced Settings tab ← General Settings
Sets the RF attenuation automatically as a function of the selected reference level. This ensures that the optimum RF attenuation is always used.

Remote command:
`INPut:ATTenuation:AUTO` on page 192
`INPut:ATTenuation` on page 192

Mechanical Atten ← RF Input ← Advanced Settings tab ← General Settings
To set the mechanical attenuation, edit the following two fields:

- In the "MODE" dropdown menu, either "Auto" or "Manual" are available. If set to "Auto", the mechanical attenuator is set automatically by the firmware. The default value is "Auto".
- Set the manual attenuation value of the mechanical attenuator in this field.

For details see the "Mech Att Manual" softkey in the base unit.

Remote command:
`INPut:ATTenuation` on page 192
`INPut:ATTenuation:AUTO` on page 192

El Atten State ← RF Input ← Advanced Settings tab ← General Settings
Switches the electronic attenuator on or off. This setting 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.

- To define the mechanical attenuation, use the Mechanical Atten setting.
- To define the electronic attenuation, use the Electrical Atten setting.

Remote command:
`INPut:EATT:AUTO` on page 194

Electrical Atten ← RF Input ← Advanced Settings tab ← General Settings
To set the electrical attenuation, edit the following fields:

- In the "MODE" dropdown menu, either "Auto" or "Manual" are available. If set to "Auto", the electrical attenuator is set automatically by the firmware. The default value is "Auto".
- Set the manual power level of the electrical attenuator.

Remote command:
`INPut:EATT` on page 193
`INPut:EATT:AUTO` on page 194
`INPut:EATT:STATe` on page 194

Preamp On/Off ← RF Input ← Advanced Settings tab ← General 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 195

Trigger Polarity ← RF Input ← Advanced Settings tab ← General Settings
for future use

IF Pow.Retrig.Holdoff ← RF Input ← Advanced Settings tab ← General Settings
for future use

IF Pow.Retrig.Hysteresis ← RF Input ← Advanced Settings tab ← General Settings
for future use

Auto Track Time ← RF Input ← Advanced Settings tab ← General Settings
Sets the sweep time for auto level measurements or swept measurements, and the capture time for auto detection. There are separate input fields for the unit seconds and slots.

Remote command:
CONFigure[:MS]:POWer:AUTO:SWEep:TIME on page 134

Trigger Level ← RF Input ← Advanced Settings tab ← General Settings
Specifies the trigger level in Volts if the instrument is in external trigger mode, or in dBm in power trigger mode.

Remote command:
TRIGger<n>[:SEQuence]:LEVel:IFPower on page 247
TRIGger<n>[:SEQuence]:LEVel[:EXTernal] on page 246

Swap I/Q ← RF Input ← Advanced Settings tab ← General Settings
Swaps the I and Q values of the signal. Swapping I and Q inverts the sideband.

Tip: Try this function if the TSC can not be found.

"ON" I and Q are exchanged, inverted sideband, Q+j*I

"OFF" Normal sideband, I+j*Q

Remote command:
[SENSe:]SWAPiq on page 239

Baseband digital ← Advanced Settings tab ← General Settings
Settings for Digital Baseband (only with **Digital Baseband Interface, R&S FSV-B17)**

Input Sample Rate ← Baseband digital ← Advanced Settings tab ← General Settings
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 193

Full Scale Level ← Baseband digital ← Advanced Settings tab ← General Settings
The "Full Scale Level" defines the level that should correspond to an I/Q sample with the magnitude "1".

Remote command:
`INPut:DIQ:RANGe[:UPPer]` on page 193

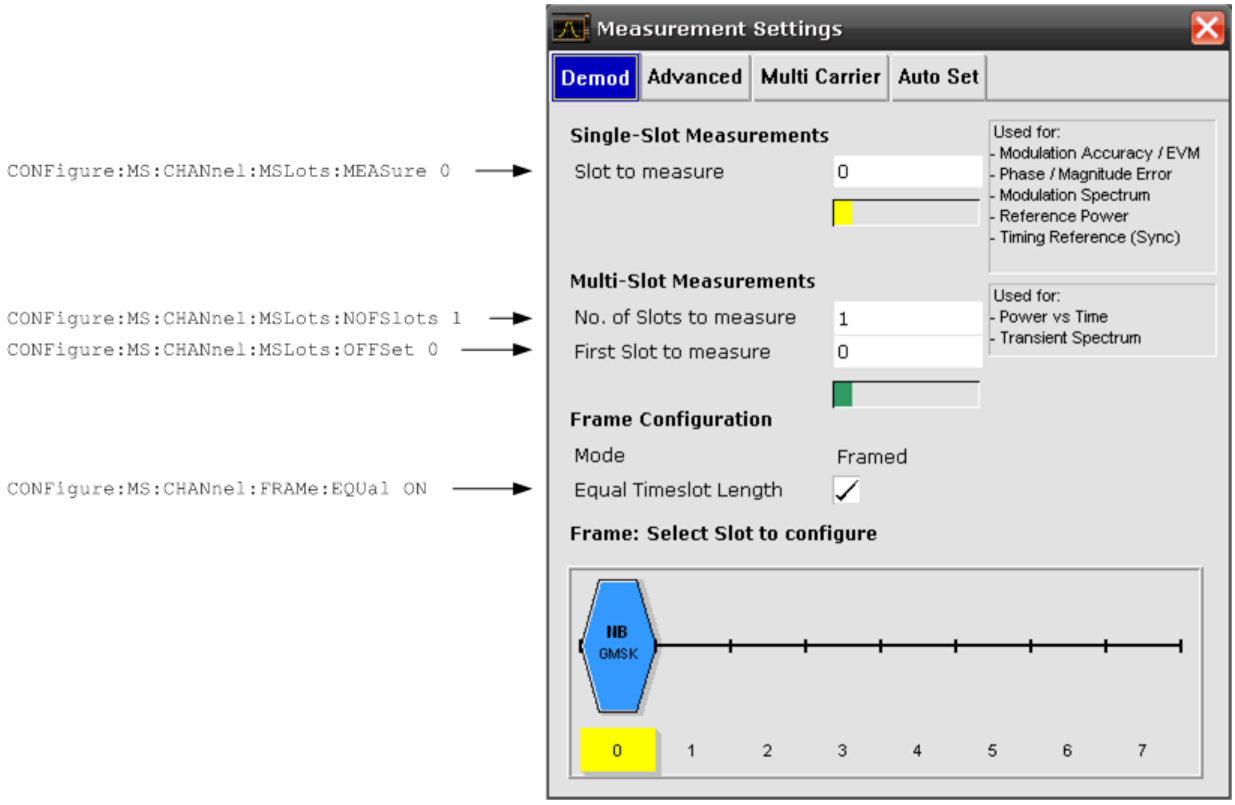
Meas Settings
Opens the "Measurement Settings" dialog box.

The "Measurement Settings" dialog box consists of the following tabs:

- "Demod tab" on page 64
- "Advanced tab" on page 71
- "Multi Meas Tab" on page 76
- "Multicarrier tab" on page 77
- "Auto Set tab" on page 79

Demod tab ← Meas Settings
To modify parameter values related to the demodulation and frame/slot configuration, the following parameter groups are available in the "Demod" tab.

- Single-slot measurements
- Multi-slot measurements
- Frame configuration



Slot to Measure ← Demod tab ← Meas Settings
This parameter specifies the slot to be measured in single-slot measurements relative to the GSM frame boundary. The following rule applies:

0 ≤ Slot to Measure ≤ 7

The "Slot to Measure" is used as the (only) slot to measure in the following measurements: (see "First Slot to measure" on page 65)

- Modulation Accuracy
- EVM vs Time
- Phase Error vs Time
- Magnitude Error vs Time
- Modulation Spectrum
- Constellation

Furthermore, the "Slot to Measure" is used to measure the reference power for the following measurements:

- Power vs Time
- Modulation Spectrum
- Transient Spectrum
- Wide Modulation Spectrum

Finally, the "Slot to Measure" is used to measure the position of its TSC, which represents the timing reference for the Power vs Time mask (limit lines) of all slots.

See also chapter 3.2.8, "Defining the Scope of the Measurement", on page 43. For details on the measurement types see chapter 3.1, "Measurements and Result Displays", on page 12.

Remote command:
`CONFigure[:MS]:CHANnel:MSLots:MEASure` on page 109

Number of Slots to measure ← Demod tab ← Meas Settings
This parameter specifies the "Number of Slots to measure" for the measurement interval of multi-slot measurements, i.e. the "Power vs. Time" and "Transient Spectrum" measurements. Between 1 and 8 consecutive slots can be measured.

See also chapter 3.2.8, "Defining the Scope of the Measurement", on page 43.

Remote command:
`CONFigure[:MS]:CHANnel:MSLots:NOFSlots` on page 109

First Slot to measure ← Demod tab ← Meas Settings
This parameter specifies the start of the measurement interval for mulit-slot measurements, i.e. "Power vs. Time"Power vs Time and Transient Spectrum measurements, relative to the GSM frame boundary. The following conditions apply:

- First Slot to measure ≤ Slot to Measure
- Slot to Measure ≤ First Slot to measure + Number of Slots to measure -1

See also chapter 3.2.8, "Defining the Scope of the Measurement", on page 43.

Remote command:
`CONFigure[:MS]:CHANnel:MSLots:OFFSet` on page 109

Equal Timeslot Length ← Demod tab ← Meas Settings
This parameter is only taken into account if "Limit Time Alignment" is set to "Slot to measure" (see "Limit Time Alignment" on page 72).

This parameter is used to adjust the time for the "Power vs Time" masks of all slots for which the "Slot to measure" is used as the time reference for the entire frame.

If activated, all slots of a frame have the same length (8 x 156.26 normal symbol periods).

If deactivated, slots number 0 and 4 of a frame have a longer duration, all others have a shorter duration compared to the "Equal Timeslot Length" (157, 156, 156, 156, 157, 156, 156, 156 normal symbol periods).

See GPP TS 51.021 and 3GPP TS 45.010 chapter "6.7 Timeslot length" for further details.

Remote command:
`CONFigure[:MS]:CHANnel:FRAMe:EQUal` on page 108

Frame: Select Slot to Configure ← Demod tab ← Meas Settings
This field shows a graphical representation of the configuration of each slot. Selecting a slot leads to its "Burst" dialog box (see "Burst" on page 66).

Inside the slot the following information is given:

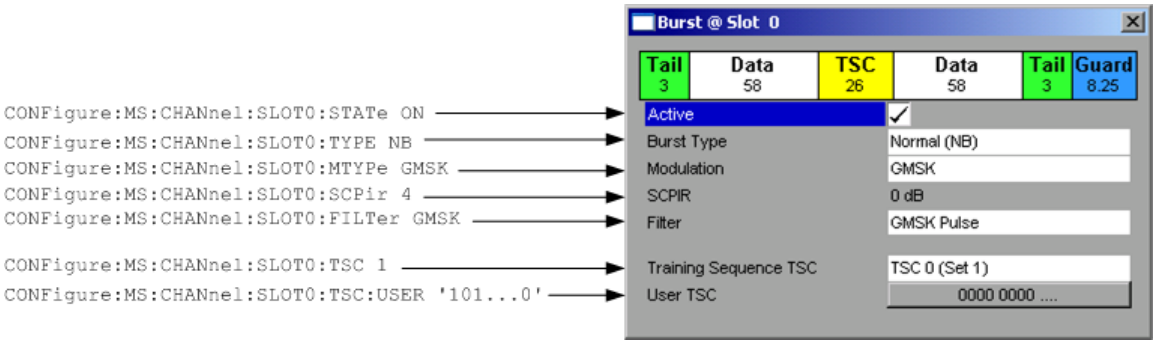
- The burst type, e.g. "Normal (NB)" for a normal burst.
- The modulation, e.g. GMSK.

Below the slot symbol, the corresponding slot numbers (0 to 7) are displayed. The frame always starts with slot number 0. The slots beginning with the "First slot to measure" and ending with "First slot to measure" + "Number of slots to measure" – 1 are marked with a green box, while the slot specified as the "Slot to measure" is highlighted in yellow.

The parameters of a specific slot can be edited by putting the focus (blue border) on the slot and pressing the ENTER key. The "Burst" dialog box opens (see "Burst" on page 66).

Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
The "Burst" dialog box opens when you select a slot to be configured in the "Demod" tab of the "Measurement Settings" (see "Frame: Select Slot to Configure" on page 66) .

In the title bar of the dialog box the selected slot number is displayed. At the top of the dialog box, the sections of the burst and their number of bits are indicated.



Active ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Activates or deactivates the selected slot.

Remote command:
`CONFigure[:MS]:CHANnel:SLOT<s>[:STATe]` on page 110

Burst Type ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Assigns a burst type to the selected slot. The following burst types are supported:

- Normal (NB)
- Higher Symbol Rate (HB)
- Access Burst (AB)

Remote command:
`CONFigure[:MS]:CHANnel:SLOT<s>:TYPE` on page 119

Modulation ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Select the modulation to be used in the slot. The available selections depend on the burst type. The following modulation types are supported, depending on the burst type:

Modulation	Normal Burst (NB)	Higher Symbol Rate (HB)	Access Burst (AB)
GMSK	x	-	x
QPSK	-	x	-
8PSK	x	-	-
16QAM	x	x	-
32QAM	x	x	-
AQPSK	x	-	-

Remote command:
`CONFigure[:MS]:CHANnel:SLOT<s>:MTYPe` on page 111

SCPIR ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
This parameter is only available for AQPSK modulation.

It specifies the Subchannel Power Imbalance Ratio (SCPIR). The value of SCPIR affects the shape of the AQPSK constellation (see chapter 3.2.4, "AQPSK Modulation", on page 37). For an SCPIR of 0 dB the constellation is square (as in "normal" QPSK), while for other values of SCPIR the constellation becomes rectangular.

Remote command:
`CONFigure[:MS]:CHANnel:SLOT<s>:SCPir` on page 113

Filter ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Specifies the pulse shape of the modulator. The following filter types are supported:

- GMSK Pulse

- Linearised GMSK Pulse
- Narrow Pulse
- Wide Pulse

Remote command:
`CONFigure[:MS]:CHANnel:SLOT<s>:FILTer` on page 110

Training Sequence TSC ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Selects the training sequence and the set of a single slot. The available values depend on the modulation as indicated in the table below.

For user-defined TSCs, select "User" and define the training sequence in "User TSC" on page 69.

Note: For AQPSK modulation, the training sequence is defined for each subchannel, see "Training Sequence TSC" on page 70.

Modulation	TSC
GMSK	TSC 0 (Set 1) TSC 1 (Set 1) TSC 2 (Set 1) TSC 3 (Set 1) TSC 4 (Set 1) TSC 5 (Set 1) TSC 6 (Set 1) TSC 7 (Set 1) TSC 0 (Set 2) TSC 1 (Set 2) TSC 2 (Set 2) TSC 3 (Set 2) TSC 4 (Set 2) TSC 5 (Set 2) TSC 6 (Set 2) TSC 7 (Set 2) TS 0 (Access Burst) TS 1 (Access Burst) TS 2 (Access Burst) USER
QPSK, 8PSK, 16QAM, 32QAM	TSC 0 TSC 1 TSC 2 TSC 3 TSC 4 TSC 5 TSC 6 TSC 7
User	user-defined TSCs ("User TSC" on page 69)

Remote command:
`CONFigure[:MS]:CHANnel:SLOT<s>:TSC` on page 116

User TSC ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Sets the bits of the user-defined TSC. The number of bits depend on the burst type and the modulation and is indicated in the table below.

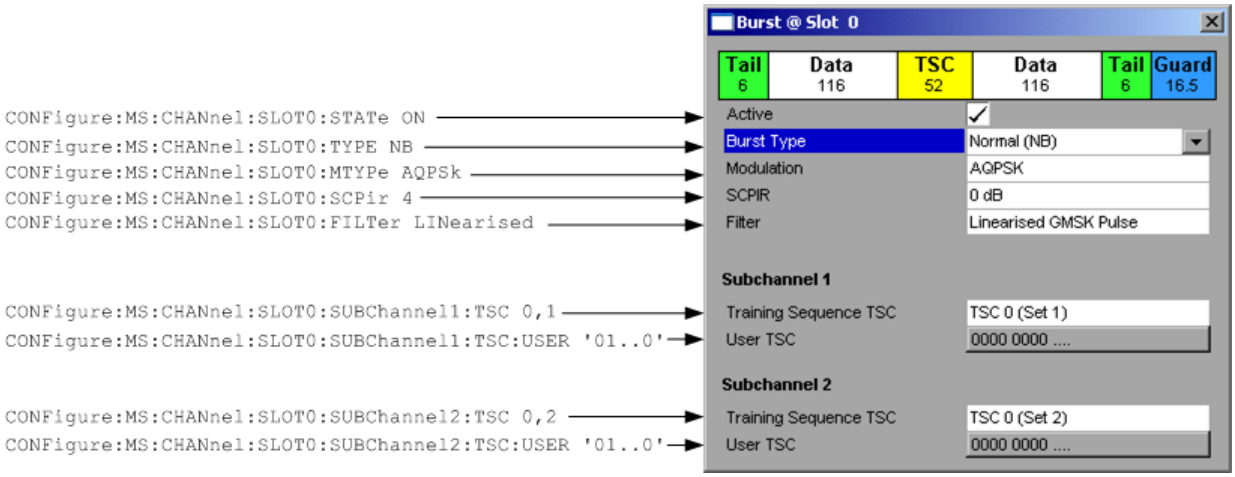
Note: For AQPSK modulation, the user-defined TSC is defined for each subchannel, see "User TSC" on page 71.

Table 3-9: Number of TSC bits depending on burst type and modulation

Burst Type	Modulation	Number of Bits
Normal	GMSK	26
Normal	8PSK	78
Normal	16QAM	104
Normal	32QAM	130
Higher Symbol Rate	QPSK	62
Higher Symbol Rate	16QAM	124
Higher Symbol Rate	32QAM	155
Access Burst	GMSK	41

Remote command:
CONFigure[:MS]:CHANnel:SLOT<s>:TSC:USER on page 118

Subchannel 1/2 ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
For AQPSK modulation, the training sequence and user-defined TSC are defined for each subchannel.



Training Sequence TSC ← Subchannel 1/2 ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Selects the training sequence and the set of the selected subchannel of a single slot for AQPSK modulation.

"TSC 0…TSC 7 (Set 1/2)"
Selects a standard TSC of Set 1/2 that complies with the GSM standard
For subchannel 1, only "Set 1" is available.

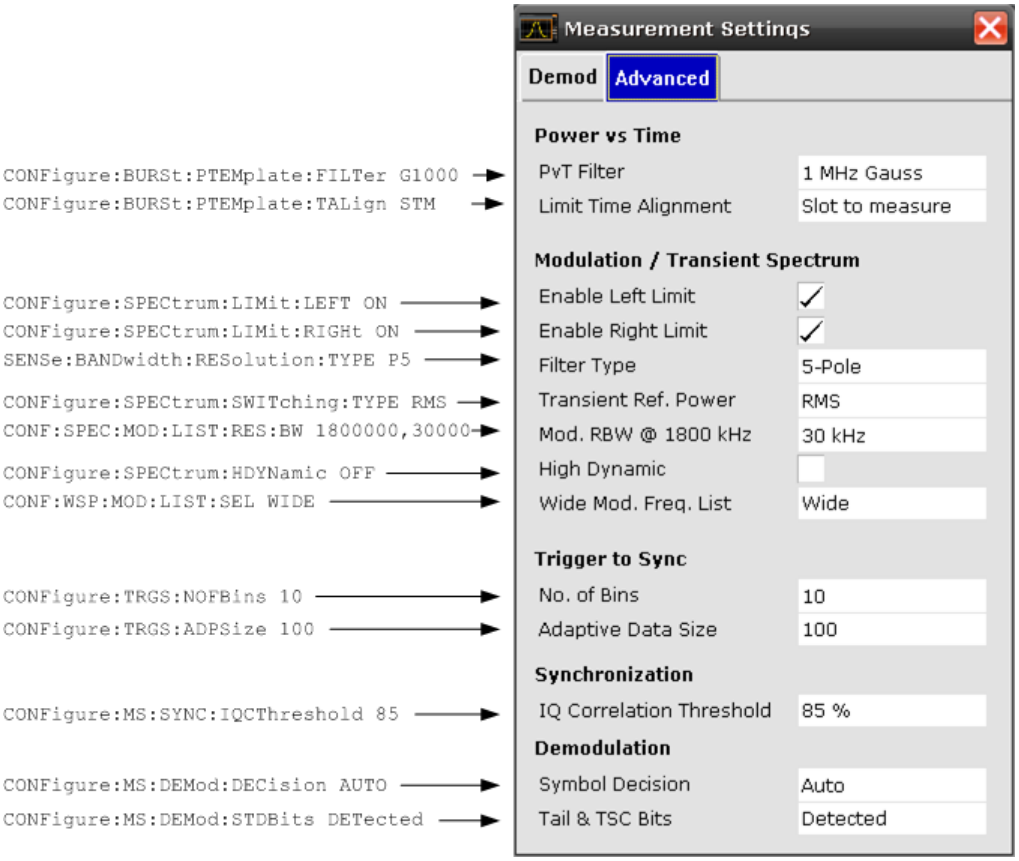
"USER" Selects a user-defined TSC (see "User TSC" on page 71).

Remote command:
CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC on page 114

User TSC ← Subchannel 1/2 ← Burst ← Frame: Select Slot to Configure ← Demod tab ← Meas Settings
Sets the 26 bits of the user-defined TSC of the selected subchannel for AQPSK modulation.

Remote command:
`CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER` on page 115

Advanced tab ← Meas Settings
This tab contains settings related to the Power vs Time, Modulation Spectrum and Transient Spectrum measurements.



PvT Filter ← Advanced tab ← Meas Settings
The PvT Filter controls the filter used to reduced the measurement bandwidth for single carrier "Power vs Time" measurements. The parameter is only available if "Multicarrier BTS" is switched off (see "Multicarrier BTS" on page 78). For single-carrier measurements, the "PvT Filter" parameter in the "Multicarrier" tab is ignored (see "PvT Filter" on page 78).

"1 MHz Gauss"
default

"500 kHz Gauss"
for backwards compatibility to FS-K5

"600 kHz"
for backwards compatibility to FS-K5

Remote command:
CONFigure:BURSt:PTEMplate:FILTer on page 139

Limit Time Alignment ← Advanced tab ← Meas Settings
The Limit Time Alignment controls how the limit lines are aligned in a "Power vs Time" measurement graph (see chapter 3.1.8, "Power vs Time", on page 20). Limit lines are defined for each slot. The limit lines are time-aligned in each slot, based on the position of the TSC (the center of the TSC is the reference point). This parameter affects how the center of the TSC is determined for each slot:

- **Slot to measure** (default): For each slot the center of the TSC is derived from the measured center of the TSC of the "Slot to measure" and the timeslot lengths specified in the standard (see "Timeslot length" in 3GPP TS 45.010 and "Slot to Measure" on page 65).
- **Per Slot**: For each slot the center of the TSC is measured. This provides reasonable time-alignment if the slot lengths are not according to standard. Note that in this case the "Power vs Time" limit check may show "pass" even if the timeslot lengths are not correct according to the standard.

Note: The "Limit Time Alignment" also decides whether the "Delta to sync" values of the "Power vs Time" list result are measured (for "Limit Time Alignment" = "Per Slot") or if they are constant as defined by the 3PP standard (for "Limit Time Alignment" = "Slot to measure").

The R&S FSV-K10 option offers a strictly standard-conformant, multiple-slot PvT limit line check. This is based on time alignment to a single specified slot (the "Slot to Measure") and allows the user to check for correct BTS timeslot alignment in the DUT, according to the GSM standard. In addition, a less stringent test which performs PvT limit line alignment on a per-slot basis ("Per Slot") is also available.

Note: When measuring Access bursts the parameter "Limit Time Alignment" should be set to "Per Slot", since the position of an Access burst within a slot depends on the set timing advance of the DUT.

Remote command:
CONFigure:BURSt:PTEMplate:TALign on page 140

Enable Left Limit ← Advanced tab ← Meas Settings
This parameter controls the left limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This parameter effects the Modulation Spectrum and Transient Spectrum measurements.

Note: For measurements on multi-carrier signals, using either the check on the left or right side allows you to measure the spectrum of the left or right-most channel while ignoring the side where adjacent channels are located.

Remote command:
CONFigure:SPECtrum:LIMit:LEFT on page 142

Enable Right Limit ← Advanced tab ← Meas Settings
This parameter controls the right limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This parameter effects the Modulation Spectrum and Transient Spectrum measurements.

Note: For measurements on multi-carrier signals, using either the check on the left or right side allows you to measure the spectrum of the left or right-most channel while ignoring the side where adjacent channels are located.

Remote command:
`CONFigure:SPECtrum:LIMit:RIGHt` on page 142

Filter Type ← Advanced tab ← Meas Settings
This parameter sets the filter type for the resolution filter to "Normal" (3 dB Gauss filter) or a 5-pole (according to the GSM standard) filter for the "Modulation Spectrum", "Transient Spectrum" and "Wide Modulation Spectrum" measurements.

Remote command:
`[SENSe]:BANDwidth[:RESolution]:TYPE` on page 238

Transient Ref. Power ← Advanced tab ← Meas Settings
This parameter controls how the reference power of the "Transient Spectrum" measurement (see chapter 3.1.10, "Transient Spectrum", on page 26) is measured.

Note: To perform the measurement according to the 3GPP standard set "Transient Ref. Power" to RMS and the PvT Filter to the slot with the highest power.
See 3GPP TS 45.005, chapter "4 Transmitter characteristics ":

For GMSK modulation, the term output power refers to the measure of the power when averaged over the useful part of the burst (see annex B).

For QPSK, AQPSK, 8-PSK, 16-QAM and 32-QAM modulation, the term "output power" refers to a measure that, with sufficient accuracy, is equivalent to the long term average of the power when taken over the useful part of the burst as specified in 3GPP TS 45.002 with any fixed TSC and with random encrypted bits.

See 3GPP TS 51.021, chapter "6.5.2 Switching transients spectrum":

The reference power for relative measurements is the power measured in a bandwidth of at least 300 kHz for the TRX under test for the time slot in this test with the highest power.

"RMS" (Default:) The reference power is the RMS power level measured over the useful part of the "Slot to measure" (see "Slot to Measure" on page 65) and averaged according to the defined "Statistic Count" (see "Statistic Count" on page 60).

"Peak" The reference power is the peak power level measured over the selected slot scope (see chapter 3.2.8, "Defining the Scope of the Measurement", on page 43) and its peak taken over Statistic Count measurements (GSM frames).

Remote command:
`CONFigure:SPECtrum:SWITching:TYPE` on page 146

Mod. RBW @ 1800 kHz ← Advanced tab ← Meas Settings
The modulation RBW at 1800 kHz controls the resolution bandwidth (RBW) and video bandwidth (VBW) used in the Modulation Spectrum and Wide Modulation Spectrum measurements at offset frequencies of +/- 1800 kHz from the carrier.

"30 kHz" (Default) RBW and VBW are set to 30 kHz for offset frequencies at +/- 1800 kHz from the carrier

"100 kHz" RBW and VBW are set to 100 kHz for offset frequencies at +/- 1800 kHz from the carrier

Remote command:
`CONFigure:SPECtrum:MODulation:LIST:BANDwidth:RESolution` on page 143

High Dynamic ← Advanced tab ← Meas Settings
If activated, the results of the (I/Q-based) Modulation Spectrum measurement are corrected by the instrument's inherent noise, which increases the dynamic range.

When "High Dynamic" is activated, a measurement of the instrument's inherent noise is automatically carried out. The instrument's inherent noise is then removed from the measured results. The inherent noise of the instrument depends on the selected center frequency and level setting. Therefore the measurement of the inherent noise is repeated whenever one of these parameters is changed.

In addition, for instruments with (early) detector boards with an even hardware code (see column "HWC" in the hardware information dialog) phase noise is reduced (at 600 kHz offset frequencies).

Note: For best performance for modulation accuracy measurements on instruments with early detector boards, deactivate the "High Dynamic" mode.

Remote command:
`CONFigure:SPECtrum:HDYNamic` on page 141

Wide Mod. Freq. List ← Advanced tab ← Meas Settings
For Wide Modulation Spectrum measurements, the wide modulation frequency list controls whether offset frequencies are measured up to 1800 kHz or 6000 kHz.

"Narrow" The measurement is performed for offset frequencies up to 1800 kHz from the carrier; this setting improves measurement speed

"Wide" (Default) The measurement is performed for offset frequencies up to 6000 kHz from the carrier

Remote command:
`CONFigure:WSPectrum:MODulation:LIST:SELect` on page 150

No. of Bins ← Advanced tab ← Meas Settings
This parameter specifies the number of bins for the histogram of the "Trigger to Sync" measurement.

Remote command:
`CONFigure:TRGS:NOFBins` on page 147

Adaptive Data Size ← Advanced tab ← Meas Settings
This parameter specifies the number of measurements (I/Q captures) after which the x-axis is fixed for the histogram calculation of the "Trigger to Sync" measurement.

Remote command:
`CONFigure:TRGS:ADPSize` on page 147

IQ Correlation Threshold ← Advanced tab ← Meas Settings
This threshold determines whether a burst is accepted if Measure only on Sync is activated. If the correlation value between the ideal IQ signal of the given TSC and the measured TSC is below the IQ correlation threshold, then the application reports "Sync not found" in the status bar. Additionally, such bursts are ignored if "Measure only on Sync" is activated.

Note: If the R&S FSV-K10 is configured to measure GMSK normal bursts, a threshold below 97% will also accept 8PSK normal bursts (with the same TSC) for analysis. In this case, activate Measure only on Sync and set the IQ Correlation Threshold to 97%. This will exclude the 8PSK normal bursts from the analysis.

Remote command:
`CONFigure[:MS]:SYNC:IQCThreshold` on page 135

Symbol Decision ← Advanced tab ← Meas Settings
The symbol decision determines how the symbols are detected in the demodulator. The setting of this parameter does not effect the demodulation of normal bursts with GMSK modulator. For normal bursts with 8PSK, 16QAM, 32QAM or AQPSK modulation or Higher Symbol Rate bursts with QPSK, 16QAM or 32QAM modulation use this parameter to get a trade-off between performance (symbol error rate of the R&S FSV-K10) and measurement speed.

"Auto" Automatically selects the symbol decision method.

"Linear" Linear symbol decision: Uses inverse filtering (a kind of zero-forcing filter) and a symbol-wise decision method. This method is recommended for high symbol to noise ratios, but not for Higher Symbol Rate bursts with a narrow pulse. The inverse filter colors the noise inside the signal bandwidth and therefore is not recommended for narrowband signals or signals with a low signal to noise ratio. Peaks in the "EVM vs Time" measurement (see chapter 3.1.4, "EVM vs Time", on page 15) may occur if the "Linear" symbol decision algorithm fails. In that case use the "Sequence" method. Linear is the fastest option.

"Sequence" Symbol decision via sequence estimation. This method uses an algorithm that minimizes the symbol errors of the entire burst. It requires that the tail bits in the analyzed signal are correct. It has a better performance (lower symbol error rate) compared to the "Linear" method, especially at low signal to noise ratios, but with a loss of measurement speed. This method is recommended for normal bursts with 16QAM or 32QAM modulation and for Higher Symbol Rate bursts with a narrow pulse.
Tip: Use this setting if it reduces the EVM RMS measurement result.

Remote command:
`CONFigure[:MS]:DEMod:DECision` on page 120

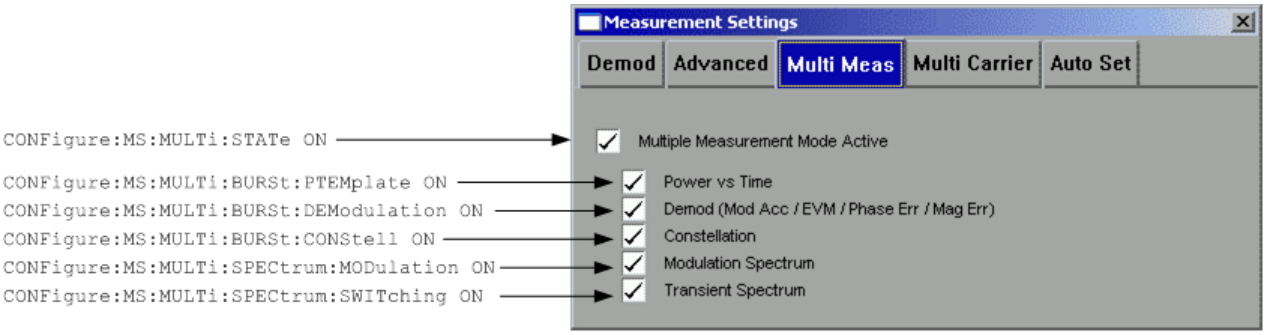
Tail & TSC Bits ← Advanced tab ← Meas Settings
The R&S FSV-K10 demodulator requires the bits of the burst (Tail, Data, TSC, Data, Tail) to provide an ideal version of the measured signal. The "Data" bits can be random and are typically not known inside the demodulator of the R&S FSV-K10. "Tail" and "TSC" bits are specified in the "Burst" dialog box (see "Burst" on page 66).

"Detected" The detected Tail and TSC bits are used to construct the ideal signal.

"Standard" The standard Tail and TSC bits (as set in the "Burst" dialog box) are used to construct the ideal signal.
Using the standard bits can be advantageous to verify whether the device under test sends the correct Tail and TSC bits. Incorrect bits would lead to peaks in the "EVM vs Time" trace (see chapter 3.1.4, "EVM vs Time", on page 15) at the positions of the incorrect bits.

Remote command:
`CONFigure[:MS]:DEMod:STDBits` on page 122

Multi Meas Tab ← Meas Settings
This tab allows you to perform several measurements at once.



Multiple Measurement Mode active ← Multi Meas Tab ← Meas Settings
Activates the multiple measurement mode. In this mode, several measurement results can be calculated on the same captured I/Q data in parallel. Only the results of the selected measurements are available. The softkeys for the other measurements only become available again when you deactivate multiple measurement mode or include the measurement in the multiple measurement selection.

Use this mode to reduce total measurement time if you know in advance which measurement results are required.

Remote command:
`CONFigure[:MS]:MULTi:STATe` on page 129

Power vs Time ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Power vs Time" measurement (see chapter 3.1.8, "Power vs Time", on page 20) are included in an active multiple measurement.

Remote command:
`CONFigure[:MS]:MULTi:BURSt:PTEMplate` on page 127

Demod ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Modulation Accuracy", "EVM vs Time", "Phase Error vs Time" and "Magnitude Error vs Time" measurements are included in an active multiple measurement.

See:

chapter 3.1.2, "Modulation Accuracy", on page 13

chapter 3.1.4, "EVM vs Time", on page 15

chapter 3.1.3, "Phase Error vs Time", on page 14

chapter 3.1.5, "Magnitude Error vs Time", on page 16

Remote command:
`CONFigure[:MS]:MULTi:BURSt:DEModulation` on page 127

Constellation ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Constellation" measurement (see chapter 3.1.6, "Constellation", on page 18) are included in an active multiple measurement.

Remote command:
`CONFigure[:MS]:MULTi:BURSt:CONStell` on page 127

Modulation Spectrum ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Modulation Spectrum" measurement (see chapter 3.1.9, "Modulation Spectrum", on page 23) are included in an active multiple measurement.

Note: By default, list results are calculated. To receive graph results, set the "Display List/Graph" softkey to "Graph" (see "Display List/Graph" on page 84).

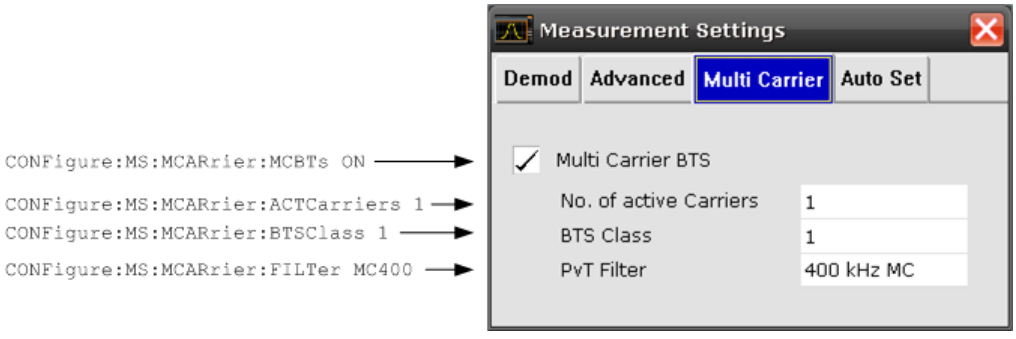
Remote command:
`CONFigure[:MS]:MULTi:SPECtrum:MODulation` on page 128

Transient Spectrum ← Multi Meas Tab ← Meas Settings
If enabled, the results of the "Transient Spectrum" measurement (see chapter 3.1.10, "Transient Spectrum", on page 26) are included in an active multiple measurement.

Note: By default, list results are calculated. To receive graph results, set the "Display List/Graph" softkey to "Graph" (see "Display List/Graph" on page 84).

Remote command:
`CONFigure[:MS]:MULTi:SPECtrum:SWITching` on page 128

Multicarrier tab ← Meas Settings
This tab provides settings related to measurements on multi-carrier base stations.



Multicarrier BTS ← Multicarrier tab ← Meas Settings
This parameter informs the R&S FSV-K10 that the measured signal is a multi-carrier signal. This function is only available if the "Device Type" is a "BTS" type (see "Device Under Test: Type" on page 57).

Activating this checkbox has the following effects:

- An additional multi-carrier filter is switched into the demodulation path of the R&S FSV-K10. This filter can, for example, suppress up to six adjacent channels with a channel spacing of 600 kHz from the measured channel (at the set center frequency) and 30 dB higher power compared to the measured channel. This filter is also taken into account during the generation of the ideal (reference) signal in order to get meaningful EVM values. (Otherwise there would be an increase in EVM because the measured signal has a smaller bandwidth compared to the reference signal).
  The constellation diagram of normal bursts with GMSK modulation then becomes similar to a 12PSK constellation.
- Additional multi-carrier parameters become available.

Remote command:
`CONFigure[:MS]:MCARrier:MCBTs` on page 125

No. of active Carriers ← Multicarrier tab ← Meas Settings
Specifies the total number of active carriers of the multi-carrier BTS to be measured. Its value affects the calculation of the limits according to the 3GPP standard for the modulation spectrum measurement, see 3GPP2 TS 45.005 (chapter 4.2.1. "Spectrum due to modulation and wide band noise"). The limit is relaxed by 10*log(N) dB for frequencies ≥ 1.8 MHz.

Remote command:
`CONFigure[:MS]:MCARrier:ACTCarriers` on page 124

BTS Class ← Multicarrier tab ← Meas Settings
For future use.

Remote command:
`CONFigure[:MS]:MCARrier:BTSClass` on page 124

PvT Filter ← Multicarrier tab ← Meas Settings
Controls the filter used to reduced the measurement bandwidth for multi-carrier "Power vs Time" measurements. For multi-carrier BTS measurements, the PvT Filter parameter in the "Advanced" tab is ignored (see "PvT Filter" on page 71).

For further details on filtering in the R&S FSV-K10 see chapter 3.2.9, "Overview of filters in R&S FSV-K10", on page 44.

The following filters are supported:

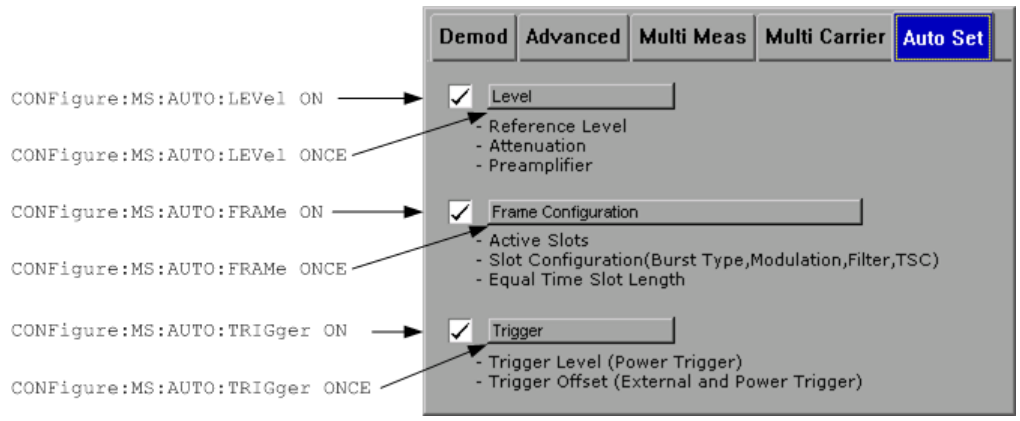
Note: The PvT filter is optimized to get smooth edges after filtering burst signals and to suppress adjacent, active channels.

"400 kHz MC" (default) Recommended for measurements with multi channels of equal power.

"300 kHz MC" Recommended for measurement scenarios where a total of six channels is active and the channel to be measured has a reduced power (e.g. 30 dB) compared to its adjacent channels.

Remote command:
`CONFigure[:MS]:MCARrier:FILTer` on page 125

Auto Set tab ← Meas Settings
Select the parameters to be set automatically when you press the AUTO SET key or "Auto Set" softkey.



Level ← Auto Set tab ← Meas Settings
When activated, a single auto level measurement is performed when the AUTO SET key is pressed.

Press the button to perform a single auto level measurement immediately.

Remote command:
`CONF:AUTO:LEV ON`: Execute Auto Level on Auto Set.
`CONF:AUTO:LEV OFF`: Do not execute Auto Level on Auto Set.
`CONF:AUTO:LEV ONCE`: Perform one Auto Level measurement immediately.
see `CONFigure[:MS]:AUTO:LEVel` on page 107

Frame Configuration ← Auto Set tab ← Meas Settings
When activated, a single auto frame configuration measurement is performed when the AUTO SET key is pressed.

The auto frame configuration measurement may take a long time, therefore it is deactivated by default. The following parameters are detected and automatically measured:

- Active slots
- Slot configuration (burst type, modulation, filter, TSC)
- Equal time slot length
- For VAMOS normal burst and GMSK: TSCs of set 1 and set 2
- For VAMOS normal burst and AQPSK: TSCs of both subchannels (restrictions see table 3-6) and SCPIR

Press the button to perform a single auto frame configuration measurement immediately.

Note: The auto frame configuration typically does not work with frequency hopping systems, unless the trigger offset is set correctly. In this case not every frame is popu-

lated by a modulated GSM signal. A workaround is to use auto frame configuration with a manually set trigger offset:

- Set "Synchronization" = "None"
- Set the trigger offset manually in the "Power vs Time" measurement.
- Set "Synchronization" back to "Burst + TSC" or "TSC".
- Deactivate the "Trigger" check box in the "Auto Set" tab.
- Press the AUTO SET key to run the auto frame configuration measurement.

Remote command:
`CONF:AUTO:FRAM ON`: Execute Auto Frame Configuration on Auto Set.
`CONF:AUTO:FRAM OFF`: Do not execute Auto Frame Configuration on Auto Set.
`CONF:AUTO:FRAM ONCE`: Perform one Auto Frame Configuration measurement immediately.
see `CONFigure[:MS]:AUTO:FRAMe` on page 106

Trigger ← Auto Set tab ← Meas Settings
If activated, the following parameters are detected and automatically measured when the AUTO SET key is pressed:

- Trigger Offset (for external and IF power trigger)
- Trigger Level (for IF power trigger only)

Press the button to perform a single auto trigger measurement immediately.

For details on the parameters refer to "General Settings" on page 56.

Remote command:
`CONF:AUTO:TRIG ON`: Execute Auto Trigger on Auto Set.
`CONF:AUTO:TRIG OFF`: Do not execute Auto Trigger on Auto Set.
`CONF:AUTO:TRIG ONCE`: Perform one Auto Trigger measurement immediately.
see `CONFigure[:MS]:AUTO:TRIGger` on page 107

Demod
Opens a demodulation submenu.

This softkey is only available if the "Synchronization" setting is set to "TSC" or "Burst +TSC" (General Settings, see "Synchronization" on page 59).

General Settings ← Demod
For details refer to the "General Settings" on page 56 softkey in the root menu of the GSM option.

Meas Settings ← Demod
For details refer to the "Meas Settings" on page 64 softkey in the root menu of the GSM option.

Modulation Accuracy ← Demod
Displays the Modulation Accuracy measurement results.

For details on the measurement refer to chapter 3.1.2, "Modulation Accuracy", on page 13.

Note: Modulation Accuracy results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.

If the "Modulation Accuracy" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
CONFigure:BURSt:MACCuracy[:IMMediate] on page 138

EVM ← Demod
Displays the "EVM vs Time" measurement results. For details on the measurements refer to chapter 3.1.4, "EVM vs Time", on page 15.

Note: EVM vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.
If the "EVM vs Time" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
CONFigure:BURSt:ETIMe[:IMMediate] on page 138

Phase Error ← Demod
Displays the "Phase Error vs Time" measurement results. For details on the measurements refer to chapter 3.1.3, "Phase Error vs Time", on page 14.

Note: Phase Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.
If the "Phase Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
CONFigure:BURSt:PFERror[:IMMediate] on page 138

Magnitude Error ← Demod
Displays the magnitude error measurement results. For details see chapter 3.1.5, "Magnitude Error vs Time", on page 16.

Note: Magnitude Error vs Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.
If the "Magnitude Error" softkey is not available, include "Demod" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
CONFigure:BURSt:MERRor[:IMMediate] on page 138

Constell ← Demod
Displays the "Constellation" measurement results. For details see chapter 3.1.6, "Constellation", on page 18.

Note: Constellation diagrams can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.
If the "Constell" softkey is not available, include "Constellation" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
CONFigure:BURSt:CONStell[:IMMediate] on page 137

Trigger to Sync ← Demod
Displays the "Trigger to Sync" measurement results. For details see chapter 3.1.7, "Trigger to Sync", on page 19.

Note: The "Trigger to Sync" measurement is only available when using external trigger mode.

Remote command:
`CONFigure:TRGS[:IMMediate]` on page 147

R&S Support ← Demod
See "R&S Support" on page 90

PvT
Opens the submenu for "Power vs Time" settings, starts the measurement and displays the measurement results. See also chapter 3.1.8, "Power vs Time", on page 20.

Note: Power vs. Time results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement. If the "PvT" softkey is not available, include "Power vs. Time" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
`CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139

General Settings ← PvT
For details refer to the "General Settings" on page 56 softkey in the root menu of the GSM option.

Meas Settings ← PvT
For details refer to the "Meas Settings" on page 64 softkey in the root menu of the GSM option.

Full ← PvT
Switches the "Power vs Time" measurement to the "full burst" view.

Remote command:
`CONF:BURS:PTEM:SEL FULL`, see `CONFigure:BURSt:PTEMplate:SELect` on page 140

Rising ← PvT
Switches the "Power vs Time" measurement to a view of the rising edges only (the rest of the burst is removed).

Remote command:
`CONF:BURS:PTEM:SEL RIS`, see `CONFigure:BURSt:PTEMplate:SELect` on page 140

Falling ← PvT
Switches the "Power vs Time" measurement to a view of the falling edges only (the rest of the burst is removed).

Remote command:
`CONF:BURS:PTEM:SEL FALL`, see `CONFigure:BURSt:PTEMplate:SELect` on page 140

Rise & Fall ← PvT
Switches the "Power vs Time" measurement to the "rise & fall" view, i.e. only rising and falling edges of the bursts are displayed.

Remote command:
`CONF:BURS:PTEM:SEL FRIS`, see `CONFigure:BURSt:PTEMplate:SELect` on page 140

Top ← PvT
Switches the "Power vs Time" measurement to the "top" view, i.e. the useful part of the bursts are shown with a zoomed y-axis.

Remote command:
`CONF:BURS:PTEM:SEL TOP`, see `CONFigure:BURSt:PTEMplate:SELect` on page 140

R&S Support ← PvT
See "R&S Support" on page 90

Spectrum
Opens a submenu for spectrum measurement settings.

General Settings ← Spectrum
For details refer to the General Settings softkey in the root menu of the GSM option.

Meas Settings ← Spectrum
For details refer to the Meas Settings softkey in the root menu of the GSM option.

Modulation Spectrum ← Spectrum
Displays the "Modulation Spectrum" measurement results.

For details on the measurement refer to chapter 3.1.9, "Modulation Spectrum", on page 23.

Note: Modulation Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.
If the "Modulation Spectrum" softkey is not available, include "Modulation Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
`CONFigure:SPECtrum:MODulation[:IMMediate]` on page 143

Transient Spectrum ← Spectrum
Displays the "Transient Spectrum" measurement results.

For details on the measurement refer to chapter 3.1.10, "Transient Spectrum", on page 26.

Note: Transient Spectrum results can be included in multiple measurements (see "Multi Meas Tab" on page 76). In this case, you do not need to start a new measurement.
If the "Transient Spectrum" softkey is not available, include "Transient Spectrum" in the multiple measurement selection or disable the multiple measurement mode.

Remote command:
`CONFigure:SPECtrum:SWITching[:IMMediate]` on page 145

Display List/Graph ← Spectrum
Sets the display mode of the "Modulation Spectrum" and the "Transient Spectrum" measurements.

"List" Spectrum results are measured at several frequency offsets from the center frequency. The results are displayed in a table.

"Graph" A spectrum trace is measured and displayed as a graph.

Remote command:
`CONFigure:SPECtrum:SELect` on page 144

R&S Support ← Spectrum
See "R&S Support" on page 90

Wide Spectrum
Displays a menu for "Wide Spectrum" measurements.

Note: "Wide Spectrum" measurements are performed using the "Spectrum" mode and thus require either an external or IF power trigger.

General Settings ← Wide Spectrum
See "General Settings" on page 56

Meas Settings ← Wide Spectrum
See "Meas Settings" on page 64

Wide Mod Spectrum ← Wide Spectrum
Starts a "Wide Modulation Spectrum" measurement (see chapter 3.1.11, "Wide Modulation Spectrum", on page 27).

Remote command:
`CONFigure:WSPectrum:MODulation[:IMMediate]` on page 148

Import
Opens the "Choose the file to import" dialog box.

Select the IQ data file you want to import and press ENTER. The extension of data files is *.iqw.

This function is not available while a measurement is running.

I/Q data is imported into the capture buffer. Then evaluation of the data including averaging (according to Statistic Count) is started. Averaging automatically stops when the defined "Statistic Count" or the end of the captured data is reached.

To automatically detect the frame/slot configuration of the imported I/Q data, press the AUTO SET key after import (see also "Frame Configuration" on page 79).

Example: Saving I/Q data to an iqw file using MATLAB for import to the R&S FSVR-K10 option

Note:
- I/Q values are in the unit Volt
- Sample rate = 6.5 MHz
- Minimum number of complex samples = 68751 (10 ms capture time)
- Maximum number of complex samples = 6503751 (1 s capture time)
- The data order of the float values in the iqw file is III...QQQ...

```
IQ = randn(1,68751)+1i*randn(1,68751); % Example for I/Q data
iq_interleaved = [real(IQ(:)) ; imag(IQ(:)) ];
fid = fopen('IQ_for_import_into_K10.iqw','w');
fwrite(fid,single(iq_interleaved),'float32');
fclose(fid);
```

Remote command:
`MMEMory:LOAD:IQ:STATe` on page 196
not available

Export
Opens the "Choose the file to export" dialog box.

Enter the path and the name of the I/Q data file you want to export and press ENTER. The extension of data files is *.iqw. If the file cannot be created or if there is no valid I/Q data to export an error message is displayed.

This function is not available while a measurement is running.

Example: Loading I/Q data exported from the R&S FSVR-K10 option using MATLAB

Note:
- I/Q values are in the unit Volt
- Sample rate = 6.5 MHz
- Minimum number of complex samples = 68751 (10 ms capture time)
- Maximum number of complex samples = 6503751 (1 s capture time)
- The data order of the float values in the iqw file is III...QQQ...

```
fid = fopen('IQ_exported_from_K10.iqw','r');
[samples, count] = fread(fid,inf,'float32');
fclose (fid);
nof_cplx_smpls = floor(count/2);
IQ = samples(1:nof_cplx_smpls) + 1i*samples(nof_cplx_smpls+1:
2*nof_cplx_smpls);
plot(20*log10(abs(IQ)),'.-');
```

Remote command:
`MMEMory:STORe:IQ:STATe` on page 197

R&S Support
See "R&S Support" on page 90

3.4 FREQ Key

This key opens the "General Settings" dialog box and directly jumps to the "Frequency" field (see "Frequency" on page 58).

3.5 AMPT Key

This key opens the "General Settings" dialog box and directly jumps to the "Reference Level" field (see "Reference Level" on page 58).

3.6 AUTO SET Key

The AUTO SET key starts a single auto set procedure. Select the parameters to be set automatically in the "Auto Set tab" on page 79 of the "Meas Settings" on page 64 dialog box.

3.7 SWEEP Key

This key opens the "Sweep" menu which contains the following softkeys:

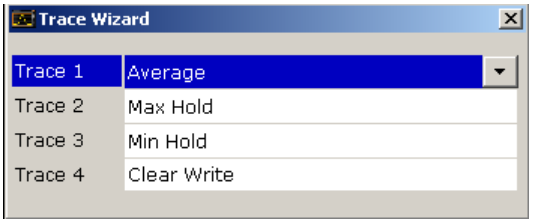
Refresh
Repeats the evaluation of the data currently in the capture buffer without capturing new data. This is useful after changing settings, for example the Statistic Count. Averaging is performed according to the "Statistic Count" and automatically stops when the defined "Statistic Count" or the end of the captured data is reached.

Remote command:
`INITiate:REFMeas[:IMMediate]` on page 191

3.8 TRACE Key

This key opens the "Trace Wizard" dialog box.

Trace Wizard



In the Trace Wizard you can select which traces of a graph are displayed in which mode (Average, Max Hold, Min Hold or Clear Write) or which should be hidden (Blank). The following table shows the available traces and modes, depending on the measurement.

Measurement	Trace 1	Trace 2	Trace 3	Trace 4
Power vs Time: Graph EVM vs Time: Graph Phase Error vs Time: Graph Magnitude Error vs Time: Graph	Average Blank	Max Hold Blank	Min Hold Blank	Clear Write Blank
Constellation: Graph	-	-	-	Clear Write Blank
Modulation Spectrum: Frequency Domain	Average Blank	-	-	Clear Write Blank
Transient Spectrum: Frequency Domain	-	Max Hold Blank	-	Clear Write Blank
Trigger to Sync: Graph	Histogram Blank	PDF of Average Blank	-	-

For a description of the trace modes see the "Trace Mode Overview" section in the base unit manual.

Remote command:
`DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 152

3.9 TRIG Key

This key opens the "General Settings" dialog box and directly jumps to the "Trigger Mode" field (see "Trigger Mode" on page 60).

3.10 Softkeys of the Marker Menu – MKR Key

The following table shows the softkeys of the marker menu specific to the GSM mode.

Marker 1/2/3/4
Opens the "Marker" dialog box for the selected marker and activates the marker. The current marker location on the x-axis is indicated. To set the marker to a different point, enter the new x-value.

The values for all active markers are displayed in the diagram.

To deactivate a marker, select the softkey again.

Remote command:
`CALCulate<n>:MARKer<m>[:STATe]` on page 95
To activate or deactivate a marker.
`CALCulate<n>:MARKer<m>[:STATe]` on page 95
To move a marker or query its position.
`CALCulate<n>:MARKer<m>:Y?` on page 98
To query the value of a marker.

Unzoom
Resets the zoom to the default state.

Remote command:
`CALCulate<n>:MARKer<m>:ZOOM` on page 98

Marker Zoom
Opens a dialog box in which you can enter the zoom factor for marker 1. The maximum zoom factor depends on the measurement.

Remote command:
`CALCulate<n>:MARKer<m>:ZOOM` on page 98

All Marker Off
Switches all markers off.

Remote command:
`CALCulate<n>:MARKer<m>:AOFF` on page 96

3.11 Softkeys of the Marker to Menu – MKR-> Key

This section describes the softkeys of the "Marker To" menu available for the GSM mode.

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 97

3.12 Softkeys of the Input/Output Menu

The following chapter describes all softkeys available in the "Input/Output" menu for GSM measurements. Note that the digital baseband functions are only available if the optional Digital Baseband Interface (R&S FSV-B17) is installed.

For details see the base unit description.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4 Remote Commands (GSM)

In this section, all remote control commands specific to the GSM option R&S FSV-K10 are described in detail. For details on conventions used in this chapter refer to section chapter 4.1, "Notation", on page 91.

The remote commands of the R&S FSV-K10 are compatible to the FS-K5 option for the FSP/FSQ family to a great extent (see the corresponding notes in the individual command descriptions). However, full compatibility can not be ensured.

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

4.1 Notation

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

Individual Description

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

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

Abbreviation	Description
A	spectrum analysis

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

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

Upper/Lower Case Notation

Upper/lower case letters are used to mark the long or short form of the key words of a command in the description. The instrument itself does not distinguish between upper and lower case letters.

Special Characters

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

Example:

```
SENSe:FREQuency:CW|:FIXed
```

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

```
SENSe:FREQuency:CW 1E3
```

```
SENSe:FREQuency:FIXed 1E3
```

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

Example: Selection of the parameters for the command

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

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

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

Description of Parameters

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

For details see the chapter "SCPI Command Structure" in the base unit description.

<Boolean>

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

<numeric_value> <num>

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

- `MAXimum`: This keyword sets the parameter to the largest possible value.
- `MINimum`: This keyword sets the parameter to the smallest possible value.
- `DEFault`: This keyword is used to reset the parameter to its default value.
- `UP`: This keyword increments the parameter value.
- `DOWN`: This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example:

```
SENSe:FREQuency:CENTer? MAXimum
```

Returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>

This keyword is provided for commands the parameters of which consist of a binary data block.

4.2 ABORt Subsystem

The ABORt Subsystem contains the commands for aborting triggered actions. An action can be triggered again immediately after being aborted. All commands trigger events, and therefore they have no *RST value.

ABORt

This command aborts a current measurement and resets the trigger system.

Example: `ABOR;INIT:IMM`

Mode: all

4.3 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.

4.3.1 CALCulate:LIMit Subsystem

The CALCulate:LIMit Subsystem contains commands for the limit checks.

CALCulate<n>:LIMit<i>:FAIL?

This command queries the result of the limit check of the limit line indicated in the selected measurement window. Note that a complete sweep must have been performed to obtain a valid result. A synchronization with *OPC, *OPC? Or *WAI should therefore be provided.

For the power vs. time graph measurement, `CALCulate:LIMit1:FAIL?` returns the result for the Max trace and `CALCulate:LIMit2:FAIL?` returns the result for the Min trace.

For the modulation spectrum measurements, `CALCulate:LIMit1:FAIL?` returns the result for the Average trace. `CALCulate:LIMit2:FAIL?` is not available.

For the transient spectrum measurements, `CALCulate:LIMit1:FAIL?` returns the result for the Max trace. `CALCulate:LIMit2:FAIL?` is not available.

Suffix:

<n> <1>
irrelevant

<i> The number of the limit line to access.

Return values:

<Result> 1 | 0 | ON | OFF

1
Fail

0
Pass

Example: `CALC:LIM2:FAIL?`

Usage: Query only

Mode: GSM

4.3.2 CALCulate:MARKer Subsystem

The marker is used to evaluate the (graphical) measurement results at certain trace points. Therefore, the marker is placed at a certain position (by specifying the X value or a trace property like maximum or minimum peak search) and then query the marker value.

GSM mode now also supports up to 4 markers.

CALCulate<n>:MARKer<m>[:STATe] <State>

This command activates a marker in the specified window.

Suffix:

<n> <1>
irrelevant

<m> <1..4>
Marker number

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Activate Power vs Time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Switch all 4 markers on
CALCulate:MARKer1:STATe ON
CALCulate:MARKer2:STATe ON
CALCulate:MARKer3:STATe ON
CALCulate:MARKer4:STATe ON
// Assign marker 1/2/3/4 to trace 1/2/3/4
CALCulate:MARKer1:TRACe 1
CALCulate:MARKer2:TRACe 2
CALCulate:MARKer3:TRACe 3
CALCulate:MARKer4:TRACe 4
// Set marker 2 to start of active part of burst
CALCulate:MARKer:X 0
// Read y-value (level of max trace) of marker 2
CALCulate:MARKer:Y?
// Switch all markers off
CALCulate:MARKer1:AOFF
```

Mode: GSM

Manual operation: See "Marker 1/2/3/4" on page 88

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 88

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command selects the trace a marker is positioned on.

The corresponding trace must have a trace mode other than "Blank".

If necessary, the corresponding marker is switched on prior to the assignment.

In the persistence spectrum result display, the command also defines if the marker is positioned on the persistence trace or the maxhold trace.

Suffix:

<n> Selects the measurement window.

<m> depends on mode
Selects the marker.

Parameters:

<Trace> **1 ... 4**
Trace number the marker is positioned on.

MAXHold
Defines the maxhold trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.

WRITe
Defines the persistence trace as the trace to put the delta marker on.
This parameter is available only for the persistence spectrum result display.

Example: `CALC:MARK3:TRAC 2`
Assigns marker 3 to trace 2.

Manual operation: See "Marker to Trace" on page 89

CALCulate<n>:MARKer<m>:X <Value>

This command positions the selected marker to the indicated position.

The corresponding trace must be active, i.e. its status must not be "BLANK" (see `DISPlay[:WINDow<n>]:TRACe<t>:MODE` on page 152).

Suffix:

<n> <1>
irrelevant

<m> <1..4>
Marker number

Parameters for setting and query:

<Value> numeric value

x-axis position of the marker

Default unit: NONE

Example: CALC1:MARK1:X 5

Mode: GSM

CALCulate<n>:MARKer<m>:Y?

This command returns the y-value at the position of the marker.

Suffix:
<n> <1>
irrelevant

<m> <1..4>
Marker number

Usage: Query only

Mode: GSM

Manual operation: See "Marker 1/2/3/4" on page 88

CALCulate<n>:MARKer<m>:ZOOM <Value>

This command defines the ratio to be zoomed around the marker 1 in the selected measurement window. The default value is 1, where the full trace is shown.

Suffix:
<n> <1>
irrelevant

<m> <1..4>
irrelevant

Parameters for setting and query:
<Value> numeric value

Zoom factor

Range: 1 to 100
*RST: 1
Default unit: NONE

Mode: GSM

Manual operation: See "Unzoom" on page 88
See "Marker Zoom" on page 88

4.3.3 CALCulate:MASK Subsystem

The commands of the CALCulate:MASK subsystem configure the frequency mask trigger.

Programming example

```
TRIG:SOUR MASK
//Selects the frequency mask as a trigger source.
MMEM:MDIR 'C:\R_S\instr\freqmask\MyMasks'
CALC:MASK:CDIR 'MyMasks'
//Creates a directory on C:\ called 'FreqMasks' and selects it as the frequency
//mask directory.
//Defining the shape of a lower frequency mask
CALC:MASK:NAME 'MyMask'
//Creates or loads a frequency mask called 'MyMask'.
CALC:MASK:COMM 'Customized Frequency Mask'
//Adds a comment to the frequency mask.
TRIG:MASK:COND ENT
//Triggers the measurement when the signal enters the frequency mask.
CALC:MASK:MODE ABS
//Selects absolute power level values.
CALC:MASK:LOW -10MHZ,-10,-4MHZ,-10,-4MHZ,-20,4MHZ,-20,4MHZ,-10,10MHZ,-10
//Defines a lower frequency mask with 6 data points.
//The first data point position is at -10 MHz from the center frequency
//and at -10 dBm, the second at -4 MHz from the center frequency etc.
CALC:MASK:LOW:SHIF:X 1MHZ
CALC:MASK:LOW:SHIF:Y 10
//Shifts the lower frequency mask by 1 MHz to the right and 10 dB up.
CALC:MASK:LOW:STAT ON
//Turns the lower frequency mask on.

//Defining the shape of an upper frequency mask
CALC:MASK:NAME 'AnotherMask'
//Creates or loads a frequency mask called 'AnotherMask'
CALC:MASK:MODE ABS
//Selects absolute power level values.
CALC:MASK:UPP -10MHZ,-10,-4MHZ,-10,-4MHZ,-20,4MHZ,-20,4MHZ,-10,10MHZ,-10
//Defines an upper frequency mask with 6 data points.
CALC:MASK:UPP:SHIF:X -1MHZ
CALC:MASK:UPP:SHIF 10
//Shift the upper frequency mask 1 MHz to the left and 10 dB up.
CALC:MASK:UPP:STAT ON
//Turns the upper frequency mask on.
//Alternatively, you can create an upper frequency mask automatically.
CALC:MASK:UPP:AUTO
//Automatically defines the shape of an upper frequency mask.

CALC:MASK:DEL
//Deletes the frequency mask called 'MyMask' in C:\FreqMasks.
```

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 102.

Compared to manual configuration of frequency masks, any changes made to a frequency mask via remote control are saved after the corresponding command has been sent.

CALCulate<n>:MASK:CDIRectory <Subdirectory>

This command selects the directory the R&S FSVR stores frequency masks in.

The directory must exist already for the command to work. You can create a new directory with `MMEMory:MDIRectory`.

Parameters:

<Subdirectory> String containing the path to the directory. The directory has to be a subdirectory of the default directory. Thus the path is always relative to the default directory (C:\R_S\INSTR\FREQMASK).
An empty string selects the default directory.

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Load Mask" on page 42

CALCulate<n>:MASK:COMMent <Comment>

This command defines a comment for the frequency mask that you have selected with `CALCulate<n>:MASK:NAME` on page 102.

Parameters:

<Comment> String containing the comment for the frequency mask.

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Labelling a frequency mask" on page 40

CALCulate<n>:MASK:DELete

This command deletes the currently selected frequency mask.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 102.

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Usage: Event

Manual operation: See "Delete Mask" on page 43

CALCulate<n>:MASK:LOWer:SHIFt:X <Frequency>

This command shifts the lower frequency mask horizontally by a specified distance. Positive values move the mask to the right, negative values shift the mask to the left.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 102.

Parameters:

<Frequency> Defines the distance of the shift.
Default unit: Hz

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Shifting mask points as a whole" on page 42

CALCulate<n>:MASK:LOWer:SHIFt:Y <Level>

This command shifts the lower frequency mask vertically by a specified distance. Positive values move the mask upwards, negative values shift the mask downwards.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 102.

Parameters:

<Level> Defines the distance of the shift. The shift is relative to the current position.
Default unit: dB

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Shifting mask points as a whole" on page 42

CALCulate<n>:MASK:LOWer[:STATe] <State>

This command turns the lower frequency mask on and off.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 102.

Parameters:

<State> **ON | OFF**

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Working with upper and lower lines" on page 40

CALCulate<n>:MASK:LOWer[:DATA] <Frequency>,<Level>,...

This command defines the shape of the lower frequency mask.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 102.

The unit of the power levels depends on `CALCulate<n>:MASK:MODE` on page 102.

If you are using the command with the vector network analysis option (R&S FSV-K70), you can only use this command as a query.

Parameters:

<Frequency>, <Level>
[N] pairs of numerical values. [N] is the number of data points the mask consists of.
Each data point is defined by the frequency (in Hz) and the level (in dB or dBm). All values are separated by commas.
Note that the data points have to be inside the current span.

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Positioning data points" on page 41

CALCulate<n>:MASK:MODE <Mode>

This command defines the scaling of the level axis for frequency masks.

Parameters:

<Mode>
ABSolute
absolute scaling of the level axis.

RELative
relative scaling of the level axis.

*RST: RELative

CALCulate<n>:MASK:NAME <Name>

This command creates or selects a frequency mask with the name that you specify by the parameter. When you use it as a query, the command returns the name of the mask currently in use.

Parameters:

<Name>
String containing the name of the mask.
Note that an empty string does not select a frequency mask.

Manual operation: See "Labelling a frequency mask" on page 40
See "Load Mask" on page 42

CALCulate<n>:MASK:SPAN <Span>

This command defines the frequency span of the frequency mask.

Parameters:

<Span> Range: 100 Hz to 40 MHz
*RST: 40 MHz

Example: `CALC:MASK:SPAN 10 MHz`
Defines a span of 10 MHz.

Manual operation: See "Defining the frequency mask span" on page 40

CALCulate<n>:MASK:UPPer:AUTO

This command automatically defines the shape of an upper frequency mask according to the spectrum that is currently measured.

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Usage: Event

CALCulate<n>:MASK:UPPer:SHIFt:X <Frequency>

This command shifts the lower frequency mask horizontally by a specified distance. Positive values move the mask to the right, negative values shift the mask to the left.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 102.

Parameters:

<Frequency> Defines the distance of the shift.

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Shifting mask points as a whole" on page 42

CALCulate<n>:MASK:UPPer:SHIFt:Y <Level>

This command shifts the upper frequency mask vertically by a specified distance. Positive values move the mask upwards, negative values shift the mask downwards.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 102.

Parameters:

<Level> Defines the distance of the shift. The shift is relative to the current position.
Default unit: dB

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Shifting mask points as a whole" on page 42

CALCulate<n>:MASK:UPPer[:STATe] <State>

This command turns the upper frequency mask on and off.

Before making any changes to a frequency mask, you have to select one by name with `CALCulate<n>:MASK:NAME` on page 102.

Parameters:

<State> **ON | OFF**

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Working with upper and lower lines" on page 40

CALCulate<n>:MASK:UPPer[:DATA] <Frequency>,<Level>,...

This command activates and defines the shape of the upper frequency mask trigger mask.

You have to select a mask before you can use this command with `CALCulate<n>:MASK:NAME` on page 102.

The unit of the power levels depends on `CALCulate<n>:MASK:MODE` on page 102.

If you are using the command with the vector network analysis option (R&S FSV-K70), you can only use this command as a query.

Parameters:

<Frequency>, <Level> [N] pairs of numerical values. [N] is the number of data points the mask consists of.
Each data point is defined by the frequency (in Hz) and the amplitude (in dB or dBm). All values are separated by commas.
Note that the data points have to be inside the current span.

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Positioning data points" on page 41
See "Automatic alignment of the frequency mask" on page 42

4.4 CONFigure Subsystem

The CONFigure Subsystem is used to set up the signal characteristics which are used in the signal, as for example the frame configuration, the measurement type to use, etc.

4.4.1 Configure[:MS] subsystem

Commands of the Configure[:MS] subsystem:

CONFigure[:MS]:ARFCn <Value>

This command specifies the Absolute Radio Frequency Channel Number (ARFCN) to be measured. Setting the ARFCN updates the frequency.

Parameters for setting and query:

<Value> numeric value

Range: 0 to 1023 (some values may not be allowed depending on the selected frequency band)

Default unit: NONE

Example: `CONF:ARFC 5`

Mode: GSM

Manual operation: See "ARFCN" on page 58

CONFigure[:MS]:AUTO <Value>

This command executes the auto set routines once, i.e. its function corresponds to pressing the AUTO SET key.

Tip: Use `CONFigure:MS:AUTO:LEVel ONCE`, `CONFigure:MS:AUTO:FRAMe ONCE` or `CONFigure:MS:AUTO:TRIGger ONCE` to execute the auto set routines seperately.

Parameters for setting and query:

<Value> ONCE

Mode: GSM

CONFigure[:MS]:AUTO:FRAMe <Value>

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: `CONF:AUTO:FRAM OFF`

Mode: GSM

Manual operation: See "Frame Configuration" on page 79

CONFigure[:MS]:AUTO:LEVel <Value>

This command is used to switch on or off automatic level detection while running auto set. When switched on, level detection is performed on auto set. Using the ONCE argument starts one auto level measurement immediately.

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: `CONF:AUTO:LEV OFF`

Mode: GSM

Manual operation: See "Level" on page 79

CONFigure[:MS]:AUTO:TRIGger <Value>

This command is used to switch on or off automatic trigger (offset/level) detection while running auto set. When switched on, trigger detection is performed on auto set. Using the ONCE argument starts one auto trigger measurement immediately.

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: `CONF:AUTO:TRIG OFF`

Mode: GSM

Manual operation: See "Trigger" on page 80

CONFigure[:MS]:BSEarch <State>

This command toggles between active burst search and inactive burst search.

Note

This command is retained for compatibility with R&S FS-K5 only. Use `CONFigure:MS:SYNC:MODE BURSt` or `CONFigure:MS:SYNC:MODE ALL` instead (see `CONFigure[:MS]:SYNC:MODE` on page 136).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Burst search on

OFF
Burst search off

*RST: 1

Mode: GSM

CONFigure[:MS]:BSTHreshold <Value>

This command changes the burst find threshold.

Note

This command is retained for compatibility with R&S FS-K5 only. Due to the improved measurement capabilities of this GSM analysis software, this remote control command (and the function behind) is not required any more.

Parameters for setting and query:

<Value> numeric value

Threshold for burst detection

Default unit: dB

Example: `CONF:BSTH 10 DB`

Mode: GSM

CONFigure[:MS]:CHANnel:FRAMe:EQUal <State>

If activated, all slots of a frame have the same length (8 x 156.26 normal symbol periods).

If deactivated, slots number 0 and 4 of a frame have a longer duration, all other a shorter duration compared to the "equal slot length" (157, 156, 156, 156, 157, 156, 156, 156 normal symbol periods).

See 3GPP TS 51.0213GPP TS 51.021 and 3GPP TS 45.0103GPP TS 45.010 chapter "6.7 Timeslot length" for further details.

This parameter is used to adjust the time for the "Power vs Time" masks of all slots. The "Slot to measure" is used as the time reference for the entire frame.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: ON

Example: CONF:CHAN:FRAM:EQU OFF

Mode: GSM

Manual operation: See "Equal Timeslot Length" on page 66

CONFigure[:MS]:CHANnel:MSLots:MEASure <Value>

This command specifies the slot to be measured in single-slot measurements relative to the GSM frame start.

Parameters for setting and query:

<Value> numeric value

Slot to measure in single-slot measurements relative to the GSM start frame

Range: 0 to 7
*RST: 0 Slots
Default unit: NONE

Example: CONF:CHAN:MSL:MEAS 5

Mode: GSM

Manual operation: See "Slot to Measure" on page 65

CONFigure[:MS]:CHANnel:MSLots:NOFSlots <Value>

This command specifies the number of slots to measure for the measurement interval of multi-slot measurements, i.e. the "Power vs Time" and "Transient Spectrum" measurements. Between 1 and 8 consecutive slots can be measured.

Parameters for setting and query:

<Value> numeric value

Number of slots to measure.

Range: 1 to 8
*RST: 1 Slots
Default unit: NONE

Example: CONF:CHAN:MSL:NOFS 5

Mode: GSM

Manual operation: See "Number of Slots to measure" on page 65

CONFigure[:MS]:CHANnel:MSLots:OFFSet <Value>

This command specifies the start for the measurement interval for multi-slot measurements, i.e. the "Power vs Time" and "Transient Spectrum" measurements, relative to the GSM frame boundary.

Parameters for setting and query:

<Value> numeric value

First slot to measure in multi-slot measurements relative to the GSM frame start.

Range: 0 to 7
*RST: 0 Slots
Default unit: NONE

Example: `CONF:CHAN:MSL:OFFS 5`

Mode: GSM

Manual operation: See "First Slot to measure" on page 65

CONFigure[:MS]:CHANnel:SLOT<s>[:STATe] <State>

This command activates this slot (this means, for example, that this slot is not considered as inactive in the PvT limit evaluation).

Suffix:

<s> <0..7>
Select the slot to configure.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: Slot 0: 1; Slot 1-7: 0

Example: `CONF:CHAN:SLOT1 ON`

Mode: GSM

Manual operation: See "Active" on page 67

CONFigure[:MS]:CHANnel:SLOT<s>:FILTer <Value>

This command specifies the pulse shape of the transmit filter of the specified slot.

Suffix:

<s> <0..7>
the slot to configure

Parameters for setting and query:

<Value> GMSK | LINearised | NARRow | WIDE

GMSK
GMSK Pulse

LINearised
Linearised GMSK Pulse

NARRow
Narrow Pulse

WIDE
Wide Pulse

*RST: GMSK

Example: CONF:CHAN:SLOT:FILT GMSK

Mode: GSM

Manual operation: See "Filter" on page 67

CONFigure[:MS]:CHANnel:SLOT<s>:MTYPe <Value>

This command specifies the modulation type of the specified slot.

Suffix:

<s> <0..7>
the slot to configure

Parameters for setting and query:

<Value> GMSK | QPSK | PSK8 | QAM16 | QAM32 | AQPSk

Modulation type; the available values depend on the burst type. For Normal Burst GMSK, 8PSK, 16QAM, 32QAM and AQPSK are available.
For Higher Symbol Rate Burst QPSK, 16QAM and 32QAM are available.

GMSK
GMSK, Gaussian Minimum Shift Keying, 1 bit/symbol.

QPSK
QPSK, Quadrature Phase Shift keying, 2 bits/symbol.

PSK8
8PSK (EDGE), Phase Shift Keying, 3 bits/symbol.

QAM16
16QAM, 16-ary Quadrature Amplitude Modulation, 4 bits/symbol.

QAM32
32QAM, 32-ary Quadrature Amplitude Modulation, 5 bits/symbol.

AQPSk
Adaptive Quadrature Amplitude Modulation

*RST: GMSK

Example: CONF:CHAN:SLOT:MTYP GMSK

Mode: GSM

Manual operation: See "Modulation" on page 67

CONFigure[:MS]:CHANnel:SLOT<s>:MULTi <Value>

This command defines the used slots of the mobile or base station. The multislot setting defines how many adjacent slots are active and which of the active slots should be used for synchronization.

For the phase-frequency error, modulation accuracy and power vs. time measurement the training sequence for the slot to synchronize must be set correctly! The reference measurement of power vs. time measurement and the questionable signal power of the main measurement is related to the slot to synchronize. In the main measurement of power vs.time, the slot to synchronize defines the synchronization point of the multi-slot signal on the screen. All results of the phase-frequency error and modulation accuracy measurement are related to the slot to synchronize.

In carrier power and modulation spectrum measurement the slot to synchronize is used to adjust the trigger delay so that the slot to synchronize is measured. With the slot to synchronize it is therefore possible to investigate a certain slot of multislot signals.

Note: This command is retained for compatibility with R&S FS-K5 only.Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead.

Suffix:
<s> <0..7>
irrelevant

Parameters for setting and query:
<Value> ACT1sync1 | ACT2sync1 | ACT2sync2 | ACT3sync1 | ACT3sync2 | ACT3sync3 | ACT4sync1 | ACT4sync2 | ACT4sync3 | ACT4sync4 | ACT5sync1 | ACT5sync2 | ACT5sync3 | ACT5sync4 | ACT5sync5 | ACT6sync1 | ACT6sync2 | ACT6sync3 | ACT6sync4 | ACT6sync5 | ACT6sync6 | ACT7sync1 | ACT7sync2 | ACT7sync3 | ACT7sync4 | ACT7sync5 | ACT7sync6 | ACT7sync7 | ACT8sync1 | ACT8sync2 | ACT8sync3 | ACT8sync4 | ACT8sync5 | ACT8sync6 | ACT8sync7 | ACT8sync8

For `ACT<k>sync<m>` the following settings are defined:
"Slot to measure" is set to *m-1*
"No. of Slots" is set to *k*
"First Slot to measure" is set to *0*
Slots 0 to k-1 are set to active; the remaining slots are set to inactive
Slot properties of slot numbers 0 to k-1 are copied from the last active "Slot to measure".

*RST: ACT1sync1

Example: `CONF:CHAN:SLOT:MULT ACT3sync2`
Slot to measure is 1.
Number of slots is 3.
First slot to measure is 0.
Slots 0, 1, 2 are active.

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:PCL <Value>

This command is now obsolete and is retained for compatibility reasons only.

Suffix:
<s> <0..7>

Parameters for setting and query:
<Value> numeric value
PCL or Dynamic PCL of the slot.
*RST: 0
Default unit: NONE

Example: `CONF:CHAN:SLOT:PCL 5`

Mode: GSM

CONFigure[:MS]:CHANnel:SLOT<s>:SCPir <Value>

This command specifies the Subchannel Power Imbalance Ratio (SCPIR) of the specified slot.

Note: This command is only available for AQPSK modulation.

Suffix:
<s> <0..7>
Number of slot to configure

Parameters for setting and query:
<Value> numeric value
Subchannel Power Imbalance Ratio (SCPIR) in dB
Range: -15 to 15
*RST: 0
Default unit: NONE

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// Setup slot 0 for VAMOS AQPSK modulation
// Activate slot
CONFigure:MS:CHANnel:SLOT0:STATe ON
// Normal burst
CONFigure:MS:CHANnel:SLOT0:TYPE NB
// Adaptive QPSK modulation
CONFigure:MS:CHANnel:SLOT0:MTYPe AQPSk
// Subchannel Power Imbalance Ratio (SCPIR) = 4 dB
CONFigure:MS:CHANnel:SLOT0:SCPir 4
// Linearised gaussian TX filter
CONFigure:MS:CHANnel:SLOT0:FILTer LINearised
// Set TSC of Subchannel 1 = TSC 0 (Set 1)
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC 0,1
// Query TSC and Set of Subchannel 1
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC?
// -> 0,1
// Set TSC of Subchannel 2 = TSC 0 (Set 2)
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC 0,2
// Query TSC and Set of Subchannel 2
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC?
// -> 0,2
```

Mode: GSM

Manual operation: See "SCPIR" on page 67

CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC <Value>

This command selects the training sequence of the specified slot and subchannel used by the mobile or base station.

This command is only available for AQPSK modulation.

Suffix:

<s> <0..7>
Number of slot to configure

<ch> <1|2>
Subchannel number

Query parameters:

<ResultType> TSC | SET

Queries the currently used TSC number or the set.

Parameters for setting and query:

<Value> 0,1 | 0,2 | 1,1 | 1,2 | 2,1 | 2,2 | 3,1 | 3,2 | 4,1 | 4,2 | 5,1 | 5,2 | 6,1 | 6,2 | 7,1 | 7,2 | USER

TSC number and Set or User TSC
Set 2 is only available for subchannel 2.

*RST: 0,1

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// Activate slot 0
CONFigure:MS:CHANnel:SLOT0:STATe ON
// Normal Burst
CONFigure:MS:CHANnel:SLOT0:TYPE NB
// AQPSK (VAMOS) modulation
CONFigure:MS:CHANnel:SLOT0:MTYPe AQPSk
// Subchannel 1: TSC 0 (Set 1)
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC 0,1
// Subchannel 1: Query TSC number and Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC?
// -> 0,1
// Subchannel 1: Query TSC number
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC? TSC
// -> 0
// Subchannel 1: Query Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC? SET
// -> 1
// Subchannel 2: TSC 0 (Set 1)
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC 0,2
// Subchannel 2: Query TSC number and Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC?
// -> 0,2
// Subchannel 2: Query TSC number
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC? TSC
// -> 0
// Subchannel 2: Query Set number
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC? SET
// -> 2
```

Mode: GSM

Manual operation: See "Training Sequence TSC" on page 70

CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER <Value>

This command sets the bits of the user definable TSC. The number of bits must be 26. `CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER` must be set first.

This command is only available for AQPSK modulation.

Suffix:

<s> <0..7>
Number of slot to configure

<ch> <1|2>
Subchannel number

Parameters for setting and query:

<Value> string

String containing the 26 user-defined bits

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// Activate slot 0
CONFigure:MS:CHANnel:SLOT0:STATe ON
// Normal Burst
CONFigure:MS:CHANnel:SLOT0:TYPE NB
// AQPSK (VAMOS) modulation
CONFigure:MS:CHANnel:SLOT0:MTYPe AQPSk
// Subchannel 1: User TSC
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC USER
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC?
// -> USER
// Subchannel 1: Set User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC:USER
'10111101100110010000100001'
// Subchannel 1: Query User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel1:TSC:
USER?
// -> 10111101100110010000100001
// Subchannel 2: User TSC
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC USER
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC?
// -> USER
// Subchannel 2: Set User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC:USER
'11010111111101011001110100'
// Subchannel 2: Query User TSC bits
CONFigure:MS:CHANnel:SLOT0:SUBChannel2:TSC:
USER?
// -> 11010111111101011001110100
```

Mode: GSM

Manual operation: See "User TSC" on page 71

CONFigure[:MS]:CHANnel:SLOT<s>:TSC <Value>

This command selects the training sequence code TSC (Normal and Higher Symbol Rate Bursts) or training (synchronization) sequence TS (for Access Bursts) of the specified slot and subchannel used by the mobile or base station. See 3GPP TS 45.002, chapter 5.2 'Bursts'.

This command is not available for AQPSK modulation (use `CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC` instead).

Suffix:

<s> 0..7

Number of the slot to configure

Query parameters:

<ResultType> TSC | SET

Queries the currently used TSC number or the set.
If no query parameter is defined, only the TS or the TSC is returned.

TSC
Only the TSC or TS is returned.

SET
The set of the TSC is returned.

Parameters for setting and query:

<Value> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0,1 | 0,2 | 1,1 | 1,2 | 2,1 | 2,2 | 3,1 | 3,2 | 4,1 | 4,2 | 5,1 | 5,2 | 6,1 | 6,2 | 7,1 | 7,2 | TS0 | TS1 | TS2 | USER

Training sequence for Normal Burst

0...7
One of the 7 pre-defined training sequence codes is used

0,1 | 0,2 | 1,1 | 1,2 | 2,1 | 2,2 | 3,1 | 3,2 | 4,1 | 4,2 | 5,1 | 5,2 | 6,1 | 6,2 | 7,1 | 7,2
TSC number and set for Normal Bursts

TS0 | TS1 | TS2
Training (synchronization) sequence for Access Bursts

USER
A user-defined training sequence is used (see `CONFigure[:MS]:CHANnel:SLOT<s>:TSC:USER` on page 118).

*RST: 0

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// Activate slot 0
CONFigure:MS:CHANnel:SLOT0:STATe ON
// Normal Burst
CONFigure:MS:CHANnel:SLOT0:TYPE NB
// --- GMSK modulation ---
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
// TSC 3 (Set 1)
CONFigure:MS:CHANnel:SLOT0:TSC 3,1
// Query TSC number
// Note: For backwards compatibility only
// the TSC number is returned.
CONFigure:MS:CHANnel:SLOT0:TSC?
// -> 3
// Query TSC number
CONFigure:MS:CHANnel:SLOT0:TSC? TSC
// -> 3
// Query Set number
CONFigure:MS:CHANnel:SLOT0:TSC? SET
// -> 1
// --- 8PSK modulation ---
CONFigure:MS:CHANnel:SLOT0:MTYPe PSK8
// TSC 3
CONFigure:MS:CHANnel:SLOT0:TSC 3
// Query TSC number
CONFigure:MS:CHANnel:SLOT0:TSC?
// -> 3
```

Mode: GSM

Manual operation: See "Training Sequence TSC" on page 68

CONFigure[:MS]:CHANnel:SLOT<s>:TSC:USER <Value>

This command sets the bits of the user definable TSC. The number of bits must be in accordance with the defined burst type and modulation (as indicated in"User TSC" on page 69). `CONFigure:MS:CHANnel:SLOT0:TSC USER` must be defined first (see `CONFigure[:MS]:CHANnel:SLOT<s>:TSC` on page 116).

Note: This command is not available for AQPSK modulation (use `CONFigure[:MS]:CHANnel:SLOT<s>:SUBChannel<ch>:TSC:USER` on page 115 instead).

Suffix:

<s> <0..7>
The slot to configure

Parameters for setting and query:

<Value> String containg the user defined bits, e.g. '10101111101010101100111100' for a GMSK normal burst.

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// Activate slot 0
CONFigure:MS:CHANnel:SLOT0:STATe ON
// Deactivate all other slots(1-7)
CONFigure:MS:CHANnel:SLOT1:STATe OFF
CONFigure:MS:CHANnel:SLOT2:STATe OFF
CONFigure:MS:CHANnel:SLOT3:STATe OFF
CONFigure:MS:CHANnel:SLOT4:STATe OFF
CONFigure:MS:CHANnel:SLOT5:STATe OFF
CONFigure:MS:CHANnel:SLOT6:STATe OFF
CONFigure:MS:CHANnel:SLOT7:STATe OFF
// Set slot 0 to GMSK
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
// User TSC 0 as user TSC in slot 0
CONFigure:MS:CHANnel:SLOT0:TSC USER
CONFigure:MS:CHANnel:SLOT0:TSC:USER
'00100101110000100010010111'
// Activate EVM vs Time measurement
CONFigure:BURSt:ETIMe
// Switch to split screen mode
DISPlay:FORMat SPLit
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Read the averaged EVM RMS value
FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?
// -> 0.388730555772781
```

Mode: GSM

Manual operation: See "User TSC" on page 69

CONFigure[:MS]:CHANnel:SLOT<s>:TYPE <Value>

Specifies the type of the burst.

Suffix:

<s> <0..7>

Parameters for setting and query:

<Value>

NB
Normal Burst

HB
Higher Symbol Rate Burst

AB
Access Burst

*RST: NB

Example:

```
CONF:CHAN:SLOT:TYPE NB
```

Mode: GSM

Manual operation: See "Burst Type" on page 67

CONFigure[:MS]:CHANnel:TSC <Value>

Sets the burst type and TSC of the 'Slot to measure'. Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead. Use `CONFigure[:MS]:CHANnel:SLOT<s>:TYPE` and `CONFigure[:MS]:CHANnel:SLOT<s>:TSC`

Parameters for setting and query:

<Value> TSC number

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
TSC number (Normal Burst)

AB0 | AB1 | AB2
TS number (Access Burst)

USER
User-defined TSC

*RST: 0

Example: `CONFigure:MS:CHANnel:TSC 0`

Mode: GSM

CONFigure[:MS]:CHANnel:TSC:USER <Value>

This command sets the bits of the user definable TSC of the "Slot to measure". The number of bits must be in accordance with the set burst type and modulation. `CONFigure:MS:CHANnel:TSC USER` needs to be set first.

Refrain from using this command in new K10 remote scripts and use pure K10 remote commands instead. Use `CONFigure:MS:CHANnel:SLOT0:TSC USER` and `CONFigure:MS:CHANnel:SLOT0:TSC:USER '10101111101010101100111100'`.

Parameters for setting and query:

<Value> string

Example:
```
CONFigure:MS:CHANnel:TSC:USER
'10101111101010101100111100'
```

Mode: GSM

CONFigure[:MS]:DEMod:DECision <Value>

This command determines how the symbols are detected in the demodulator. The setting of this parameter does not effect the demodulation of Normal Bursts with GMSK modulation. For Normal Bursts with 8PSK, 16QAM, 32QAM or AQPSK modulation or Higher Symbol Rate Bursts with QPSK, 16QAM or 32QAM modulation use this parameter to get a trade-off between performance (symbol error rate of the K10) and measurement speed.

Parameters for setting and query:

<Value> AUTO | LINear | SEQuence

Symbol decision method

AUTO
Automatically selects the symbol decision method.

LINear
Linear symbol decision: Uses inverse filtering (a kind of zero-forcing filter) and a symbol-wise decision method. This method is recommended for high symbol to noise ratios, but not for Higher Symbol Rate bursts with a narrow pulse. The inverse filter colors the noise inside the signal bandwidth and therefore is not recommended for narrow-band signals or signals with a low signal to noise ratio. Peaks in the "EVM vs Time" measurement (see chapter 3.1.4, "EVM vs Time", on page 15) may occur if the "Linear" symbol decision algorithm fails. In that case use the "Sequence" method. Linear is the fastest option.

SEQuence
Symbol decision via sequence estimation. This method uses an algorithm that minimizes the symbol errors of the entire burst. It requires that the tail bits in the analyzed signal are correct. It has a better performance (lower symbol error rate) compared to the "Linear" method, especially at low signal to noise ratios, but with a loss of measurement speed. This method is recommended for normal bursts with 16QAM or 32QAM modulation and for Higher Symbol Rate bursts with a narrow pulse.

*RST: AUTO

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Activate EVM vs Time measurement
CONFigure:BURSt:ETIMe:IMMediate
// Set slot 0: Higher Symbol Rate burst, 16QAM, Wide Pulse & TSC 0
CONFigure:MS:CHANnel:SLOT0:STATe ON
CONFigure:MS:CHANnel:SLOT0:TYPE HB
CONFigure:MS:CHANnel:SLOT0:MTYPe QAM16
CONFigure:MS:CHANnel:SLOT0:FILTer WIDE
CONFigure:MS:CHANnel:SLOT0:TSC 0
// Use 'seqeunce estimator' for the symbol decision
CONFigure:MS:DEMod:DECision SEQuence
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Read the averaged EVM RMS value
FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?
// Use the 'linear' method for the symbol decision
CONFigure:MS:DEMod:DECision LINear
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Read the averaged EVM RMS value
FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?
```

Mode: GSM

Manual operation: See "Symbol Decision" on page 75

CONFigure[:MS]:DEMod:STDBits <Value>

The R&S FSV-K10 demodulator requires the bits of the burst (Tail, Data, TSC, Data, Tail) to provide an ideal version of the measured signal. The "Data" bits can be random and are typically not known inside the demodulator of the R&S FSV-K10. "Tail" and "TSC" bits are specified in the "Burst" dialog box (see "Burst" on page 66). Using the "Tail & TSC Bits" setting you can select whether the detected Tail and TSC bits or the standard bits (as set in the "Burst" dialog box) are used to construct the ideal signal. Using the standard bits can be advantageous to verify whether the device under test sends the correct Tail and TSC bits. Incorrect bits would lead to peaks in the "EVM vs Time" trace (see chapter 3.1.4, "EVM vs Time", on page 15) at the positions of the incorrect bits.

Parameters for setting and query:

<Value> DETected | STD

*RST: DETected

Example:
```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Activate EVM vs Time measurement
CONFigure:BURSt:ETIMe:IMMediate
// Replace detected Tail & TSC bits by the standard bits
CONFigure:MS:DEMod:STDBits STD
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Read the averaged EVM RMS value
FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?
```

Mode: GSM

Manual operation: See "Tail & TSC Bits" on page 76

CONFigure[:MS]:DEVice:TYPE <Value>

This command specifies the type of device to be measured.

Parameters for setting and query:

<Value> BTSNormal | BTSMicro | BTSPico | MSNormal | MSSMall

BTSNormal
BTS, TRX power class Normal

BTSMicro
BTS, TRX power class Micro

BTSPico
BTS, TRX power class Pico

MSNormal
MS, normal type

MSSMall
MS, small type

*RST: BTSNormal

Example:
```
CONF:DEV:TYPE BTSNormal
```

Mode: GSM

Manual operation: See "Device Under Test: Type" on page 57

CONFigure[:MS]:MCARrier[:STATe] <State>

This command is retained for compatibility with R&S FS-K5 only. In new R&S FSV-K10 remote scripts use the commands described in the example below instead.

For BTS devices, this command activates multicarrier BTS and sets the 300 MHz multicarrier Power vs Time filter.

For MS devices, this command is not available.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: 0

Example:

```
// Use the following pure K10 commands instead
// of the old FS-K5 command
// 'CONFigure:MS:MCARrier:STATe ON'.

// Switch on mode for multi-carrier BTS measurements
// Note: With the next command internally also a
// multi-carrier pre-filter for the 'Demod' measurements
// will be activated.
// Switch on mode for multi-carrier BTS measurements.
CONFigure:MS:MCARrier:MCBTs ON
// Select K5 compatible multi-carrier pre-filter for PvT measurement.
CONFigure:MS:MCARrier:FILTer MC300
```

Mode: GSM

CONFigure[:MS]:MCARrier:ACTCarriers <Value>

This parameter specifies the total number of active carriers of the multi-carrier BTS to be measured. Its value affects the calculation of the limits according to the 3GPP standard for the modulation spectrum measurement, see 3GPP2 TS 45.005 (chapter 4.2.1. "Spectrum due to modulation and wide band noise"). The limit is changed by 10*log(N).

Parameters for setting and query:

<Value> numeric value

Number of active carriers

Range: 1 to 12
*RST: 1
Default unit: NONE

Example:

```
CONF:MCAR:ACTC
```

Mode: GSM

Manual operation: See "No. of active Carriers" on page 78

CONFigure[:MS]:MCARrier:BTSClass <Value>

This command defines the base station class. The specified BTS Class effects the calculation of the limits according to the 3GPP standard for the modulation spectrum measurement, see 3GPP2 TS 45.005 (chapter 4.2.1. "Spectrum due to modulation and wide band noise" and chapter 4.3.2 "Base Transceiver Station", search for "Multicarrier BTS").

Parameters for setting and query:

<Value> 1 | 2

*RST: 1

Example: `CONF:MCAR:BTSClass`

Mode: GSM

Manual operation: See "BTS Class" on page 78

CONFigure[:MS]:MCARrier:FILTer <Value>

This command controls the filter used to reduce the measurement bandwidth for multi-carrier "Power vs Time" measurements.

For multi-carrier BTS, the PvT Filter parameter in the "Advanced" tab is ignored.

Parameters for setting and query:

<Value> MC400 | MC300

PvT filter type

MC400
Recommended for measurements with multi-channels of equal power.

MC300
Recommended for measurement scenarios where a total of six channels is active and the channel to be measured has a reduced power (e.g. 30 dB) compared to its adjacent channels. The PvT filter is optimized to get smooth edges after filtering burst signals and to suppress adjacent, active channels.

*RST: MC400

Example: `CONF:MCAR:FILT MC400`

Mode: GSM

Manual operation: See "PvT Filter" on page 78

CONFigure[:MS]:MCARrier:MCBTs <State>

This parameter informs the R&S FSV-K10 that the measured signal is a multi-carrier signal. This function is only available if the "Device Type" is a "BTS" type (see `CONFigure[:MS]:DEVice:TYPE` on page 123). If active, a special multi-carrier filter is switched into the demodulation path and further multi-carrier-specific parameters become available.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
The measured signal is a multi-carrier signal.

OFF
The measured signal is a single-carrier signal.

*RST: OFF

Example: `CONF:MCAR:MCBT ON`

Mode: GSM

Manual operation: See "Multicarrier BTS" on page 78

CONFigure[:MS]:MTYPe <Value>

This command sets the modulation type of all slots.

Note: This command is retained for compatibility with R&S FS-K5 only.

Parameters for setting and query:

<Value> GMSK | EDGE

Modulation type

*RST: GMSK

Example:

```
// Enter the GSM option K10
INSTrument:SELect GSM
// Old FS-K5 commands
CONFigure:MS:MTYPe EDGE
// Please use the following K10 commands instead
// K5: 'GMSK' -> K10: 'GMSK'
// K5: 'EDGE' -> K10: 'PSK8'
CONFigure:MS:CHANnel:SLOT0:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT1:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT2:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT3:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT4:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT5:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT6:MTYPe PSK8
CONFigure:MS:CHANnel:SLOT7:MTYPe PSK8
// Old FS-K5 commands
CONFigure:MS:CHANnel:SLOT1:MTYPe GMSK
CONFigure:MS:CHANnel:SLOT1:MTYPe?
// -> GMSK
// Please use the following K10 commands instead
CONFigure:MS:CHANnel:MSLots:MEASure?
// -> 0 This is the slot number of the 'slot to measure'
// Set and query the modulation of the 'slot to measure'
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
CONFigure:MS:CHANnel:SLOT0:MTYPe?
// -> GMSK
```

Mode: GSM

CONFigure[:MS]:MULTi:BURSt:CONStell <State>

Use this command to always include / exclude the calculation of the results of the "Constellation" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate "Constellation" results.

OFF
Do not calculate "Constellation" results.

*RST: 1

Mode: GSM

Manual operation: See "Constellation" on page 77

CONFigure[:MS]:MULTi:BURSt:DEModulation <State>

Use this command to always include / exclude the calculation of the results of the Modulation Accuracy, EVM vs Time, Phase Error vs Time and Magnitude Error vs Time measurements when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate Modulation Accuracy, EVM vs Time, Phase Error vs Time and Magnitude Error vs Time results.

OFF
Do not calculate Modulation Accuracy, EVM vs Time, Phase Error vs Time and Magnitude Error vs Time results.

*RST: 1

Mode: GSM

Manual operation: See "Demod" on page 77

CONFigure[:MS]:MULTi:BURSt:PTEMplate <State>

Use this command to always include / exclude the calculation of the (graph and list) results of the "Power vs Time" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate Power vs Time (list and graph) results.

OFF
Do not calculate Power vs Time (list and graph) results.

*RST: 1

Mode: GSM

Manual operation: See "Power vs Time" on page 76

CONFigure[:MS]:MULTi:SPECtrum:MODulation <State>

Use this command to always include / exclude the calculation of the results of the "Modulation Spectrum" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe` on page 129).

Note: When activated, list results are returned. To obtain graphical results, use `CONFigure:SPECtrum:SELect FREQdomain`, see `CONFigure:SPECtrum:SELect` on page 144.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate "Modulation Spectrum" results.

OFF
Do not calculate "Modulation Spectrum" results.

*RST: 1

Example: `CONFigure:MS:MULTi:SPECtrum:MODulation ON`

Mode: GSM

Manual operation: See "Modulation Spectrum" on page 77

CONFigure[:MS]:MULTi:SPECtrum:SWITching <State>

Use this command to always include / exclude the calculation of the results of the "Transient Spectrum" measurement when the multiple measurement mode is active (see `CONFigure[:MS]:MULTi:STATe`).

Note: When activated, list results are returned. To obtain graphical results, use `CONFigure:SPECtrum:SELect FREQdomain`, see `CONFigure:SPECtrum:SELect` on page 144.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
Calculate Transient Spectrum results.

OFF
Do not calculate Transient Spectrum results.

*RST: 1

Mode: GSM

Manual operation: See "Transient Spectrum" on page 77

CONFigure[:MS]:MULTi:STATe <State>

This command activates the multiple measurement mode. Multiple measurement mode means that several measurement results can be calculated on the same I/Q data capture in parallel. If it is known in advance which measurement results are required, then use the multiple measurement mode to reduce total measurement time. When active, only the results of the selected measurements are available. Measurements that are not selected are not available.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

*RST: 0

Example:

```
// Multiple measurement mode example for a 16QAM signal
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set the center frequency to 935 MHz
SENSe1:FREQuency:CENTer 935MHz
// Multiple measurement mode example for a 16QAM signal
// Configure for a 16QAM signal
CONFigure:MS:CHANnel:SLOT0 ON
CONFigure:MS:CHANnel:SLOT0:TYPE NB
CONFigure:MS:CHANnel:SLOT0:MTYPe QAM16
CONFigure:MS:CHANnel:SLOT0:FILTer LINearised
CONFigure:MS:CHANnel:SLOT1 OFF
CONFigure:MS:CHANnel:SLOT2 OFF
CONFigure:MS:CHANnel:SLOT3 OFF
CONFigure:MS:CHANnel:SLOT4 OFF
CONFigure:MS:CHANnel:SLOT5 OFF
CONFigure:MS:CHANnel:SLOT6 OFF
CONFigure:MS:CHANnel:SLOT7 OFF
// Set the statistic count
SENSe1:SWEep:COUNt 200
// Activate the multi meas mode
CONFigure:MS:MULTi:STATe 1
// Select all required measurements
CONFigure:MS:MULTi:BURSt:DEModulation 1
CONFigure:MS:MULTi:SPECtrum:MODulation 1
CONFigure:MS:MULTi:BURSt:PTEMplate 1
CONFigure:MS:MULTi:SPECtrum:SWITching 1
// Turn off the display while the measurement is running
SYST:DISP:UPD OFF
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Turn on the display to view results
SYST:DISP:UPD ON
```

Mode: GSM

Manual operation: See "Multiple Measurement Mode active" on page 76

CONFigure[:MS]:NETWork[:TYPE] <Value>

This command works in conjunction with the CONFigure[:MS]:NETWork:FREQuency:BAND command to specify the frequency band of the signal to be measured. The command is not in-line with the manual operation to hold the SCPI remote control part compatible with the R&S FS-K5.

Parameters for setting and query:

<Value> PGSM | EGSM | DCS | PCS | TGSM | RGSM | GSM

PGSM
Primary GSM

EGSM
Extended GSM

DCS
DCS

PCS
PCS

TGSM
T-GSM

RGSM
Railway GSM

GSM
GSM

*RST: EGSM

Example: `CONF:NETW PGSM`

Mode: GSM

Manual operation: See "Frequency Band" on page 57

CONFigure[:MS]:NETWork:FREQuency:BAND <Value>

This command works in conjunction with the CONFigure[:MS]:NETWork[:TYPE] command to specify the frequency band of the signal to be measured. The command is not in-line with the manual operation to hold the SCPI remote control part compatible with the R&S FS-K5.

Parameters for setting and query:

<Value> 380 | 410 | 450 | 480 | 710 | 750 | 810 | 850 | 900 | 1800 | 1900

380
380 MHz band – valid for TGSM

410
410 MHz band – valid for TGSM

450
450 MHz band – valid for GSM

480
480 MHz band – valid for GSM

710
710 MHz band – valid for GSM

750
750 MHz band – valid for GSM

810
810 MHz band – valid for TGSM

850
850 MHz band – valid for GSM

900
900 MHz band – valid for PGSM, EGSM, RGSM and TGSM

1800
1800 MHz band – valid for DCS

1900
1900 MHz band – valid for PCS

*RST: 900

Example: `CONF:NETW:FREQ 380`

Mode: GSM

Manual operation: See "Frequency Band" on page 57

CONFigure[:MS]:POWer:CLASs <Value>

This command the power class of the device under test.

Parameters for setting and query:

<Value> 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | E1 | E2 | E3 | M1 | M2 | M3 | P1

1
MS and BTS power class 1

2
MS and BTS power class 2

3
MS and BTS power class 3

4
MS and BTS power class 4

5
MS and BTS power class 5

6
BTS power class 6

7
BTS power class 7

8
BTS power class 8

E1
MS power class E1

E2
MS power class E2

E3
MS power class E3

M1
BTS power class M1 (Micro)

M2
BTS power class M2 (Micro)

M3
BTS power class M3 (Micro)

P1
BTS power class P1 (Pico)

*RST: 2

Example: `CONF:POW:CLAS 1`

Mode: GSM

Manual operation: See "Power Class" on page 58

CONFigure[:MS]:POWer:STATic <Value>

This command is now obsolete and is retained for compatibility reasons only.

Parameters for setting and query:

<Value> numeric value

BTS static power step / power control level.

Default unit: NONE

Example: `CONF:POW:STAT 5`

Mode: GSM

CONFigure[:MS]:POWer:AUTO <Value>

This command is used to switch on or off automatic power level detection. When switched on, power level detection is performed at the start of each measurement sweep. Using the ONCE argument starts the auto level measurement immediately.

Parameters for setting and query:

<Value> OFF | ON | ONCE

OFF
Switch the function off

ON
Switch the function on

ONCE
Execute the function once

*RST: ON

Example: `CONF:POW:AUTO OFF`

Mode: GSM

Manual operation: See "Reference Level" on page 58

CONFigure[:MS]:POWer:AUTO:SWEep:TIME <Value>

This command is used to specify the auto track time, i.e. the sweep time for auto level measurements or swept measurements and the capture time for auto detection.

Parameters for setting and query:

<Value> numeric value

Auto level measurement sweep time

Range: 0.01 to 1
*RST: 0.1 s
Default unit: S

Example: `CONF:POW:AUTO:SWE:TIME 0.01 MS`

Mode: GSM

Manual operation: See "Auto Track Time" on page 63

CONFigure[:MS]:PRATe <Value>

This command is retained for compatibility with R&S FS-K5 only. This command has no effect.

Parameters for setting and query:

<Value> numeric value

*RST: 4
Default unit: NONE

Mode: GSM

CONFigure[:MS]:RESTore

This command is retained for compatibility with R&S FS-K5 only. This command has no effect.

Mode: GSM

CONFigure[:MS]:SSEarch <State>

This command is retained for compatibility with R&S FS-K5 only. In new K10 remote scripts use `CONFigure:MS:SYNC:MODE TSC` or `CONFigure:MS:SYNC:MODE ALL` instead (see `CONFigure[:MS]:SYNC:MODE` on page 136).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
TSC search on

OFF
TSC search off

*RST: 1

Example: `CONF:SSE ON`

Mode: GSM

CONFigure[:MS]:SYNC:IQCThreshold <Value>

This command sets the IQ correlation threshold. The IQ correlation threshold decides whether a burst is accepted if "Measure only on Sync" is activated (see `CONFigure[:MS]:SYNC:ONLY` on page 137). If the correlation value between the ideal IQ signal of the given TSC and the measured TSC is below the IQ correlation threshold, then the application reports "Sync not found" in the status bar. Additionally, such bursts are ignored if "Measure only on Sync" is activated.

Parameters for setting and query:

<Value> numeric value

IQ Correlation Threshold

Range: 0 to 100
*RST: 85
Default unit: NONE

Example: `CONF:SYNC:IQCT 98`

Mode: GSM

Manual operation: See "IQ Correlation Threshold" on page 75

CONFigure[:MS]:SYNC:MODE <Value>

This command sets the synchronization mode of the R&S FSV-K10.

Parameters for setting and query:

<Value> ALL | TSC | BURSt | NONE

ALL
First search for the power profile (burst search) according to the frame configuration in the capture buffer. Second, inside the found bursts search for the TSC of the "Slot to measure" as given in the frame configuration. "ALL" is usually faster than "TSC" for bursted signals.

TSC
Search the capture buffer for the TSC of the "Slot to measure" as given in the frame configuration. This mode corresponds to a correlation with the given TSC. This mode can be used for continous (but framed) signals or bursted signals.

BURSt
Search for the power profile (burst search) according to the frame configuration in the capture buffer.
Note: For "Burst" no demodulation measurements (e.g. "Modulation Accuracy") are supported. Only "Power vs Time", "Modulation Spectrum", "Transient Spectrum" measurements are supported.

NONE
Do not synchronize at all. If an external or power trigger is chosen, the trigger instant corresponds to the frame start.
Tip: Manually adjust the trigger offset to move the burst to be analyzed under the mask in the "Power vs Time" measurement.
Note: For "None" no demodulation measurements (e.g. "Modulation Accuracy") are supported. Only "Power vs Time", "Modulation Spectrum", "Transient Spectrum" measurements are supported.

*RST: ALL

Example: `CONF:SYNC:MODE TSC`

Mode: GSM

Manual operation: See "Synchronization" on page 59

CONFigure[:MS]:SYNC:ONLY <State>

If activated, only results from frames (slots) where the "Slot to measure" was found are displayed and taken into account in the averaging of the results. The behavior of this function depends on the value of the"Synchronization" parameter (see `CONFigure[:MS]:SYNC:MODE` on page 136).

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

1 | ON
measure only on sync

0 | OFF
always measure even if sync not found

*RST: OFF

Example: `CONF:SYNC:MODE TSC`
Search the capture buffer for the TSC of the "Slot to measure" as given in the frame configuration.
`CONF:SYNC:ONLY ON`
Only if the TSC is found, the results are displayed.

Mode: GSM

Manual operation: See "Measure only on Sync" on page 60

4.4.2 CONFigure:BURSt subsystem

Commands of the Configure:BURSt subsystem:

CONFigure:BURSt:CONStell[:IMMediate]

This command selects the constellation measurement.

Example: `CONF:BURS:CONS`

Usage: Setting only

Mode: GSM

Manual operation: See "Constell" on page 81

CONFigure:BURSt:ETIMe[:IMMediate]

This command selects measurement of the EVM Vs time.

Example: `CONF:BURS:ETIM`

Usage: Setting only

Mode: GSM

Manual operation: See "EVM" on page 81

CONFigure:BURSt:MACCuracy[:IMMediate]

This command selects measurement of the modulation accuracy.

Example: `CONF:BURS:MACC`

Usage: Setting only

Mode: GSM

Manual operation: See "Modulation Accuracy" on page 80

CONFigure:BURSt:MERRor[:IMMediate]

This command selects measurement of the "Magnitude Error vs Time" (see chapter 3.1.5, "Magnitude Error vs Time", on page 16).

Example: `CONF:BURS:MERR`

Usage: Setting only

Mode: GSM

Manual operation: See "Magnitude Error" on page 81

CONFigure:BURSt:PFERror[:IMMediate]

This command selects measurement of the "Phase Error vs Time" (see chapter 3.1.3, "Phase Error vs Time", on page 14).

Example: `CONF:BURS:PFER`

Usage: Setting only

Mode: GSM

Manual operation: See "Phase Error" on page 81

CONFigure:BURSt:PTEMplate[:IMMediate]

This command selects the measurement of power vs. time (PvT) of the mobile or base station. Both graph and list results (slot power and "Delta to Sync" values) are displayed.

Example: `CONF:BURS:PTEM`

Usage: Setting only

Mode: GSM

Manual operation: See "PvT" on page 82

CONFigure:BURSt:PTEMplate:FILTer <Value>

The PvT Filter controls the filter used to reduce the measurement bandwidth for single carrier "Power vs Time" measurements. The parameter is only available if "Multi Carrier BTS" in the Multi Carrier tab is switched off (see "Multicarrier BTS" on page 78). Therefore the "PvT Filter" parameter in the "Multi Carrier" tab is ignored in the single carrier case.

Parameters for setting and query:

<Value> G1000 | G500 | B600

B600
Default Lowpass, 600 kHz

G500
Gaussian Filter, 500 kHz

G1000
Gaussian Filter, 1000 kHz

*RST: G1000

Example: `CONF:BURS:PTEM:FILT G500`

Mode: GSM

Manual operation: See "PvT Filter" on page 71

CONFigure:BURSt:PTEMplate:SELect <Value>

Parameters for setting and query:

<Value> FULL | RISing | FALLing | TOP | FRISing

FULL
Full burst; all bursts in the slot scope are displayed

RISing
Rising edges only (the rest of the bursts are removed)

FALLing
Falling edges only (the rest of the bursts are removed)

TOP
Top high resolution (the Y axis is streched to show the measurement slot power area in detail)

FRISing
Rising and Falling together (useful parts and guard intervals removed)

*RST: FULL

Example: `CONF:BURS:PTEM:SEL FULL`

Mode: GSM

Manual operation: See "Full" on page 82
See "Rising" on page 82
See "Falling" on page 83
See "Rise & Fall" on page 83
See "Top" on page 83

CONFigure:BURSt:PTEMplate:TALign <Mode>

This command controls the time-alignment of the limit lines for the "Power vs Time" measurement (see "Limit Time Alignment" on page 72).

Note: When measuring Access bursts the parameter "Limit Time Alignment" should be set to `PSLot`, since the position of an Access burst within a slot depends on the set timing advance of the DUT.

Parameters for setting and query:

<Mode> STMeasure | PSLot

STMeasure
For each slot the mid of TSC is derived from the measured mid of TSC of the "Slot to measure" and the timeslot lengths specified in the standard (see "Timeslot length" in 3GPP TS 45.010).

PSLot
For each slot the mid of TSC is measured. This provides reasonable time-alignment if the slot lengths are not according to standard. However, the "Power vs Time" limit check is also passed.

*RST: STMeasure

Example: CONF:BURS:PTEM:TAL PSL

Mode: GSM

Manual operation: See "Limit Time Alignment" on page 72

4.4.3 CONFigure:SPECtrum subsystem

Commands of the Configure:SPECtrum subsystem:

CONFigure:SPECtrum:HDYNamic <State>

If activated, the results of the (I/Q-based) "Modulation Spectrum" measurement (see CONFigure:SPECtrum:MODulation[:IMMediate] on page 143) are corrected by the instrument's inherent noise, which increases the dynamic range.

When "High Dynamic" is activated, a measurement of the instrument's inherent noise is automatically carried out. The instrument's inherent noise is then removed from the measured results. The inherent noise of the instrument depends on the selected center frequency and level setting. Therefore the measurement of the inherent noise is repeated whenever one of these parameters is changed.

In addition, for instruments with (early) detector boards with an even hardware code (see column "HWC" in the hardware information dialog) phase noise is reduced (at 600 kHz offset frequencies).

For best performance for modulation accuracy measurements on instruments with early detector boards, deactivate the "High Dynamic" mode.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
// Select Modulation Spectrum measurement
// (measurement on captured I/Q data)
CONFigure:SPECtrum:MODulation:IMMediate
// Activate high dynamic mode
CONF:SPEC:HDYN ON
```

Mode: GSM

Manual operation: See "High Dynamic" on page 74

CONFigure:SPECtrum:LIMit:LEFT <State>

This command controls the left limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This command affects the "Modulation Spectrum" and "Transient Spectrum" measurements.

Note: For measurements on multi-carrier signals, use either the check on the left or right side to measure the spectrum of the left- or right-most channel and to ignore the side where adjacent channels are located.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
check limit

OFF
do not check limit

*RST: 1

Example: `CONF:SPEC:LIM:LEFT OFF`

Mode: GSM

Manual operation: See "Enable Left Limit" on page 72

CONFigure:SPECtrum:LIMit:RIGHt <State>

This command controls the right limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. This command affects the "Modulation Spectrum" and "Transient Spectrum" measurements.

Note: For measurements on multi-carrier signals, use either the check on the left or right side to measure the spectrum of the left- or right-most channel and to ignore the side where adjacent channels are located.

Parameters for setting and query:

<State> 1 | 0 | ON | OFF

ON
check limit

OFF
do not check limit

*RST: 1

Example: `CONF:SPEC:LIM:LEFT OFF`

Mode: GSM

Manual operation: See "Enable Right Limit" on page 73

CONFigure:SPECtrum:MODulation[:IMMediate]

This command selects measurement of the spectrum due to modulation (MOD). This measurement is based on captured I/Q data. Use the Wide Modulation spectrum measurements for measurements in zero span mode (see `CONFigure:WSPectrum:MODulation[:IMMediate]` on page 148).

Example: `CONF:SPEC:MOD`

Usage: Setting only

Mode: GSM

Manual operation: See "Modulation Spectrum" on page 83

CONFigure:SPECtrum:MODulation:LIMIT <Mode>

This command selects whether the list results (power and limit values) of the "Modulation Spectrum" measurement are returned in a relative (dB) or absolute (dBm) unit. This command is only available when the "Modulation Spectrum" measurement is selected (see `CONFigure:SPECtrum:MODulation[:IMMediate]` on page 143.

Parameters for setting and query:

<Mode> ABSolute | RELative

*RST: RELative

Example:
```
// Select Modulation Spectrum measurement
// (measurement on captured I/Q data)
CONFigure:SPECtrum:MODulation:IMMediate
// Only list results are required
CONFigure:SPECtrum:SELect LIST
// Absolute power and limit results in dBm
CONFigure:SPECtrum:MODulation:LIMit ABSolute
// Run one measurement and query absolute list results
READ:SPECtrum:MODulation:ALL?
// -> 0,933200000,933200000,-108.66,-65.00,ABS,PASSED, ...
```

Mode: GSM

CONFigure:SPECtrum:MODulation:LIST:BANDwidth:RESolution <OffsetFreq>, <RBW_VBW>

This command controls the resolution bandwidth (RBW) and video bandwidth (VBW) used in the Modulation Spectrum and Wide Modulation Spectrum measurements at offset frequencies of +/- 1800 kHz from the carrier.

Parameters:

<RBW_VBW> 30000 | 100000

RBW and VBW in Hz at the given offset frequency

Setting parameters:

<OffsetFreq> offset frequency in Hz

Range: 1800000
*RST: 1800000

Example:

```
// --- Mod. Spectrum measurement ---
// (measurement on captured I/Q data)
CONFigure:SPECtrum:MODulation:IMMediate
// Only list results are required
CONFigure:SPECtrum:SELect LIST
// RBW = 100 kHz @ 1800 kHz offset freq.
CONFigure:SPECtrum:MODulation:LIST:
BANDwidth:RESolution 1800000,100000
// Check set value
CONFigure:SPECtrum:MODulation:LIST:BANDwidth:
RESolution? 1800000
// -> 100000
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Fetch list results (table)
FETCh:SPECtrum:MODulation:ALL?
```

Example:

```
// --- Wide Mod. Spectrum measurement ---
// (gated zero span measurement)
CONFigure:WSPectrum:MODulation:IMMediate
// Measure offset freqs. up to 1800 kHz only
CONFigure:WSPectrum:MODulation:LIST:SELect
NARRow
// RBW = 100 kHz @ 1800 kHz offset freq.
CONFigure:SPECtrum:MODulation:LIST:BANDwidth:
RESolution 1800000,100000
// Check set value
CONFigure:SPECtrum:MODulation:LIST:BANDwidth:
RESolution? 1800000
// -> 100000
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Fetch list results (table)
FETCh:WSPectrum:MODulation:ALL?
```

Mode: GSM

Manual operation: See "Mod. RBW @ 1800 kHz" on page 74

CONFigure:SPECtrum:SELect <Mode>

This command selects how the modulation and transient spectrum measurement is performed and displayed.

Parameters for setting and query:

<Mode> LIST | FREQdomain

LIST
Spectrum results are measured at several frequency offsets from the center frequency. The results are displayed in a table.

FREQdomain
A spectrum trace is measured and displayed as a graph.

*RST: FREQdomain

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Modulation spectrum graph measurement
CONFigure:SPECtrum:MODulation:IMMediate
// --- Graph example ---
// Graph (frequency domain) and List results are required
CONFigure:SPECtrum:SELect FREQdomain
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Fetch graph results, i.e. average trace (trace 1)
TRACe1:DATA? TRACe1
// Fetch list results (table)
FETCh:SPECtrum:MODulation:ALL?
// --- List example ---
// Only list results are required ---
CONFigure:SPECtrum:SELect LIST
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Fetch list results (table)
FETCh:SPECtrum:MODulation:ALL?
```

Mode: GSM

Manual operation: See "Display List/Graph" on page 84

CONFigure:SPECtrum:SWITching[:IMMediate]

This command selects measurement of the spectrum due to switching transients (TRA).

Example:

```
CONF:SPEC:SWIT
```

Usage: Setting only

Mode: GSM

Manual operation: See "Transient Spectrum" on page 83

CONFigure:SPECtrum:SWITching:LIMIT <Mode>

This command selects whether the list results (power and limit values) of the "Transient Spectrum" measurement are returned in a relative (dB) or absolute (dBm) unit. This command is only available when the "Transient Spectrum" measurement is selected (see `CONFigure:SPECtrum:SWITching[:IMMediate]` on page 145).

Parameters for setting and query:

<Mode> ABSolute | RELative

*RST: RELative

Example:

```
// Select Transient Spectrum measurement
// (measurement on captured I/Q data)
CONFigure:SPECtrum:SWITching:IMMediate
// Only list results are required
CONFigure:SPECtrum:SELect LIST
// Absolute power and limit results in dBm
CONFigure:SPECtrum:SWITching:LIMit ABSolute
// Run one measurement and query absolute list results
READ:SPECtrum:SWITching:ALL?
// -> 0,933200000,933200000,-101.55,-36.00,ABS,PASSED, ...
```

Mode: GSM

CONFigure:SPECtrum:SWITching:TYPE <DetectorMode>

This command controls how the reference power of the "Transient Spectrum" measurement (see chapter 3.1.10, "Transient Spectrum", on page 26) is measured.

Parameters for setting and query:

<DetectorMode> PEAK | RMS

RMS
(Default:) The reference power is the RMS power level measured over the useful part of the "Slot to measure" (see "Slot to Measure" on page 65) and averaged according to the defined "Statistic Count" (see "Statistic Count" on page 60).

PEAK
The reference power is the peak power level measured over the selected slot scope (see chapter 3.2.8, "Defining the Scope of the Measurement", on page 43) and its peak taken over Statistic Count measurements (GSM frames).

*RST: RMS

Example:

```
CONFigure:SPECtrum:SWITching:TYPE?
```

Mode: GSM

Manual operation: See "Transient Ref. Power" on page 73

4.4.4 Other Commands in the CONFigure Subsystem

CONFigure:TRGS:ADPSize <Value>

This command specifies the number of measurements after which the x-axis is fixed for the histogram calculation of the "Trigger to Sync" measurement.

Parameters for setting and query:

<Value> numeric value

Adaptive data size

Range: 10 to 1000
*RST: 100
Default unit: NONE

Mode: GSM

Manual operation: See "Adaptive Data Size" on page 75

CONFigure:TRGS:NOFBins <Value>

This command specifies the number of bins for the histogram of the "Trigger to Sync" measurement.

Parameters for setting and query:

<Value> numeric value

Number of bins

Range: 10 to 1000
*RST: 10
Default unit: NONE

Mode: GSM

Manual operation: See "No. of Bins" on page 74

CONFigure:TRGS[:IMMediate]

This command selects the "Trigger to Sync" measurement. This measurement is only available for external trigger mode. Make sure that the "Trigger Offset" (in the "General Settings" dialog box, see "Trigger Offset" on page 60) is set correctly, e.g. using the "Auto Set" (Trigger) functionality of the R&S FSV-K10.

Usage: Setting only

Mode: GSM

Manual operation: See "Trigger to Sync" on page 82

CONFigure:WSPectrum:MODulation[:IMMediate]

This command selects the measurement of the wide spectrum due to modulation (WMOD). The wide modulation spectrum measurement uses a series of zero span mode measurements and can measure offset frequencies up to 6 MHz.

This command is only available for IF power or external trigger mode. Make sure that the Trigger Offset (in the "General Settings" dialog) is set correctly, e.g. using the Auto Set (Trigger) functionality of the R&S FSV-K10 (see "Trigger Mode" on page 60 and "Trigger" on page 80).

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Switch display on
SYSTem:DISPlay:UPDate ON
// Activate slot 0
CONFigure:MS:CHANnel:SLOT0:STATe ON
// Deactivate all other slots(1-7)
CONFigure:MS:CHANnel:SLOT1:STATe OFF
CONFigure:MS:CHANnel:SLOT2:STATe OFF
CONFigure:MS:CHANnel:SLOT3:STATe OFF
CONFigure:MS:CHANnel:SLOT4:STATe OFF
CONFigure:MS:CHANnel:SLOT5:STATe OFF
CONFigure:MS:CHANnel:SLOT6:STATe OFF
CONFigure:MS:CHANnel:SLOT7:STATe OFF
// Set slot 0 to Normal Burst, GMSK, TSC 0
CONFigure:MS:CHANnel:SLOT0:TYPE NB
CONFigure:MS:CHANnel:SLOT0:MTYPe GMSK
// Set center frequency to 900 MHz
SENSe:FREQuency:CENTer 900MHZ
// Set the Ref level to 0 dbm
DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:RF 0
// Read back the Ref Level
DISPlay:WINDow1:TRACe1:Y:SCALe:RLEVel:RF?
// Choose the Wide Modulation spectrum measurement
CONFigure:WSPectrum:MODulation:IMMediate
// Trigger Mode should be set to Power mode by default
TRIGger1:SEQuence:SOURce IFPower
// Run Auto Trigger (determine the trigger level and offset)
CONFigure:MS:AUTO:TRIGger ONCE;*OPC?
// Read out the trigger level
TRIGger1:SEQuence:LEVel:IFPower?
// Read out the Trigger Offset
TRIGger1:SEQuence:HOLDoff:TIME?
// Set the statistic count to 50
SENSe:SWEep:COUNt 50
// Do one measurement and read out the results for all offset frequencies
READ:WSPectrum:MODulation:ALL?
```

Usage: Setting only

Mode: GSM

Manual operation: See "Wide Mod Spectrum" on page 84

CONFigure:WSPectrum:MODulation:LIMIT <Mode>

This command selects whether the list results (power and limit values) of the "Wide Modulation Spectrum" measurement are returned in a relative (dB) or absolute (dBm) unit. This command is only available when the "Wide Modulation Spectrum" measurement is selected (see `CONFigure:WSPectrum:MODulation[:IMMediate]` on page 148).

Parameters for setting and query:

<Mode> ABSolute | RELative

*RST: RELative

Example:

```
// Select Wide Modulation Spectrum measurement
// (gated zero span measurement)
CONFigure:WSPectrum:MODulation:IMMediate
// Absolute power and limit results in dBm
CONFigure:WSPectrum:MODulation:LIMit ABSolute
// Run one measurement and query absolute list results
READ:WSPectrum:MODulation:ALL?
// -> 0,929200000,929200000,-104.41,-65.00,ABS,PASSED, ...
```

Mode: GSM

CONFigure:WSPectrum:MODulation:LIST:SELect <Mode>

For Wide Modulation Spectrum measurements, this command controls whether offset frequencies are measured up to 1800 kHz or 6000 kHz.

Tip: Select "Narrow" to improve speed.

Parameters for setting and query:

<Mode>

NARRow
The measurement is performed for offset frequencies up to 1800 kHz from the carrier; this setting improves measurement speed

WIDE
The measurement is performed for offset frequencies up to 6000 kHz from the carrier

*RST: WIDE

Example:
// Select Wide Modulation Spectrum measurement
// (gated zero span measurement)
```
CONFigure:WSPectrum:MODulation:IMMediate
```
// Absolute power and limit results in dBm
```
CONFigure:WSPectrum:MODulation:LIST:SELect
NARRow
```
// RBW = 100 kHz @ 1800 kHz offset freq.
```
CONFigure:SPECtrum:MODulation:LIST:BANDwidth:
RESolution 1800000,100000
```
// Run a (blocking) single sweep
```
INITiate:IMMediate;*WAI
```
// Fetch list results (table)
```
FETCh:WSPectrum:MODulation:ALL?
```

Mode: GSM

Manual operation: See "Wide Mod. Freq. List" on page 74

4.5 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[:WINDow<n>]:SELect

This command selects whether screen A or screen B is active.

Suffix:
<n> <1|2>
Screen number. 1 = screen A, 2 = screen B.

Example:
```
//Preset the instrument*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Activate constellation measurement
CONFigure:BURSt:CONStell:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Switch to full screen mode (show only one
screen)
DISPlay:FORMat SINGle
// Select screen A (I/Q constellation graph)
DISPlay:WINDow1:SELect
// Select screen B (modulation accuracy table)
DISPlay:WINDow2:SELect
// Switch to split screen mode (show all
screens)
DISPlay:FORMat SPLit
```

Usage: Setting only

Mode: GSM

DISPlay[:WINDow<n>]:SSELect

This command selects whether screen A or screen B is active. WINDow1 corresponds to SCREEN A, WINDow2 to SCREEN B.

Suffix:
<n> <1>

Example:
```
DISP:SSEL
```

Usage: Setting only

Mode: GSM

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command controls whether a trace is displayed or not, and in which mode. Each trace can only display a certain mode, or nothing at all ("Blank"). The table below indicates which measurements can display which traces and which trace modes.

Note: even if a trace is not displayed, the results can still be queried (see `TRACe[:DATA]?` on page 245).

Suffix:
<n> <1|2>
Screen number. 1 = screen A, 2 = screen B.

<t> <1..4>
Trace number

Parameters for setting and query:

<Mode> AVERage | MAXHold | MINHold | WRITe | PDFavg | BLANk

For a description of the trace modes see the "Trace Mode Overview" section in the base unit manual.

PDFavg
A PDF of the average trace.

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Modulation spectrum graph measurement
CONFigure:SPECtrum:MODulation:IMMediate
CONFigure:SPECtrum:SELect FREQdomain
INITiate:IMMediate
// Switch off the display of all available traces
DISPlay:WINDow1:TRACe1:MODE BLANk
DISPlay:WINDow1:TRACe4:MODE BLANk
// Switch on the display of all available traces again
DISPlay:WINDow1:TRACe1:MODE AVERage
DISPlay:WINDow1:TRACe4:MODE WRITe
```

Mode: GSM

Manual operation: See "Trace Wizard" on page 87

Table 4-1: Available traces and trace modes for the measurement types

Measurement	Trace 1	Trace 2	Trace 3	Trace 4
Power vs Time: Graph EVM vs Time: Graph Phase Error vs Time: Graph Magnitude Error vs Time: Graph	AVERage BLANk	MAXHold BLANk	MINHold BLANk	WRITe BLANk
Constellation: Graph	-	-	-	WRITe BLANk
Modulation Spectrum: Frequency Domain	AVERage BLANk	-	-	WRITe BLANk
Transient Spectrum: Frequency Domain	-	MAXHold BLANk	-	WRITe BLANk
Trigger to Sync: Graph	WRITe BLANk	PDFavg BLANk	-	-

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command specifies the external attenuation or gain applied to the RF signal. A positive value indicates attenuation, a negative value indicates gain. Displayed power level values are shifted by this value. For details refer to the "Reference Level Offset" softkey of the base unit.

This command is not available for signals from the Digital Baseband Interface (R&S FSVR-B17).

Suffix:

<n> <1|2>
irrelevant

<t> <1..4>
irrelevant

Parameters for setting and query:

<Value> numeric value

External attenuation (positive) or gain (negative).

*RST: 0 dB
Default unit: dB

Example: `DISP:TRAC:Y:SCAL:RLEV:OFFS 10 DB`

Mode: GSM

Manual operation: See "External Attenuation" on page 58

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel[:RF] <Value>

This command can be used to retrieve or set the current internal instrument reference level for RF input used when performing measurements.

Suffix:

<n> <1|2>
irrelevant

<t> <1..4>
irrelevant

Parameters for setting and query:

<Value> numeric value

Reference level of RF input.

*RST: -20 dBm
Default unit: dBm

Example: `DISP:TRAC:Y:SCAL:RLEV -20 DBM`

Mode: GSM

Manual operation: See "Reference Level" on page 58
See "Ref. Level" on page 61

4.6 FETCh Subsystem

The FETCh Subsystem contains commands for reading out results of complex measurement tasks.

The following subsystems are included:

4.6.1 FETCh:BURSt subsystem

FETCh:BURSt[:MACCuracy]:ADRoop:AVERage?

This command reads out the average measurement of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Average value
Default unit: dB

Example: `FETC:BURS:ADR:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:ADRoop:CURRent?

This command reads out the currently measured value of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `FETC:BURS:ADR:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:ADRoop:MAXimum?

This command reads out the maximum measurement of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `FETC:BURS:ADR:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:ADRoop:SDEViation?

This command reads out the standard deviation measurement of the Amplitude Droop taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `FETC:BURS:ADR:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:ALL?

This command returns all the results of the Modulation Accuracy table. The results are output as a list of comma separated strings.

When the measurement is started, the analyzer is automatically set to single sweep.

Further results of the measurement can be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> <Error Vector Magnitude RMS>, <Error Vector Magnitude Peak>, <Magnitude Error RMS>, <Magnitude Error Peak>, <Phase Error RMS>, <Phase Error Peak>, <Burst Power>,< Frequency Error>, <IQ Offset>, <IB Imbalance>

Each item consists of an Average, Current, Maximum and Standard Deviation value

Example: `FETC:BURS:ALL?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:AVERage?

This command reads out the average measurement of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value

Average value

Default unit: dB

Example: `FETC:BURS:BPOW:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:CURRent?

This command reads out the currently measured value of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value

Currently measured value

Default unit: dB

Example: `FETC:BURS:BPOW:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:MAXimum?

This command reads out the maximum measurement of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `FETC:BURS:BPOW:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:BPOWer:SDEViation?

This command reads out the standard deviation measurement of the Burst Power taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `FETC:BURS:BPOW:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:AVERage?

This command reads out the average of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Activate modulation accuracy measurement
CONFigure:BURSt:MACCuracy:IMMediate
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
\\ Query the measurement result
FETC:BURS:PEAK:AVER?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

This command reads out the current peak value of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value

Currently measured peak

Default unit: NONE

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Activate modulation accuracy measurement
CONFigure:BURSt:MACCuracy:IMMediate
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
\\ Query the measurement result
FETC:BURS:PEAK:CURR?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:MAXimum?

This command reads out the maximum of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Activate modulation accuracy measurement
CONFigure:BURSt:MACCuracy:IMMediate
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
\\ Query the measurement result
FETC:BURS:PEAK:MAX?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:PEAK:SDEViation?

This command reads out the standard deviation of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Activate modulation accuracy measurement
CONFigure:BURSt:MACCuracy:IMMediate
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
\\ Query the measurement result
FETC:BURS:PEAK:SDEV?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:RMS:AVERage?

This command reads out the average of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Activate modulation accuracy measurement
CONFigure:BURSt:MACCuracy:IMMediate
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
\\ Query the measurement result
FETC:BURS:RMS:AVER?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

This command reads out the current RMS value of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Activate modulation accuracy measurement
CONFigure:BURSt:MACCuracy:IMMediate
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
\\ Query the measurement result
FETC:BURS:RMS:CURR?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:RMS:MAXimum?

This command reads out the maximum of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value

Maximum

Default unit: NONE

Example:

\\ Preset the instrument
```
*RST
```
\\ Enter the GSM option K10
```
INSTrument:SELect GSM
```
\\ Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```
\\ Activate modulation accuracy measurement
```
CONFigure:BURSt:MACCuracy:IMMediate
```
\\ Run a (blocking) single sweep
```
INITiate:IMMediate;*WAI
```
\\ Query the measurement result
```
FETC:BURS:RMS:MAX?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy][:EVM]:RMS:SDEViation?

This command reads out the standard deviation of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts.

Return values:

<Result> numeric value

Standard deviation

Default unit: NONE

Example:

\\ Preset the instrument
```
*RST
```
\\ Enter the GSM option K10
```
INSTrument:SELect GSM
```
\\ Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```
\\ Activate modulation accuracy measurement
```
CONFigure:BURSt:MACCuracy:IMMediate
```
\\ Run a (blocking) single sweep
```
INITiate:IMMediate;*WAI
```
\\ Query the measurement result
```
FETC:BURS:RMS:SDEV?
```

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:AVERage?

This command reads out the average measurement of the Frequency Error taken over the selected number of bursts.

This command is retained for compatibility with R&S FS-K5 only. Use the `FETCh:BURSt[:MACCuracy]:FREQuency:AVERage?` command which behaves the same way.

Return values:

<Result> numeric value
Average value
Default unit: Hz

Example: `FETC:BURS:FERR:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:CURRent?

This command reads out the currently measured value of the Frequency Error taken over the selected number of bursts.

This command is retained for compatibility with R&S FS-K5 only. Use the `FETCh:BURSt[:MACCuracy]:FREQuency:CURRent?` command which behaves the same way.

Return values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: `FETC:BURS:FERR:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:MAXimum?

This command reads out the maximum measurement of the Frequency Error taken over the selected number of bursts.

This command is retained for compatibility with R&S FS-K5 only. Use the `FETCh:BURSt[:MACCuracy]:FREQuency:MAXimum?` command which behaves the same way.

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: `FETC:BURS:FERR:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FERRor:SDEViation?

This command reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts.

This command is retained for compatibility with R&S FS-K5 only. Use the `FETCh:BURSt[:MACCuracy]:FREQuency:SDEViation?` command which behaves the same way.

Return values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: `FETC:BURS:FERR:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:AVERage?

This command reads out the average measurement of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Average value
Default unit: Hz

Example: `FETC:BURS:FREQ:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:CURRent?

This command reads out the currently measured value of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: `FETC:BURS:FREQ:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:MAXimum?

This command reads out the maximum measurement of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: `FETC:BURS:FREQ:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:FREQuency:SDEViation?

This command reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: `FETC:BURS:FREQ:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:AVERage?

This command reads out the average measurement of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: FETC:BURS:IQIM:AVER?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:CURRent?

This command reads out the currently measured value of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: FETC:BURS:IQIM:CURR?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:MAXimum?

This command reads out the maximum measurement of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: FETC:BURS:IQIM:MAX?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQIMbalance:SDEViation?

This command reads out the standard deviation measurement of the IQ Imbalance taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: FETC:BURS:IQIM:SDEV?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:AVERage?

This command reads out the average measurement of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: `FETC:BURS:IQOF:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:CURRent?

This command reads out the currently measured value of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `FETC:BURS:IQOF:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:MAXimum?

This command reads out the maximum measurement of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `FETC:BURS:IQOF:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:IQOFfset:SDEViation?

This command reads out the standard deviation measurement of the IQ Offset taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:IQOF:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:AVERage?

This command reads out the average of the peak measurement of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: `FETC:BURS:MERR:PEAK:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

This command reads out the currently measured peak value of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured peak value
Default unit: NONE

Example: `FETC:BURS:MERR:PEAK:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:MAXimum?

This command reads out the maximum of the peak measurement of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: FETC:BURS:MERR:PEAK:MAX?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:PEAK:SDEViation?

This command reads out the standard deviation of the peak measurement of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: FETC:BURS:MERR:PEAK:SDEV?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:RMS:AVERage?

This command reads out the average of the RMS measurement of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: FETC:BURS:MERR:RMS:AVER?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

This command reads out the currentl ymeasured RMS value of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: FETC:BURS:MERR:RMS:CURR?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:RMS:MAXimum?

This command reads out the maximum of the RMS measurement of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `FETC:BURS:MERR:RMS:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:MERRor:RMS:SDEViation?

This command reads out the standard deviation of the RMS measurement of the Magnitude Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:MERR:RMS:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:OSUPpress:AVERage?

This command reads out the average measurement of the IQ Offset Suppression taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Average value
Default unit: dB

Example: `FETC:BURS:OSUP:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:OSUPpress:CURRent?

This command reads out the currently measured value of the IQ Offset Suppression taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `FETC:BURS:OSUP:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:OSUPpress:MAXimum?

This command reads out the maximum measurement of the IQ Offset Suppression taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `FETC:BURS:OSUP:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:OSUPpress:SDEViation?

This command reads out the standard deviation measurement of the IQ Offset Suppression taken over the selected number of bursts (see "Statistic Count" on page 60).

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `FETC:BURS:OSUP:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERCentile:EVM?

This command reads out the 95 % percentile of the Error Vector Magnitude measurement taken over the selected number of bursts.

Return values:

<Result> numeric value
Default unit: NONE

Example: `FETC:BURS:PERC:EVM?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERCentile:MERRor?

This command reads out the 95 % percentile of the Magnitude Error measurement taken over the selected number of bursts.

Return values:
<Result> numeric value
Default unit: NONE

Example: `FETC:BURS:PERC:MERR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERCentile:PERRor?

This command reads out the 95 % percentile of the Phase Error measurement taken over the selected number of bursts.

Return values:
<Result> numeric value
Default unit: NONE

Example: `FETC:BURS:PERC:PERR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:AVERage?

This command reads out the average of the peak measurement of the Phase Error taken over the selected number of bursts.

Return values:
<Result> numeric value
Average value
Default unit: NONE

Example: `FETC:BURS:PERR:PEAK:AVER?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

This command reads out the current peak value of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured peak
Default unit: NONE

Example: `FETC:BURS:PERR:PEAK:CURR?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:MAXimum?

This command reads out the maximum of the peak measurement of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `FETC:BURS:PERR:PEAK:MAX?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:PEAK:SDEViation?

This command reads out the standard deviation of the peak measurement of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:PERR:PEAK:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:RMS:AVERage?

This command reads out the average of the RMS measurement of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Average value
Default unit: NONE

Example: FETC:BURS:PERR:RMS:AVER?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

This command reads out the currently measured RMS value of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: FETC:BURS:PERR:RMS:CURR?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:RMS:MAXimum?

This command reads out the maximum of the RMS measurement of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: FETC:BURS:PERR:RMS:MAX?

Usage: Query only

Mode: GSM

FETCh:BURSt[:MACCuracy]:PERRor:RMS:SDEViation?

This command reads out the standard deviation of the RMS measurement of the Phase Error taken over the selected number of bursts.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `FETC:BURS:PERR:RMS:SDEV?`

Usage: Query only

Mode: GSM

FETCh:BURSt:PTEMplate:TRGS:AVERage?

This command reads out the average of the time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value

Average value

Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Auto set trigger offset
// Note: Correct frame / slot configuration assumed!
CONFigure:MS:AUTO:TRIGger ONCE
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Query the measurement result
FETC:BURS:PTEM:TRGS:AVER?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:PTEMplate:TRGS:CURRent?

This command reads out the most recently measured time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value
Currently measured value
Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Query the measurement result
FETC:BURS:PTEM:TRGS:CURR?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:PTEMplate:TRGS:MAXimum?

This command queries the maximum of the time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value
Maximum
Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Auto set trigger offset
// Note: Correct frame / slot configuration assumed!
CONFigure:MS:AUTO:TRIGger ONCE
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Query the measurement result
FETC:BURS:PTEM:TRGS:MAX?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:PTEMplate:TRGS:MINimum?

This command queries the minimum of the time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see CONFigure:TRGS[:IMMediate] on page 147).

Return values:

<Result> numeric value
Minimum time
Default unit: S

Usage: Query only

Mode: GSM

FETCh:BURSt:PTEMplate:TRGS:SDEViation?

This command queries the standard deviation of the time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see CONFigure:TRGS[:IMMediate] on page 147).

Return values:

<Result> numeric value
Standard deviation
Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Auto set trigger offset
// Note: Correct frame / slot configuration assumed!
CONFigure:MS:AUTO:TRIGger ONCE
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Query the measurement result
FETC:BURS:PTEM:TRGS:SDEV?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:ALL:AVERage?

This command reads out the average power for the selected slot for all measured bursts.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Average value
Default unit: dBm

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Run a single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:ALL:AVERage?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:ALL:CRESt?

This command reads out the crest factor for the selected slot for all measured bursts.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value

Crest factor

Default unit: dB

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Run a single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:ALL:CRESt?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:ALL:MAXimum?

This command reads out the maximum power for the selected slot for all measured bursts.

This command is only available if "Power vs Time" measurement is selected (see CONFigure:BURSt:PTEMplate[:IMMediate] on page 139).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value

Maximum

Default unit: dBm

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Run a single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:ALL:MAXimum?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:CURRent:AVERage?

This command reads out the average power for the selected slot for the current burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≤ s ≤ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Average power
Default unit: dBm

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Run a single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:CURRent:AVERage?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:CURRent:CRESt?

This command reads out the crest factor for the selected slot for the current burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) <= s <= (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value

Crest factor

Default unit: dB

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Run a single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:CURRent:CRESt?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:CURRent:MAXimum?

This command reads out the maximum power for the selected slot for the current burst.

This command is only available if "Power vs Time" measurement is selected and if the slot is part of the selected slot scope (see chapter 3.2.8, "Defining the Scope of the Measurement", on page 43).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≦ s ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value

Maximum

Default unit: dBm

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Run a single sweep
\\ Note: 'FETCh' only reads the results without starting a new single sweep!
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT0:CURRent:MAXimum?
```

Usage: Query only

Mode: GSM

FETCh:BURSt:SPOWer:SLOT<s>:DELTatosync?

This command reads out the "Delta to Sync" value for the selected slot (see chapter 3.1.8, "Power vs Time", on page 20). This command is only available when the "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<s> <0..7>
Slot number to measure power on. The selected slot must be within the slot scope, i.e.
(First slot to measure) ≦ <slot> ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Default unit: dBm

Example:

```
\\ Preset the instrument
RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Run a single sweep
\\ Note: "FETCh" only reads the results without starting a new single sweep.
\\ Run a (blocking) single sweep
INITiate:IMMediate;*WAI
FETCh:BURSt:SPOWer:SLOT1:DELTatosync?
```

Usage: Query only

Mode: GSM

4.6.2 FETCh:SPECtrum subsystem

FETCh:SPECtrum:MODulation[:ALL]?

This command returns the measured modulation spectrum of the mobile or base station. This command is only available when "Modulation Spectrum" measurement is selected (see `CONFigure:SPECtrum:MODulation[:IMMediate]` on page 143).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm (depending on `CONFigure:SPECtrum:MODulation:LIMIT`).

<Limit> Limit at the offset frequency in dB or dBm (depending on `CONFigure:SPECtrum:MODulation:LIMIT`).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned (depending on CONFigure:SPECtrum:MODulation:LIMIT).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
FETC:SPEC:MOD?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
...
```

Usage: Query only

Mode: GSM

FETCh:SPECtrum:MODulation:REFerence?

This command returns the measured reference power of the "Modulation Spectrum". This command is only available when the "Modulation Spectrum" measurement is selected (see CONFigure:SPECtrum:MODulation[:IMMediate] on page 143).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example:
```
FETCh:SPECtrum:MODulation:REFerence?
```

Usage: Query only

Mode: GSM

FETCh:SPECtrum:SWITching[:ALL]?

This command reads out the result of the measurement of the transient spectrum of the mobile or base station. This command is only available when the "Transient Spectrum" measurement is selected (see CONFigure:SPECtrum:SWITching[:IMMediate] on page 145).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm
For more information see CONFigure:SPECtrum:SWITching:LIMIT).

<Limit> Limit at the offset frequency in dB or dBm.
For more information see CONFigure:SPECtrum:SWITching:LIMIT).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.
For more information see CONFigure:SPECtrum:SWITching:LIMIT).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
FETC:SPEC:SWIT?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
```

Usage: Query only

Mode: GSM

FETCh:SPECtrum:SWITching:REFerence?

This command returns the measured reference power of the "Transient Spectrum". This command is only available when the "Transient Spectrum" measurement is selected (see CONFigure:SPECtrum:SWITching[:IMMediate] on page 145).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example:
```
FETCh:SPECtrum:SWITching:REFerence?
```

Usage: Query only

Mode: GSM

4.6.3 FETCh:WSPECtrum subsystem

FETCh:WSPectrum:MODulation[:ALL]?

This command reads out the result of the "Wide Modulation Spectrum" measurement of the mobile or base station. This command is only available if the modulation spectrum measurement is selected (see `CONFigure:WSPectrum:MODulation[:IMMediate]`.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm.

<Limit> Limit at the offset frequency in dB or dBm.

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example: `FETCh:WSPectrum:MODulation:ALL?`

Usage: Query only

Mode: GSM

FETCh:WSPectrum:MODulation:REFerence?

This command returns the measured reference power of the "Wide Modulation Spectrum". This command is only available when the "Wide Modulation Spectrum" measurement is selected (see `CONFigure:WSPectrum:MODulation[:IMMediate]` on page 148).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: `FETCh:WSPectrum:MODulation:REFerence?`

Usage: Query only

Mode: GSM

4.7 INITiate Subsystem

The INITiate subsystem is used to start and stop a measurement.

Commands of the INITiate subsystem:

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

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

The sweep is started immediately.

Suffix:
<n> irrelevant

Parameters:
<State> ON | OFF
*RST: ON

Example:
```
INIT:CONT OFF
```
Switches the sequence to single sweep.
```
INIT:CONT ON
```
Switches the sequence to continuous sweep.

Mode: all

INITiate:REFMeas[:IMMediate]

Repeats the evaluation of the data currently in the capture buffer without capturing new data. This is useful after changing settings, for example the Statistic Count. Averaging is performed according to the "Statistic Count" and automatically stops when the defined "Statistic Count" or the end of the captured data is reached.

Example:
```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and do one measurement
INITiate1:CONTinuous OFF
// Set capture time to 1 s
SENSe1:SWEep:TIME 1 S
// Activate power vs time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_1.iqw'
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_2.iqw'
// Now we want to analyze the first capture again
// Import I/Q data from file
MMEMory:LOAD:IQ:STATe 1,'C:\gsm_1.iqw'
// Instead of 1 slots 8 slots should be analyzed
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
// Refresh to apply the changed setting
INITiate:REFMeas:IMMediate
```

Usage: Event

Mode: GSM

Manual operation: See "Refresh" on page 86

4.8 INPut Subsystem

The INPut subsystem controls the input characteristics of the RF inputs of the instrument.

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" on page 62
See "Mechanical Atten" on page 62

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" on page 62
See "Mechanical Atten" on page 62

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".

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: 1E-06 V 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 64

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 63).

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 63

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 "Electrical Atten" on page 62

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 State" on page 62
See "Electrical Atten" on page 62

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.

Manual operation: See "Electrical Atten" on page 62

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 62

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 "Signal Source" on page 59

4.9 INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

Commands of the INSTrument subsystem:

INSTrument[:SELect] <Mode>

Selects the operating mode. Note that the commands are different for R&S FSVR and R&S FSQ/FSG.

Parameters for setting and query:

<Mode> SANalyzer | MGSM | GSM

SAN
Spectrum analyzer

MGSM (R&S FSQ/FSG: GSM)
GSM mode (R&S FSV-K10 option)

*RST: SAN

Example: `INST MGSM`

Usage: SCPI confirmed

Mode: GSM

INSTrument:NSELect <Mode>

Selects the operating mode.

Note that the commands are different for R&S FSV and R&S FSQ/FSG.

Parameters for setting and query:

<Mode> 1 | 5

1
Spectrum analyzer

5
GSM option, R&S FSV-K10

*RST: 1

Example: `INST:NSEL 5`

Usage: SCPI confirmed

Mode: GSM

4.10 MMEMory Subsystem

MMEMory:LOAD:IQ:STATe 1, <FileName>

This command loads the I/Q data from the specified `.iqw` file.

Note: switch to single sweep mode (`INIT:CONT OFF`) before importing I/Q data as otherwise the instrument will continue to measure data and display the current results rather than the imported data.

Parameters:

<FileName> Complete file name including the path

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and do one measurement
INITiate1:CONTinuous OFF
// Set capture time to 1 s
SENSe1:SWEep:TIME 1 S
// Activate power vs time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_1.iqw'
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_2.iqw'
// Now we want to analyze the first capture again
// Import I/Q data from file
MMEMory:LOAD:IQ:STATe 1,'C:\gsm_1.iqw'
// Instead of 1 slots 8 slots should be analyzed
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
// Refresh to apply the changed setting
INITiate:REFMeas:IMMediate
```

Usage: Setting only

Manual operation: See "Import" on page 84

MMEMory:MDIRectory <Directory>

This command creates a new directory. The file name includes indication of the path and may also include the drive name. The path name complies with DOS conventions.

Parameters:

<Directory> <directory_name> = DOS path name

Example:

```
MMEM:MDIR 'C:\R_S\Instr\user'
```

Usage: Event

MMEMory:STORe:IQ:STATe 1, <FileName>

This command stores the I/Q data to the specified `.iqw` file.

Parameters:

<FileName> Complete file name including the path

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and do one measurement
INITiate1:CONTinuous OFF
// Set capture time to 1 s
SENSe1:SWEep:TIME 1 S
// Activate power vs time measurement
CONFigure:BURSt:PTEMplate:IMMediate
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_1.iqw'
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Export captured I/Q data to file
MMEMory:STORe:IQ:STATe 1,'C:\gsm_2.iqw'
// Now we want to analyze the first capture again
// Import I/Q data from file
MMEMory:LOAD:IQ:STATe 1,'C:\gsm_1.iqw'
// Instead of 1 slots 8 slots should be analyzed
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
// Refresh to apply the changed setting
INITiate:REFMeas:IMMediate
```

Manual operation: See "Export" on page 85

4.11 READ Subsystem

The READ subsystem contains commands for starting complex measurement tasks, and for querying the results subsequently.

The following subsystems are included:

4.11.1 READ:AUTO Subsystem

READ:AUTO:LEVTime

This command is used to perform a single measurement to detect the required reference level and the trigger offset automatically.

Note that this command is maintained for compatibility reasons only. Use `CONFigure[:MS]:AUTO:LEVel` and `CONFigure[:MS]:AUTO:TRIGger` for new remote control programs.

Parameters:

PASSED — Fixed value; irrelevant

<Dummy> — Fixed value (0); irrelevant

Return values:

<ReferenceLevel> — The detected reference level
Default unit: variable

<TriggerOffset> — The detected time offset between the trigger event and the start of the sweep

<TriggerLevel> — The detected trigger level
Range: -50 dBm to 20 dBm

Example:

```
READ:AUTO:LEVT?
// --> PASSED,9.2404,-0.00000007695,1.4,0
```

4.11.2 READ:BURSt subsystem

READ:BURSt[:MACCuracy]:ALL?

This command starts the measurement and returns all the results. When the measurement is started the analyzer is automatically set to single sweep.

Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Example: READ:BURS:ALL?

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:ADRoop:AVERage?

This command starts the measurement and reads out the average measurement of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Return values:

<Result> numeric value
Average
Default unit: dB

Example: READ:BURS:ADR:AVER?

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:ADRoop:CURRent?

This command starts the measurement and reads out the currently measured value of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: READ:BURS:ADR:CURR?

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:ADRoop:MAXimum?

This command starts the measurement and reads out the maximum measurement of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `READ:BURS:ADR:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:ADRoop:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the Amplitude Droop taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `READ:BURS:ADR:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:BPOWer:AVERage?

This command starts the measurement and reads out the average measurement of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: dB

Example: `READ:BURS:BPOW:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:BPOWer:CURRent?

This command starts the measurement and reads out the currently measured value of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `READ:BURS:BPOW:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:BPOWer:MAXimum?

This command starts the measurement and reads out the maximum measurement of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `READ:BURS:BPOW:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:BPOWer:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the Burst Power taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `READ:BURS:BPOW:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:PEAK:AVERage?

This command starts the measurement and reads out the average of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:PEAK:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:PEAK:CURRent?

This command starts the measurement and reads out the currently measured peak value of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:PEAK:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:PEAK:MAXimum?

This command starts the measurement and reads out the maximum of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:PEAK:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:PEAK:SDEViation?

This command starts the measurement and reads out the average of the peak measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:PEAK:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:RMS:AVERage?

This command starts the measurement and reads out the average of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:RMS:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:RMS:CURRent?

This command starts the measurement and reads out the currently measured RMS value of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:RMS:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:RMS:MAXimum?

This command starts the measurement and reads out the maximum of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:RMS:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy][:EVM]:RMS:SDEViation?

This command starts the measurement and reads out the standard deviation of the RMS measurement of the Error Vector Magnitude taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: READ:BURS:RMS:SDEV?

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor:AVERage?

This command starts the measurement and reads out the average measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

This command is retained for compatibility with R&S FS-K5 only. Use the READ:BURSt[:MACCuracy]:FREQuency:AVERage? command which behaves the same way.

Return values:

<Result> numeric value
Average
Default unit: Hz

Example: READ:BURS:FERR:AVER?

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor:CURRent?

This command starts the measurement and reads out the currently measured value of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the FETCh:BURSt subsystem.

This command is retained for compatibility with R&S FS-K5 only. Use the READ:BURSt[:MACCuracy]:FREQuency:CURRent? command which behaves the same way.

Return values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: READ:BURS:FERR:CURR?

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor:MAXimum?

This command starts the measurement and reads out the maximum measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

This command is retained for compatibility with R&S FS-K5 only. Use the `READ:BURSt[:MACCuracy]:FREQuency:MAXimum?` command which behaves the same way.

Note

An ongoing measurement can be aborted via the command `ABORt`.

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: `READ:BURS:FERR:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FERRor:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

This command is retained for compatibility with R&S FS-K5 only. Use the `READ:BURSt[:MACCuracy]:FREQuency:SDEViation?` command which behaves the same way.

Return values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: `READ:BURS:FERR:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FREQuency:AVERage?

This command starts the measurement and reads out the average measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: Hz

Example: `READ:BURS:FREQ:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FREQuency:CURRent?

This command starts the measurement and reads out the currently measured value of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: Hz

Example: `READ:BURS:FREQ:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FREQuency:MAXimum?

This command starts the measurement and reads out the maximum measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: Hz

Example: `READ:BURS:FREQ:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:FREQuency:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the Frequency Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: Hz

Example: `READ:BURS:FREQ:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQIMbalance:AVERage?

This command starts the measurement and reads out the average measurement of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:IQIM:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQIMbalance:CURRent?

This command starts the measurement and reads out the currently measured value of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:IQIM:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQIMbalance:MAXimum?

This command starts the measurement and reads out the maximum measurement of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:IQIM:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQIMbalance:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the IQ Imbalance taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:IQIM:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQOFfset:AVERage?

This command starts the measurement and reads out the average measurement of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:IQOF:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQOFfset:CURRent?

This command starts the measurement and reads out the currently measured value of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:IQOF:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQOFfset:MAXimum?

This command starts the measurement and reads out the maximum measurement of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:IQOF:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:IQOFfset:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the IQ Offset taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:IQOF:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:PEAK:AVERage?

This command starts the measurement and reads out the average of the peak measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:PEAK:CURRent?

This command starts the measurement and reads out the currently measured peak value of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:PEAK:MAXimum?

This command starts the measurement and reads out the maximum of the peak measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:PEAK:SDEViation?

This command starts the measurement and reads out the standard deviation of the peak measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:MERR:PEAK:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:RMS:AVERage?

This command starts the measurement and reads out the average of the RMS measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:MERR:RMS:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:RMS:CURRent?

This command starts the measurement and reads out the currently measured RMS value of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:MERR:RMS:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:RMS:MAXimum?

This command starts the measurement and reads out the maximum of the RMS measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:MERR:RMS:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:MERRor:RMS:SDEViation?

This command starts the measurement and reads out the standard deviation of the RMS measurement of the Magnitude Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:MERR:RMS:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:OSUPpress:AVERage?

This command starts the measurement and reads out the average measurement of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: dB

Example: `READ:BURS:OSUP:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:OSUPpress:CURRent?

This command starts the measurement and reads out the currently measured value of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: dB

Example: `READ:BURS:OSUP:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:OSUPpress:MAXimum?

This command starts the measurement and reads out the maximum measurement of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: dB

Example: `READ:BURS:OSUP:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:OSUPpress:SDEViation?

This command starts the measurement and reads out the standard deviation measurement of the IQ Offset Suppression taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: dB

Example: `READ:BURS:OSUP:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERCentile:EVM?

This command starts the measurement and reads out the 95 % percentile of the Error Vector Magnitude measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Default unit: NONE

Example: `READ:BURS:PERC:EVM?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERCentile:MERRor?

This command starts the measurement and reads out the 95 % percentile of the Magnitude Error measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Default unit: NONE

Example: `READ:BURS:PERC:MERR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERCentile:PERRor?

This command starts the measurement and reads out the 95 % percentile of the Phase Error measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Default unit: NONE

Example: `READ:BURS:PERC:PERR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:PEAK:AVERage?

This command starts the measurement and reads out the average of the peak measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:PEAK:CURRent?

This command starts the measurement and reads out the currently measured peak value of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:PEAK:MAXimum?

This command starts the measurement and reads out the maximum of the peak measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:PEAK:SDEViation?

This command starts the measurement and reads out the standard deviation of the peak measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:PERR:PEAK:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:RMS:AVERage?

This command starts the measurement and reads out the average of the RMS measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Average
Default unit: NONE

Example: `READ:BURS:PERR:RMS:AVER?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:RMS:CURRent?

This command starts the measurement and reads out the currently measured RMS value of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Currently measured value
Default unit: NONE

Example: `READ:BURS:PERR:RMS:CURR?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:RMS:MAXimum?

This command starts the measurement and reads out the maximum of the RMS measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Maximum
Default unit: NONE

Example: `READ:BURS:PERR:RMS:MAX?`

Usage: Query only

Mode: GSM

READ:BURSt[:MACCuracy]:PERRor:RMS:SDEViation?

This command starts the measurement and reads out the standard deviation of the RMS measurement of the Phase Error taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<Result> numeric value
Standard deviation
Default unit: NONE

Example: `READ:BURS:PERR:RMS:SDEV?`

Usage: Query only

Mode: GSM

READ:BURSt:PTEMplate:TRGS:AVERage?

This command starts a "Trigger to Sync" measurement and queries the average time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value
Average
Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Auto set trigger offset
// Note: Correct frame / slot configuration assumed!
CONFigure:MS:AUTO:TRIGger ONCE
// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!
READ:BURS:PTEM:TRGS:AVER?
```

Usage: Query only

Mode: GSM

READ:BURSt:PTEMplate:TRGS:CURRent?

This command starts a "Trigger to Sync" measurement and queries the currently measured time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value
Currently measured time
Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!
READ:BURS:PTEM:TRGS:CURR?
```

Usage: Query only

Mode: GSM

READ:BURSt:PTEMplate:TRGS:MAXimum?

This command starts a "Trigger to Sync" measurement and queries the maximum time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value

Maximum

Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Auto set trigger offset
// Note: Correct frame / slot configuration assumed!
CONFigure:MS:AUTO:TRIGger ONCE
// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!
READ:BURS:PTEM:TRGS:MAX?
```

Usage: Query only

Mode: GSM

READ:BURSt:PTEMplate:TRGS:MINimum?

This command starts a "Trigger to Sync" measurement and queries the minimum time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value

Minimum

Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Auto set trigger offset
// Note: Correct frame / slot configuration assumed!
CONFigure:MS:AUTO:TRIGger ONCE
// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!
READ:BURS:PTEM:TRGS:MIN?
```

Usage: Query only

Mode: GSM

READ:BURSt:PTEMplate:TRGS:SDEViation?

This command starts a "Trigger to Sync" measurement and queries the standard deviation of the time between the external trigger event and the start of the first symbol of the training sequence (midamble) in seconds over the selected number of I/Q captures (see "Statistic Count" on page 60). This command is only available if an external trigger is selected and the "Trigger to Sync" measurement is active (see `CONFigure:TRGS[:IMMediate]` on page 147).

Return values:

<Result> numeric value
Standard deviation
Default unit: S

Example:

```
// Preset the instrument
*RST
// Enter the GSM option K10
INSTrument:SELect GSM
// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
// Set external trigger more
TRIGger1:SEQuence:SOURce EXTernal
// Activate Trigger to Sync measurement
CONFigure:TRGS:IMMediate
// Set minimum capture time to speed up measurement
SENSe1:SWEep:TIME MINimum
// Auto set trigger offset
// Note: Correct frame / slot configuration assumed!
CONFigure:MS:AUTO:TRIGger ONCE
// Note: 'READ' starts a new single sweep and then reads the results.
// Use 'FETCh' to query several results!
READ:BURS:PTEM:TRGS:SDEV?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:ALL:AVERage?

This command starts the measurement and reads out the average power for the selected slot for all measured burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≦ s ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value

Average

Default unit: dBm

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Note: 'READ' starts a new single sweep annd then reads the
results. Please use 'FETCh' to query several results!
READ:BURSt:SPOWer:SLOT1:ALL:AVERage?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:ALL:CRESt?

This command starts the measurement and reads out the crest factor for the selected slot for all measured burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≦ s ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Crest factor
Default unit: dB

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Note: 'READ' starts a new single sweep annd then reads the results. Please use 'FETCh' to query several results!
READ:BURSt:SPOWer:SLOT1:ALL:CRESt?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:ALL:MAXimum?

This command starts the measurement and reads out the maximum power for the selected slot for all measured burst.

This command is only available if "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≦ s ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Maximum
Default unit: dBm

Example:

\\ Preset the instrument
```
*RST
```
\\ Enter the GSM option K10
```
INSTrument:SELect GSM
```
\\ Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
\\ First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```
\\ Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```
\\ **Note:** 'READ' starts a new single sweep annd then reads the results. Please use 'FETCh' to query several results!
```
READ:BURSt:SPOWer:SLOT1:ALL:MAXimum?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:CURRent:AVERage?

This command starts the measurement out the average power for the selected slot for the current burst. This command is only available when the Power vs Time measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≦ s ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Average
Default unit: dBm

Example:

\\ Preset the instrument
```
*RST
```
\\ Enter the GSM option K10
```
INSTrument:SELect GSM
```
\\ Switch to single sweep mode and stop sweep
```
INITiate:CONTinuous OFF;:ABORt
```
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
```
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
```
\\ First Slot to measure = 0
```
CONFigure:MS:CHANnel:MSLots:OFFSet 0
```
\\ Activate PvT (Power vs Time) measurement
```
CONFigure:BURSt:PTEMplate:IMMediate
```
\\ **Note:** 'READ' starts a new single sweep annd then reads the results. Please use 'FETCh' to query several results!
```
READ:BURSt:SPOWer:SLOT1:CURRent:AVERage?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:CURRent:CRESt?

This command starts the measurement out the crest factor for the selected slot for the current burst. This command is only available when the "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≦ s ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Crest factor
Default unit: dB

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Note: 'READ' starts a new single sweep annd then reads the
results. Please use 'FETCh' to query several results!
READ:BURSt:SPOWer:SLOT1:CURRent:CRESt?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:CURRent:MAXimum?

This command starts the measurement out the maximum power for the selected slot for the current burst. This command is only available when the Power vs Time measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot s must be within the slot scope, i.e. (First slot to measure) ≦ s ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Maximum
Default unit: dBm

Example:

```
\\ Preset the instrument
*RST
\\ Enter the GSM option K10
INSTrument:SELect GSM
\\ Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORt
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
CONFigure:MS:CHANnel:MSLots:NOFSlots 8
\\ First Slot to measure = 0
CONFigure:MS:CHANnel:MSLots:OFFSet 0
\\ Activate PvT (Power vs Time) measurement
CONFigure:BURSt:PTEMplate:IMMediate
\\ Note: 'READ' starts a new single sweep annd then reads the
results. Please use 'FETCh' to query several results!
READ:BURSt:SPOWer:SLOT1:CURRent:MAXimum?
```

Usage: Query only

Mode: GSM

READ:BURSt:SPOWer:SLOT<Slot>:DELTatosync?

This command starts the measurement of the "Delta to Sync" value for the selected slot (see chapter 3.1.8, "Power vs Time", on page 20). This command is only available when the "Power vs Time" measurement is selected (see `CONFigure:BURSt:PTEMplate[:IMMediate]` on page 139).

Suffix:

<Slot> <0..7>
Slot number to measure power on. The selected slot must be within the slot scope, i.e.
(First slot to measure) ≦ <slot> ≦ (First slot to measure + Number of Slots to measure - 1).

Return values:

<Result> numeric value
Default unit: dBm

Example:
\\ Preset the instrument
`RST`
\\ Enter the GSM option K10
`INSTrument:SELect GSM`
\\ Switch to single sweep mode and stop sweep
`INITiate:CONTinuous OFF;:ABORt`
\\ Set the slot scope: Use all 8 slots for the PvT measurement.
\\ Number of slots to measure = 8
`CONFigure:MS:CHANnel:MSLots:NOFSlots 8`
\\ First Slot to measure = 0
`CONFigure:MS:CHANnel:MSLots:OFFSet 0`
\\ Activate PvT (Power vs Time) measurement
`CONFigure:BURSt:PTEMplate:IMMediate`
\\Note: `READ` starts a new single sweep annd then reads the results. Use `FETCh` to query several results.
`READ:BURSt:SPOWer:SLOT1:DELTatosync?`

Usage: Query only

Mode: GSM

4.11.3 READ:SPECtrum subsystem

Commands of the READ:SPECtrum subsystem

READ:BURSt[:MACCuracy]:ALL

This command starts the measurement and returns all the results. When the measurement is started the analyzer is automatically set to single sweep.

Further results of the measurement can then be queried without restart of the measurement via the `FETCh:BURSt` subsystem.

Return values:

<MeasValue> <Error Vector Magnitude RMS>, <Error Vector Magnitude Peak>, <Magnitude Error RMS>, <Magnitude Error Peak>, <Phase Error RMS>, <Phase Error Peak>, <Burst Power>,< Frequency Error>, <IQ Offset>, <IB Imbalance>

The results are output as a list of comma separated strings. Each item consists of an Average, Current, Maximum and Standard Deviation value.

Example: `READ:BURS:ALL?`

Mode: GSM

READ:SPECtrum:MODulation[:ALL]

This command starts the measurement and returns the result of the measured modulation spectrum of the mobile or base station. This command is only available when the "Modulation Spectrum" measurement is selected (see CONFigure:SPECtrum:MODulation[:IMMediate] on page 143).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm (depending on CONF:WSP:MOD:LIM).

<Limit> Limit at the offset frequency in dB or dBm (depending on CONF:WSP:MOD:LIM).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned (depending on CONF:WSP:MOD:LIM).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example: READ:SPEC:MOD?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,

Mode: GSM

READ:SPECtrum:MODulation:REFerence[:IMMediate]?

This command starts the measurement and returns the measured reference power of the "Modulation Spectrum". This command is only available when the "Modulation Spectrum" measurement is selected (see CONFigure:SPECtrum:MODulation[:IMMediate] on page 143).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: READ:SPECtrum:MODulation:REFerence:IMMediate?

Usage: Query only

Mode: GSM

READ:SPECtrum:SWITching[:ALL]?

This command starts the measurement and reads out the result of the measurement of the transient spectrum. This command is only available when the transient spectrum measurement is selected (see `CONFigure:SPECtrum:SWITching[:IMMediate]` on page 145).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm.
For more information see `CONFigure:SPECtrum:SWITching:LIMIT`).

<Limit> Limit at the offset frequency in dB or dBm
For more information see `CONFigure:SPECtrum:SWITching:LIMIT`).

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.
For more information see `CONFigure:SPECtrum:SWITching:LIMIT`).

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:

```
READ:SPEC:SWIT?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
```

Usage: Query only

Mode: GSM

READ:SPECtrum:SWITching:REFerence[:IMMediate]

This command starts the measurement and returns the measured reference power of the "Transient Spectrum". This command is only available when the "Transient Spectrum" measurement is selected (see `CONFigure:SPECtrum:SWITching[:IMMediate]` on page 145).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: `READ:SPECtrum:SWITching:REFerence:IMMediate?`

Mode: GSM

READ:SPECtrum:WMODulation:GATing?

This command reads out the gating settings for gated `Wide Modulation Spectrum` measurements. It is identical to `READ:SPECtrum:WMODulation:GATing?` and is maintained for compatibility reasons only.

Example: `READ:SPEC:WMOD:GAT?`

Usage: Query only

Mode: GSM

4.11.4 READ:WSPectrum subsystem

Commands of the READ:WSPectrum subsystem

READ:WSPectrum:MODulation[:ALL]?

This command starts the measurement and reads out the result of the measurement of the "Wide Modulation Spectrum" of the mobile or base station. This command is only available when the wide modulation spectrum measurement is selected (see `CONFigure:WSPectrum:MODulation[:IMMediate]` on page 148).

The result is a list of partial result strings separated by commas.

Return values:

<Placeholder> curently irrelevant

<Freq1> Absolute offset frequency in Hz

<Freq2> Absolute offset frequency in Hz

<Level> Measured level at the offset frequency in dB or dBm.

<Limit> Limit at the offset frequency in dB or dBm.

<Abs/Rel> Indicates whether relative (dB) or absolute (dBm) limit and level values are returned.

<Status> Result of the limit check in character data form

PASSED
no limit exceeded

FAILED
limit exceeded

Example:
```
READ:WSP:MOD?
0,998200000,998200000,-84.61,-56.85,REL,PASSED,
0,998400000,998400000,-85.20,-56.85,REL,PASSED,
...
```

Usage: Query only

Mode: GSM

READ:WSPectrum:MODulation:GATing?

This command reads out the gating settings for gated "Modulation Spectrum" or "Wide Modulation Spectrum" measurements (see chapter 3.1.9, "Modulation Spectrum", on page 23 and chapter 3.1.11, "Wide Modulation Spectrum", on page 27).

The returned values can be used to set the gating interval for "list" measurements (i.e. a series of measurements in zero span mode at several offset frequencies). This is done in the "Spectrum" mode using the `SENSe:LIST` subsystem (see `[SENSe:]LIST:POWer:SET`).

Prior to this command make sure you set the correct Trigger Mode ("IF power" or "External") and Trigger Offset (in the "General Settings" dialog, see "General Settings" on page 56). The "Trigger Offset" can be determined using the "Auto Set" (Trigger) functionality of the R&S FSV-K10.

Return values:

<TriggerOffset> Calculated trigger offset, based on the user-defined "Trigger Offset" and "Frame Configuration", such that 50-90% of the active part of the "Slot to measure" (excluding TSC) is measured.

<GateLength> Calculated gate length, based on the user-defined "Trigger Offset" and "Frame Configuration", such that 50-90% of the active part of the "Slot to measure" (excluding TSC) is measured.

Example:
```
READ:WSP:MOD:GAT?
```

Usage: Query only

Mode: GSM

READ:WSPectrum:MODulation:REFerence[:IMMediate]

This command starts the measurement and returns the measured reference power of the "Wide Modulation Spectrum". This command is only available when the "Wide Modulation Spectrum" measurement is selected (see `CONFigure:WSPectrum:MODulation[:IMMediate]` on page 148).

The result is a list of partial result strings separated by commas.

Return values:

<Level1> measured reference power in dBm

<Level2> measured reference power in dBm

<RBW> resolution bandwidth used to measure the reference power in Hz

Example: `READ:WSPectrum:MODulation:REFerence:IMMediate?`

Mode: GSM

4.12 SENSe Subsystem

The SENSe subsystem is organized in several subsystems. The commands of these subsystems directly control device-specific settings, they do not refer to the signal characteristics of the measurement signal. The SENSe subsystem controls the essential parameters of the analyzer. In accordance with the SCPI standard, the keyword SENSe is optional for this reason, which means that it is not necessary to include the SENSe node in command sequences.

The following subsystems are included:

Commands of the SENSe subsystem:

[SENSe]:BANDwidth[:RESolution]:TYPE <Type>

This command switches the filter type for the resolution filter for the "Modulation Spectrum", "Transient Spectrum" and "Wide Modulation Spectrum" measurement.

Parameters for setting and query:

<Type> NORMal | P5

NORMal
Gaussian filter with a 3 dB bandwidth of either 30 kHz or 100 kHz. This value is retained for compatibility with R&S FS-K5 only.

P5
5 Pole filter with a 3 dB bandwidth of either 30 kHz or 100 kHz. This filter is required by the GSM standard specification.

*RST: P5

Example: `BAND:TYPE NORM`

Mode: GSM

Manual operation: See "Filter Type" on page 73

[SENSe]:BURSt:COUNt <Count>

The remote control command is used to specify the number of measurements to be averaged. This command is synonymous with `[SENSe:]SWEep:COUNt` on page 240.

Parameters for setting and query:

<Count> numeric value

Target statistic count, i.e. number of measurements to be averaged.

*RST: 200
Default unit: NONE

Example: `BURS:COUN 5`

Mode: GSM

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency (frequency domain) or measuring frequency (time domain).

If the frequency is modified, the "ARFCN" is updated accordingly.

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 "Frequency" on page 58

[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 61

[SENSe:]SWAPiq <State>

This command defines whether or not the recorded IQ pairs should be swapped (I<->Q) before being processed. Swapping I and Q inverts the sideband.

Try this function if the TSC can not be found.

Parameters:

<State> ON | OFF

ON
I and Q are exchanged, inverted sideband, Q+j*I

OFF
Normal sideband, I+j*Q,

*RST: OFF

Example: `SWAP ON`
Specifies that IQ values should be swapped.

Mode: WLAN, GSM, OFDM, OFDMA/WiBro

Manual operation: See "Swap I/Q" on page 63

[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 "Statistic Count" on page 60

[SENSe:]SWEep:COUNt:CURRent?

This command returns the current Statistic Count. It can be used to track the progress of the averaging progress until it reaches the set "Statistic Count" (see `[SENSe:]SWEep:COUNt` on page 240).

Usage: Query only

[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 "Capture Time" on page 59

4.13 STATus Subsystem

The STATus subsystem contains the commands for the status reporting system (for details refer to chapter 5, "Status Reporting System", on page 251). *RST does not influence the status registers.

4.13.1 Commands of the STATus subsystem

STATus:OPERation[:EVENt]

This command queries the contents of the EVENt part of the STATus:OPERation register. The contents of the EVENt part are deleted after readout.

Example: `STAT:OPER?`

Mode: all

STATus:OPERation:CONDition

This command queries the CONDition part of the `STATus:OPERation` register (see the base unit description of status registers in the Remote Control Basics chapter).

Readout does not delete the contents of the CONDition part. The value returned reflects the current hardware status.

Example: `STAT:OPER:COND?`

Mode: all

4.13.2 STATus:QUEStionable Subsystem

This subsystem queries the information in the status reporting system. For details see chapter 5, "Status Reporting System", on page 251.

STATus:QUEStionable:POWer[:EVENt]?

This command queries the contents of the "EVENt" part of the `STATus:QUEStionable:POWer` register. Readout deletes the contents of the "EVENt" part.

Example: `STAT:QUES:POW?`

Usage: Query only
SCPI confirmed

Mode: all

STATus:QUEStionable:POWer:CONDition?

This command queries the contents of the "CONDition" part of the `STATus:QUEStionable:POWer` register (see chapter 5.4, "STATus:QUEStionable:POWer Register", on page 254). Readout does not delete the contents of the "CONDition" part.

Example: `STAT:QUES:POW:COND?`

Usage: Query only
SCPI confirmed

Mode: all

STATus:QUEStionable:POWer:ENABle <BitDefinition>

This command sets the bits of the "ENABle" part of the `STATus:QUEStionable:POWer` register. The "ENABle" register selectively enables the individual events of the associated "EVENt" part for the summary bit.

Parameters:
<BitDefinition> 0 to 65535

Example: `STAT:QUES:POW:ENAB 65535`

Usage: SCPI confirmed

Mode: all

STATus:QUEStionable:POWer:NTRansition <BitDefinition>

This command sets the edge detectors of all bits of the `STATus:QUEStionable:POWer` register from 1 to 0 for the transitions of the "CONDition" bit.

Parameters:
<BitDefinition> 0 to 65535

Example: `STAT:QUE:POWS:NTR 65535`

Usage: SCPI confirmed

Mode: all

STATus:QUEStionable:POWer:PTRansition <BitDefinition>

This command sets the edge detectors of all bits of the `STATus:QUEStionable:POWer` register from 0 to 1 for the transitions of the "CONDition" bit.

Parameters:
<BitDefinition> 0 to 65535

Example: `STAT:QUES:POW:PTR 65535`

Usage: SCPI confirmed

Mode: all

STATus:QUEStionable:SYNC[:EVENt]?

This command queries the contents of the `EVENt` part of the `STATus:QUEStionable:SYNC` register.

The `EVENt` part indicates whether an event has occurred since the last reading, it is the "memory" of the `CONDition` part. It only indicates events passed on by the transition filters. It is updated continuously. This part can only be read by the user. Reading the register or using the `*CLS` command clears it.

For details on possible events see chapter 5, "Status Reporting System", on page 251.

Example: `STAT:QUES:SYNC`

Usage: Query only

Mode: GSM

STATus:QUEStionable:SYNC:CONDition?

This command queries the contents of the `CONDition` part of the `STATus:QUEStionable:SYNC` register. This register part can only be read, but not written to or cleared. Readout does not delete the contents of the `CONDition` part.

Example: `STAT:QUES:SYNC:COND?`

Usage: Query only

Mode: GSM

STATus:QUEStionable:SYNC:ENABle <RegisterContent>

This command sets the bits of the ENABle part of the `STATus:QUEStionable:SYNC` register for screen A and B. The ENABle register selectively enables the individual events of the associated `EVENt` part for the summary bit in the status byte.

(See "Hierarchy of Status Registers" in the R&S FSVR Operating Manual).

Parameters for setting and query:

<RegisterContent> numeric value

Content of the specific aspect of the status register

*RST: 65535

Mode: GSM

STATus:QUEStionable:SYNC:NTRansition <RegisterContent>

This command determines what bits in the `STATus:QUEStionable:SYNC:CONDition` register will set the corresponding bit in the `STATus:QUEStionable:SYNC:EVENt` register when that bit has a negative transition (1 to 0).The parameter is the sum of the decimal values of the bits that are to be enabled.

Parameters for setting and query:

<RegisterContent> numeric value

Content of the specific aspect of the status register

*RST: 0

Mode: GSM

STATus:QUEStionable:SYNC:PTRansition <RegisterContent>

This command determines which bits in the `STATus:QUEStionable:SYNC:CONDition` register will set the corresponding bit in the `STATus:QUEStionable:SYNC:EVENt` register when that bit has a positive transition (0 to 1).The parameter is the sum of the decimal values of the bits that are to be enabled.

Parameters for setting and query:

<RegisterContent> numeric value

Content of the specific aspect of the status register

*RST: 65535

Mode: GSM

4.14 TRACe Subsystem

The TRACe subsystem controls access to the instruments internal trace memory.

TRACe[:DATA]? <TraceNumber>

This command reads trace data out of the instrument. The returned values are scaled in the current level unit. In ASCII format, a list of values separated by commas is returned (Comma Separated Values = CSV).

Query parameters:

<TraceNumber> TRACe1 | TRACe2 | TRACe3 | TRACe4

Trace name to be read out

TRACe1
Average trace;
(Transient Spectrum: Maximum trace)

TRACe2
Maximum trace

TRACe3
Minimum trace

TRACe4
Current trace

Example: `TRAC1:DATA? TRACe1`

Usage: Query only

Mode: GSM

TRACe[:DATA]:X?

Usage: Query only

Mode: GSM

TRACe<n>:IQ:DATA:MEMory <OffsetSamples>, <NoOfSamples>

Returns the captured I/Q data.

Note: The data can be only queried if the measurement is not running.

Query parameters:

<OffsetSamples> The offset of the values to be read related to the start of the captured I/Q data.

<NoOfSamples> The number of samples to be read.

Return values:

<Result> a comma separated list of values in floating point format (Comma Separated Values = CSV). The number of values returned is 2 * "# of samples", the first half being the I-values, the second half the Q-values.

The result values are scaled linearly in Volt and correspond to the voltage at the RF input of the instrument.

Default unit: Volt

Mode: GSM

4.15 TRIGger Subsystem

The TRIGger subsystem is used to synchronize instrument actions with events. It is thus possible to control and synchronize the start of a sweep.

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <TriggerOffset>

Specifies the time offset between the trigger event (e.g. for an external or power trigger) and the frame start of the GSM signal in seconds.

Suffix:
<n> <1|2>

Parameters for setting and query:
<TriggerOffset> numeric value
*RST: 0
Default unit: S

Example: TRIG:HOLD 1ms

Mode: GSM

Manual operation: See "Trigger Offset" on page 60

TRIGger<n>[:SEQuence]:LEVel[:EXTernal] <Level>

This command sets the level of the external trigger source.

Suffix:
<n> <1|2>

Parameters for setting and query:
<Level> numeric value
External trigger level
*RST: 1.4 V
Default unit: V

Example: `TRIG:LEV:EXT 1 MV`

Mode: GSM

Manual operation: See "Trigger Level" on page 63

TRIGger<n>[:SEQuence]:LEVel:IFPower <TriggerLevel>

This command defines the power level at the third intermediate frequency that must be exceeded to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed. If defined, a reference level offset is also considered.

Suffix:
<n> irrelevant

Parameters:
<TriggerLevel> *RST: -20 dBm

Example: `TRIG:LEV:IFP -30DBM`

Manual operation: See "Trigger Level" on page 63

TRIGger<n>[:SEQuence]:MASK:CONDition <Condition>

This command sets the condition that activates the frequency mask trigger.

Parameters:
<Condition>

ENTer
Triggers on entering the frequency mask.

LEAVing
Triggers on leaving the frequency mask.

INSide
The trigger is active as long as the signal is inside the frequency mask.

OUTSide
The trigger is active as long as the signal is outside the frequency mask.

*RST: INSide

Example: See chapter 4.3.3, "CALCulate:MASK Subsystem", on page 98.

Manual operation: See "Setting the trigger condition" on page 40

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source.

For details on trigger modes refer to the "Trg/Gate Source" softkey in the base unit description.

Suffix:
<n> irrelevant

Parameters:

<Source> EXTernal | IFPower | IMMediate | MASK | TIME | VIDeo

Note that the availability of the trigger source depends on the measurement you are in.

EXTernal
Selects an external trigger.

IFPower
Selects the power trigger on the second intermediate frequency.

IMMediate
Selects the free run mode (= no trigger).

MASK
Selects the frequency mask trigger.

TDTRigger
Selects the time domain trigger.

TIME
Selects the time trigger.

VIDeo
Selects the video trigger. The video trigger is available for time domain measurements.

*RST: IMMediate

Example: `TRIG:SOUR EXT`
Selects the external trigger input as source of the trigger signal

Manual operation: See "Trigger Mode" on page 60

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:AUTO <Value>

This command is identical to `CONFigure[:MS]:AUTO:TRIGger` on page 107 and is maintained for compatibility reasons only.

Suffix:

<n> <1|2>

Parameters for setting and query:

<Value> OFF | ON | ONCE

*RST: ON

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:EXTernal <TriggerOffset>

If the signal source is RF input, this command sets the trigger motde to "External" and the trigger offset to the defined value.

Suffix:

<n> <1|2>

Parameters for setting and query:
<TriggerOffset> numeric value
*RST: 0 s
Default unit: S

Example: `TRIG:SYNC:ADJ:EXT 1 MS`

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:IFPower <TriggerOffset>

If the signal source is RF input, this command sets the trigger motde to "Power" and the trigger offset to the defined value.

Suffix:
<n> <1|2>

Parameters for setting and query:
<TriggerOffset> numeric value
*RST: 0 s
Default unit: S

Example: `TRIG:SYNC:ADJ:IFP 1 MS`

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:IMMediate

This command sets the trigger mode to "FREE RUN".

Suffix:
<n> <1|2>

Example: `TRIG:SYNC:ADJ:IMM`

Usage: Setting only

Mode: GSM

TRIGger<n>[:SEQuence]:SYNChronize:ADJust:RFPower <TriggerOffset>

If the signal source is RF input, this command sets the trigger motde to "Power" and the trigger offset to the defined value.

Suffix:
<n> <1|2>

Parameters for setting and query:
<TriggerOffset> numeric value
*RST: 0 s
Default unit: S

Example: `TRIG:SYNC:ADJ:RFP 1 MS`

Mode: GSM

4.16 Commands for Compatibility

The following commands are retained for compatibility with R&S FS-K5 only. They do not cause errors in a remote program; however, the settings commands have no effect and the query commands do not provide useful results.

CALCulate:LIMit<n>:NAME?
CALCulate:LIMit<n>:CONTinuous:OFFS
CALCulate:LIMit<n>:LOWer:MARGin
CALCulate:LIMit<n>:LOWer:OFFS
CALCulate:LIMit<n>:UPPer:MARGin
CALCulate:LIMit<n>:UPPer:OFFS
CALCulate:LIMit<n>:STATe
CALCulate:MATH:MODE
CONFigure:BURSt:PTEMplate:TMHRes
CONFigure[:MS]:ECONfigure:STATe

These commands are retained for compatibility with R&S FS-K5 only. They do not cause errors in a remote program; however, the settings commands have no effect and the query commands do not provide useful results.

CONFigure:BURSt:PTEMplate:FRZoom?

This command is retained for compatibility with R&S FS-K5 only. The query command does not provide useful results.

The setting command is not accepted and returns an error.

Usage: Query only

5 Status Reporting System

In addition to the registers provided by the base system, the following register is used in the GSM option (R&S FSV-K10): STAT:QUES:SYNC. Although this register is provided by the base system, the GSM option (R&S FSV-K10) uses different bits and definitions.

In this section, only the new and altered status registers/bits for the GSM option (R&S FSV-K10) are described. Detailed information on the status registers of the base system is given in the section "Status Reporting System" in chapter 5 of the Operating Manual on CD.

The status reporting system stores all information on the current operating state of the instrument, e.g. that the instrument is currently performing a calibration and information on errors which have occurred. This information is stored in the status registers and in the error queue. The status registers and the error queue can be queried via IEC bus.

The information is structured hierarchically. The register *status byte* (STB) defined in IEEE 488.2 and its associated mask register *service request enable* (SRE) form the uppermost level. The STB receives its information from the standard *event status register* (ESR) which is also defined in IEEE 488.2 with the associated mask register standard *event status enable* (ESE). The STB registers STATus:OPERation and STATus:QUEStionable, which are defined by SCPI and contain detailed information on the instrument.

The *Individual STatus* flag (IST) and the *parallel poll enable* register (PPE) allocated to it are also part of the status reporting system. The IST flag, like the SRQ, combines the entire instrument status in a single bit. The PPE fulfils the same function for the IST flag as the SRE for the service request.

The output buffer contains the messages the instrument returns to the controller. It is not part of the status reporting system, but determines the value of the MAV bit in the STB.

Description of the Status Registers

All the status registers are the same as those provided by the base system, with the exception of the following:

- STATus:OPERation – Although this register is provided by R&S FSVR Kernel main, R&S FSV-K10 makes use of bits in this register which are not used within R&S FSVR Kernel main
- STATus:QUES:SYNC - Although this register is provided by the base system, the GSM option (R&S FSV-K10) uses different bits and definitions.
- STATus:QUES:LIMit - This register is provided by the base system; however, in the GSM option (R&S FSV-K10) , there is only 1 limit register combining all displayed limits. (Limit lines are only available in screen A, which displays the traces, while screen B displays the measurement results as a list.)

The deviations from the status register structure of the base system are described below.

5.1 STATus:OPERation Register

In the CONDition part, this register contains information on which actions the instrument is being executing or, in the EVENt part, information on which actions the instrument has executed since the last reading. It can be read using commands `STATus:OPERation:CONDition` or `STATus:OPERation[:EVENt]`.

Bit No	Meaning
0	CALibrating This bit is set as long as the instrument is performing a calibration.
1 to 3	These bits are not used
4	MEASuring A "1" in this bit position indicates that a measurement is in progress. R&S FSV-K10 only
5 to 7	These bits are not used
8	HardCOPy in progress This bit is set while the instrument is printing a hardcopy.
9 to 14	These bits are not used
15	This bit is always 0

5.2 STATus:QUEStionable Register

This register comprises information about indefinite states which may occur if the unit is operated without meeting the specifications. It can be queried with commands `STATus:OPERation[:EVENt]` and `STATus:OPERation:CONDition`.

Bit No	**Meaning**
0 to 2	These bits are not used
3	POWer This bit is set if a questionable power occurs (cf. also section "STATus:QUEStionable:POWer Register").
4	TEMPerature This bit is set if a questionable temperature occurs.
5	FREQuency The bit is set if a frequency is questionable (cf. section "STATus:QUEStionable:FREQuency Register").

Bit No	Meaning
6 to 7	These bits are not used
8	CALibration The bit is set if a measurement is performed uncalibrated (= ^ label "UNCAL")
9	LIMit (device-specific) This bit is set if a limit value is violated (see also section STATus:QUEStionable:LIMit Register). Note: Limit register is associated with limit lines for the Spectrum Mask measurement only.
10	LMARgin (device-specific) This bit is set if a margin is violated (see also section STATus:QUEStionable:LMARgin Register)
11	SYNC (device-dependent) This bit is set if, in measurements or pre-measurements in FSV-K10 mode, synchronization fails, no signal is detected or no burst is found. This bit is also set if input settings conflict with the measurement setup (see also "STATus:QUEStionable:SYNC Register").
12	ACPLimit This bit is set if a limit for the adjacent channel power measurement is violated (see also section "STATus:QUEStionable:ACPLimit Register").
13 to 14	These bits are not used
15	This bit is always 0

5.3 STATus:QUEStionable:SYNC Register

This contains information about sync and bursts not found, and about pre-measurement results exceeding or falling short of expected values.

The bits can be queried with commands `STATus:QUEStionable:SYNC[:EVENt]?` on page 243 and `STATus:QUEStionable:SYNC:CONDition?` on page 243.

Bit No	Meaning
0	BURSt not found This bit is set if no burst is found during a measurement, except for: • Wide Modulation Spectrum measurement (That is, for all I/Q based measurements.) If a burst is found in these measurements, the bit is reset.
1	SYNC not found This bit is set if the synchronization sequence (training sequence) of the midamble is not found during a measurement, except for: • Wide Modulation Spectrum measurement (That is, for all I/Q based measurements.) If the synchronization sequence (training sequence) of the midamble is found in these measurements, the bit is reset.

2 to 14	These bits are not used
15	This bit is always 0

5.4 STATus:QUEStionable:POWer Register

The STATus:QUEStionable:POWer register contains information about possible overload situations that may occur during operation of the R&S FSVR.

You can read out the register with `STATus:QUEStionable:POWer:CONDition?` or `STATus:QUEStionable:POWer[:EVENt]?`

Table 5-1: Meaning of the bits used in the STATus:QUEStionable:POWer register

Bit No.	Meaning
0	OVERload This bit is set if an overload occurs at the RF input. The R&S FSVR displays the enhancement label "OVLD".
1	UNDerload This bit is set if an underload occurs at the RF input. The R&S FSVR displays the enhancement label "UNLD".
2	IF_OVerload This bit is set if an overload occurs in the IF path. The R&S FSVR displays the enhancement label "IFOVL".
3 to 14	Unused
15	This bit is always 0.

List of Commands

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