R&S® FSV-K8
Firmware Option Bluetooth Measurements
Operating Manual

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Test & Measurement

Operating Manual

ROHDE&SCHWARZ

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

- analyzer-K8 (1310.8155.02)

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

- R&S®FSV 3 (1307.9002K03)
- R&S®FSV 7 (1307.9002K07)
- R&S®FSV 13 (1307.9002K13)
- R&S®FSV 30 (1307.9002K30)
- R&S®FSV 40 (1307.9002K39)
- R&S®FSV 40 (1307.9002K40)
- R&S®FSVR 7 (1311.0006K7)
- R&S®FSVR 13 (1311.0006K13)
- R&S®FSVR 30 (1311.0006K30)

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

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

The product Open SSL includes cryptographic software written by Eric Young (eay@cryptsoft.com) and software written by Tim Hudson (tjh@cryptsoft.com).
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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

Contents

1 Documentation Overview

The user documentation for the analyzer is divided as follows:

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

Quick Start Guide

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

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

Operating Manuals

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

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

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

The following Operating Manuals are available for the analyzer:

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

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

Service Manual

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

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

Online Help

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

Release Notes

The release notes describe the installation of the firmware, new and modified functions, eliminated problems, and last minute changes to the documentation. The corresponding

firmware version is indicated on the title page of the release notes. The current release notes are provided in the Internet.

2 Conventions Used in the Documentation

2.1 Typographical Conventions

The following text markers are used throughout this documentation:

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

2.2 Conventions for Procedure Descriptions

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

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

3 How to Use the Help System

Calling context-sensitive and general help

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

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

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

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

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

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

Contents of the help dialog box

The help dialog box contains four tabs:

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

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

Navigating in the table of contents

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

Navigating in the help topics

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

Searching for a topic

1. Change to the "Index" tab.

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

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

Changing the zoom

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

Closing the help window

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

4 Bluetooth Measurements Option R&S FSV-K8

Overview of Firmware Option R&S FSV-K8

This section contains all information required for operation of an analyzer equipped with Application Firmware R&S FSV–K8. It covers operation via menus and the remote control commands for bluetooth measurements.

This part of the documentation consists of the following chapters:

- chapter 4.1, "Introduction to Bluetooth Measurements (K8)", on page 13
  Introduces the Bluetooth option and provides further information.
- chapter 4.2, "Instrument Functions for Bluetooth Measurements (K8)", on page 23
  Shows all softkeys available in the "Bluetooth" menu. This chapter also presents the remote control commands associated with each softkey function.
- chapter 4.3, "Remote Commands for Bluetooth Measurements (K8)", on page 67
  Describes all remote control commands defined for bluetooth measurements.

This part of the documentation includes only functions of the Application Firmware R&S FSV–K8. For all other descriptions, refer to the description of the base unit.

4.1 Introduction to Bluetooth Measurements (K8)

Introduction

This section gives background information on Bluetooth Measurements (option R&S FSV-K8).

4.1.1 Bluetooth Overview

This section provides the following general information on Bluetooth measurements:

- Bluetooth technical parameters
- Power classes
- Structure of a Bluetooth data packet

Bluetooth technical parameters

Table 4-1: Common Parameters

frequency bands	2402 + (0...78) MHz
channel spacing	1 MHz
symbol rate	1 Msym/s
slot length (frequency hopping)	625 (sec
packet sizes	1, 3, 5 slot packets

Table 4-2: Modulation Parameters Basic Rate

modulation	GFSK
TX filter	Gaussian
BT /	0.5
modulation index	0.28 – 0.35 nominal 0.32
frequency deviation	160 kHz settled 141 kHz 010101 suite
bandwidth –3dB –20dB	 220 kHz 1 MHz
bit rate	1 Mbps

Table 4-3: Modulation Parameters Enhanced Data Rate

modulation	π/4–DQPSK	8DPSK
TX filter	RRC	RRC
roll–off factor	0.4	0.4
bandwidth –3dB	± 500kHz	± 500kHz
bit rate	2 Mbps	3 Mbps

Power classes

Power Class	Maximum (Pmax)	Nominal	Minimum (Pmin)	Power Control
1	100 mW (20 dBm)		1 mW (0 dBm)	from Pmin (< +4 dBm) to Pmax
2	2.5 mW (4dBm)	1 mW (0 dBm)	0.25 mW (–6dBm)	optional
3	1 mW (0dBm)			optional

Structure of a Bluetooth data packet

Every Bluetooth data packet is divided into 3 basic sections: access code, header and payload. The following figures show the order and bit lengths of the individual sections:

access code 72 bits				
4 bits preamble	64 bits sync word	4 bits trailer	54 bits header	240 / 1496 / 2744 bits payload*)

*) During EUT evaluation the payload contains certain bit sequences: PRBS9 (Pseudo Random Bit Sequence) or 11110000 or 10101010.

The sync word is transmitted as the major part of the access code. For this purpose, the LAP (lower address part) of the BD address is expanded to 64 bit by adding the BCH code and baker.

sync word 64 bits		
BCH code 34 bits	LAP 24 bits	Barker 6 bits

The LAP (lower address part) of the BD address serves as a basis for the sync word.

BD – address 48 bits		
NAP 16 bits	UAP 8 bits	LAP 24 bits

In case of EDR packets the payload is divided into 6 other sections:

DPSK					
guard 5µs	SYNC	payload header	user payload 0–2723Symb	CRC code	trailer

4.1.2 Supported Tests

The Bluetooth Measurements Option supports measurements according to the Bluetooth RF Test Specification (Bluetooth SIG) , Revision 2.0.E.3, Mar 2005, on the analyzer. The following tests are currently implemented according to this specification:

- Output Power
- TX Output Spectrum – Adjacent Channel Power

- Modulation Characteristics
- Initial Carrier Frequency Tolerance (ICFT)
- Carrier Frequency Drift
- EDR Relative Transmit Power
- EDR Carrier Frequency Stability and Modulation Accuracy
- EDR Differential Phase Encoding
- EDR In–band Spurious Emissions

4.1.3 Overview of Transmitter Tests

Table 4-4: Basic Rate Measurements

	Output Power	**TX Output Spectrum – Adjacent Channel Power**	**Modulation Characteristics**	**Initial Carrier Frequency Tolerance**	**Carrier Frequency Drift**
Hop	on	off	off	on / off	on / off
Trigger	extern	–	–	–	–
Synchronization	Yes (p0), but also possible without	no	yes (p0)	yes (p0)	yes (p0)
packet Type	longest supported	DH1	longest supported	DH1	all supported packets (DH1/3/5)
Payload	PRBS 9	PRBS 9	11110000 10101010	PRBS 9	10101010
Test Mode	loop back	loop back	loop back	loop back	loop back
Operating Mode	IQ mode	analyzer zero span	IQ mode	IQ mode	IQ mode
RBW	3 MHz	100 kHz	–	–	–
VBW	3 MHz	300 kHz	–	–	–
Power	supported maximum	supported maximum	supported maximum	supported maximum	not specified
Sweep Time	one complete packet	79s per sweep (= 100ms * 10 * 79)	one complete packet	–	one complete packet
Sweep Count	–	10	10 (extern)	10	10
Trace Mode	Maxh	Maxh	–	–	–
Detector	Peak	Aver	–	–	–
Frequency in MHz	low / middle / high	each channel	low / middle / high	low / middle / high	low / middle / high

	Output Power	TX Output Spectrum – Adjacent Channel Power	Modulation Characteristics	Initial Carrier Frequency Tolerance	Carrier Frequency Drift
Span	–	–	–	–	–
Test cond	norm / ext	norm / ext	norm / ext	norm / ext	norm / ext
Results	peak and average power 1) P_{AV} < 100 mW (20 dBm) 2) P_{PK} < 200 mW (23 dBm) 3) P_{max} > P_{AV} >P_{min} at maximum power step P_{AV} < 1 mW (0 dBm)	channel power of all channels 1) P_{TX} (f) ≤ – 20 dBm for |M–N| = 2 2) P_{TX} (f) ≤ – 40 dBm for |M–N| ≥ 3	all 8 bit peak deviations and average deviations	carrier offset within the 4 preamble bits	carrier offsets of the 4 bit preamble, of all 10 bit payload sequences; maximum drift rate of all 10 bit payload sequences at 50 µs offset

	EDR Relative TX Power	EDR Carrier Frequency Stability and Modulation Accuracy	EDR Differential Phase Encoding	EDR In–band Spurious Emissions
Hop	off	off	off	off
Trigger	–	–	–	extern/ IF power
Synchronization	yes	yes	yes	yes, needed for gate adjustment
packet Type	longest supported	longest supported	longest supported	longest supported
Payload	PRBS 9	PRBS9	PRBS9	PRBS9
Test Mode	loop back	loop back	TX mode	loop back
Operating Mode	IQ mode	IQ mode	IQ mode	analyzer zero span
RBW	3 MHz	–	–	100 kHz
VBW	3 MHz	–	–	300 kHz
Power	supported minimum/ maximum	supported minimum/ maximum	supported minimum/ maximum	supported minimum/ maximum
Sweep Time	one complete packet	one complete packet	one complete packet	10*79* gate length
Sweep Count	10	200 blocks	100	10
Trace Mode	ClrWr	–	–	Maxh
Detector	Aver	–	–	Aver

	EDR Relative TX Power	EDR Carrier Frequency Stability and Modulation Accuracy	EDR Differential Phase Encoding	EDR In–band Spurious Emissions
Frequency in MHz	low / middle / high	low / middle / high	low / middle / high	each channel
Span	–	–	–	79 MHz
Test cond	norm / ext	norm / ext	norm / ext	norm / ext
Results	ratio of DPSK and GFSK power	carrier frequency stability and error vector magnitude	number of failed packets	channel power of all channels

4.1.4 Functional Description – Block Diagram

The Adjacent Channel Power and EDR In–band Spurious Emissions measurements are performed in the "Spectrum Analyzer" mode. For this test case the complete frequency band is scanned using a sequence of zero span measurements.

All other test cases are based on a digital I/Q demodulator which determines the temporal characteristics of power and frequency. The output data of the demodulator are the basis for calculation of all relevant measurement results like modulation characteristics or output power. The demodulator reaches a maximum in accuracy and temperature stability by sampling the IF signal and converting it digitally down into the base band (I/Q area).

The measurements are performed by passing the following signal processing steps:

- LAP (Lower Address Part) trigger detection
- Resampling
- Channel filtering
- Automated packet and bit pattern detection
- Limit check
- Parallel display of measurement curves and numeric results on the screen

The figure 4-1 shows the analyzer hardware from the IF to the processor. The analog IF filter is fixed to 20MHz. The A/D converter samples the 20 MHz IF signal with a sampling frequency of 65.83 MHz.

Low pass filtering is performed after the signal has been down–converted into the complex base band and the data rate is reduced in the sequence. The amount of decimation depends on the selected oversampling factor = points / symbol. The default setting is 4, resulting in a 4 MHz sampling rate. For EDR–measurements, the oversampling factor is always fixed to 4. The resulting I/Q data are stored in a memory of 512 k words for I and Q respectively. The hardware trigger (external or IF power) controls the memory access.

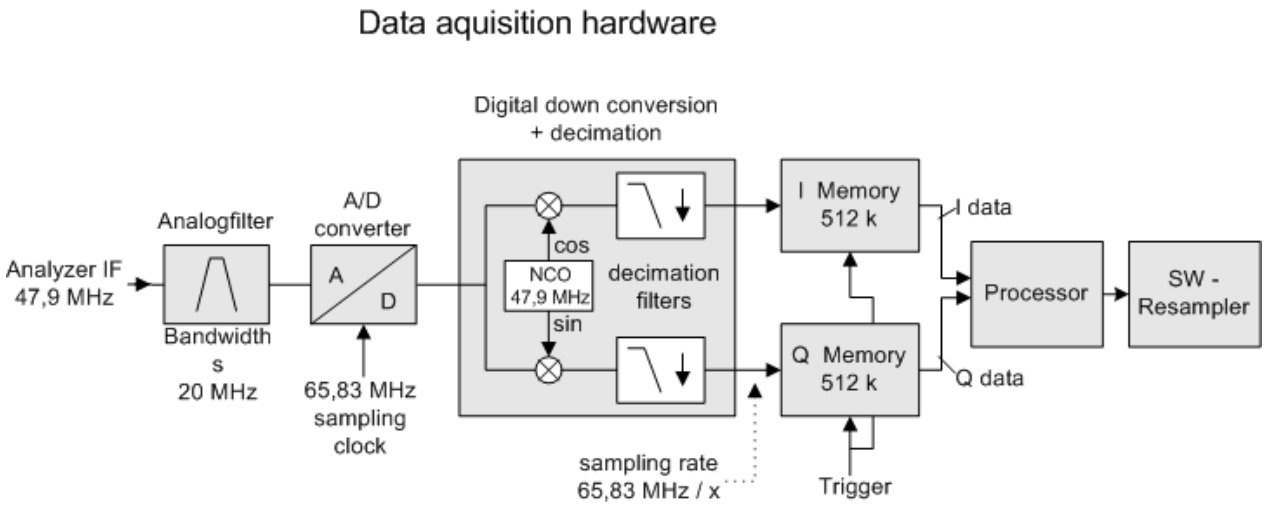


Fig. 4-1: Block diagram of the signal processing architecture of the analyzer

4.1.5 Bandwidths

The Bluetooth RF Specification defines a minimal bandwidth of 3 MHz. The digital bandwidth depends on the selected oversampling factor (= points / symbol). With the default setting of 4, the digital bandwidth is 3 MHz. This digital filter has a flat amplitude characteristics and does not affect the frequency deviation of the signal.

4.1.6 Measurement Filter (Meas Filter On)

The RF Specification allows high distortion power in the first adjacent channels. The 3 MHz filter does not suppress this kind of distortion, which leads to a high interference in modulation. Therefore a precise measurement of the frequency deviation is not possible.

In order to obtain correct deviation results, the spectrum analyzer supplies an optional filter with a passband only appropriate for the channel to measure. This filter is used by default. The Bluetooth spectrum has a bandwidth of 1 MHz. The filter is flat within 1.04 MHz (ripple: only 0.02 dB) and has steep edges. This measurement filter is not dependent on the selected oversampling factor. As a result the displayed deviation value is increased by 3.2%, but without the filter the displayed deviation value can increase dramatically due to interference from adjacent channels. Generally the result is more precise, if the displayed deviation is lower with filtering than without filtering. In these cases the inaccuracy caused by the adjacent channel interference is higher than the systematic inaccuracy caused by the filter.

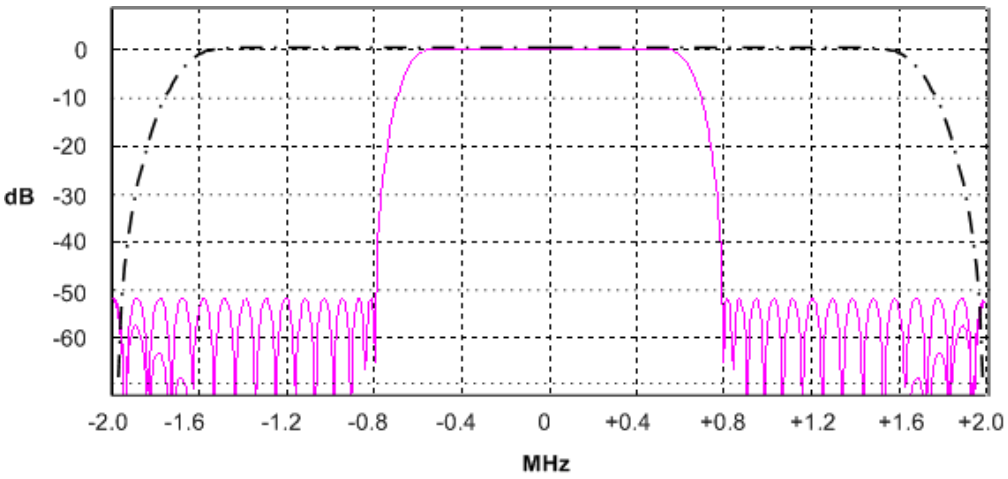


Fig. 4-2: Selection of digital filters

Dashed–dotted curve: Standard filter with 4 points / symbol

Solid curve: Optional measurement filter, independent of the points / symbol setting

4.1.7 Oversampling

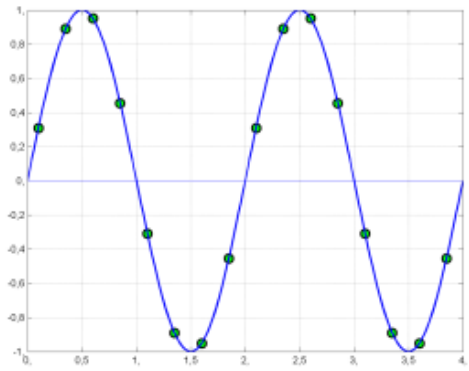
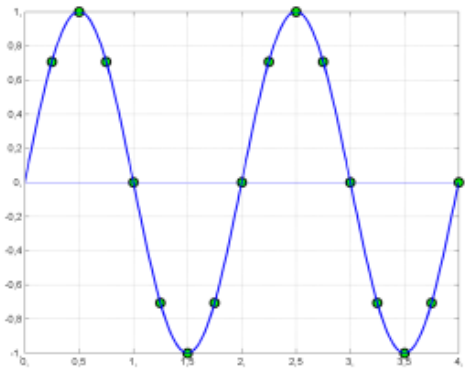
The number of samples per symbol is equivalent to the sampling rate in MHz (due to the symbol length of 1 µs).

Digital bandwidth (flat area)	Points per Symbol	Sampling rate
10 MHz	32	32 MHz
8 MHz	16	16 MHz
5 MHz	8	8 MHz
3.0 MHz	4	4 MHz
1.6 MHz	2	2 MHz

According to the RF Test Specification an oversampling factor of 4 is required at minimum. For Basic Rate measurements, this oversampling factor can be selected as oversampling factor in a range from 2 to 32. For EDR–measurements, the oversampling factor is fixed to 4 which is also the default value.

Although possible, a value greater than 4 is not recommended. It increases the measurement time due to the extended calculation effort. Additionally, the resulting bandwidth will be larger than required, which leads to lower measurement accuracy, unless the optional measurement filter (Meas Filter On) is used as described in chapter 4.1.5, "Bandwidths", on page 19.

The spectrum analyzer uses a timing offset correction in order to move the samples to the zero trespassing points. As a result there is one sample per symbol time, which is especially important for a 0101 symbol sequence in order to obtain the precise value for the peak frequency deviation.

Sampling times before timing offset correction	Sampling times after timing offset correction
	

Advantages of the timing offset correction:

- No jitter with low sampling rates
- With one sample per zero, the trespassing point is always a sample in the middle of the bit length. Therefore the maximum values in the frequency deviation of 0101 bit patterns can be detected precisely also with low sampling rates.
- The immunity to interference when determining the data bits is improved.
- Higher suppression of the distortion during peak detection.

4.1.8 Determining Average or Max/Min Values

These functions are very useful in order to obtain more stable results or to find sporadic spurious signals not included in every burst. In many cases the RF Test Specification defines measurements over a 10 burst period.

The number of measurements can be selected using sweep count function, thus adapting the measurement to the individual requirements. In single sweep mode, the calculation of average or maximum / minimum values is performed over a well–defined number of sweeps (= sweep count). Continuous sweep mode yields continuous averaging and calculation of maximum / minimum values over the whole measurement time.

Modulation measurements

They are performed in the "Clear Write" trace mode. In continuous sweep mode, a "live" display is obtained, which allows e.g. an instant view of changes during alignment of a DUT. In single sweep mode and with the sweep count set to 10, the spectrum analyzer evaluates 10 bursts as required by the RF Test Specification. This means that a result is obtained after exactly 10 bursts.

Power measurements

They are performed in the "Maxhold" trace mode in relation with the defined measurement time. The measurement time is selected in order to make sure that always one complete

burst is acquired. In this case, several sweeps are combined to one trace before this result trace is evaluated.

Impact of the sweep count on the measurement results

Trace Mode	Continuous Sweep	Single Sweep & Sweep Count
Clear Write	All measurement results (min., max., average) are updated with every sweep. The corresponding values are calculated based on the current curve.	Starts a measurement with n sweeps (n = sweep count). All measurement results (min., max., average) are calculated based on these n sweeps.
AVG, MaxHold, MinHold	All measurement results (min., max., average) are updated with every sweep. The corresponding values are calculated based on the current curve. The trace is the continuous average value (AVG) or the extreme value (MaxHold, MinHold) since the start of the measurement.	Starts a measurement with n sweeps (n = sweep count). n defines the number of sweeps that are taken into account for the trace math functions (AVG, MaxHold, MinHold). The n sweeps result in one trace and the measurement results (Min, Max, Average) are calculated based on this summarized trace.

The functions described above differ from the detector functions of the instrument:

- Detectors combine the measurement data obtained by oversampling to one measurement point on the screen. The kind of combination (Max Peak, Min Peak, Average, RMS) can be selected.
- The trace functions affect complete measurement curves: A resulting curve is calculated from several subsequent sweeps. The method of calculation (Average, Maxhold, Minhold) can be selected here as well.

Thus the detector is the arithmetic rule for how sample data collected with a high data rate are combined to a measurement point of one individual measurement curve, whereas the trace mode is the rule of how samples taken from several measurement curves are to be combined to a new resulting curve.

For the ACP measurement, the "Average" detector is set.

4.1.9 Trigger Concepts

As the DUT (Device Under Test) uses frequency hopping, a trigger method is necessary for two reasons:

- A measurement is only possible during the period of time, when there is a TX signal (burst) at the frequency under request.
- In order to determine the modulation characteristics correctly, a synchronization with the preamble of the signal must be supplied.

If the "Find Sync" softkey is activated, the synchronization is supplied towards the 64 bit sync word. For this purpose, in a first step a burst is searched automatically within the RF signal, or, if selected, the external trigger or the IF power trigger are used to determine the burst position.

In a second step the sync word position is searched by correlation of the signal with the sync word defined in the initialization phase. The correlation is performed directly with the FM signal, not with the data bits, which are only available after the phase shifter has been processed. The find burst process is continued as long as no sync word is found.

After the position of the sync word has been determined, the position of the p0 bit is calculated from the average value of all zero trespassing points, as defined in the RF test specification. Finally the samples are moved in a way that each sample matches one zero trespassing point (phase shifting).

The only measurement possible without synchronization is the Output Power measurement. The specified measurement time is 20% to 80% of the burst length. Without synchronization the burst length is defined via the –3dB points of the power curve. With synchronization the burst starts with the p0 bit. Therefore varying measurement results is possible if the power of the EUT is not constant within the burst.

In order to supply stable synchronization the EUT must be operated in reduced hopping mode. The EUT is only allowed to toggle between two frequencies, because otherwise the repetition time for the same frequency would become higher than the record length. If the test environment supplies an external trigger that marks the channel to be measured a synchronization is also possible with normal hopping operation.

4.2 Instrument Functions for Bluetooth Measurements (K8)

This option provides measurements to test the conformity of signal sources to the Bluetooth RF Test Specification (Bluetooth SIG).

For background information on Bluetooth measurements refer to chapter 4.1, "Introduction to Bluetooth Measurements (K8)", on page 13.

To open the Bluetooth menu

- If the "Bluetooth" mode is not the active measurement mode, press the MODE key and activate the "Bluetooth" option.
  If the "Bluetooth" mode is already active, press the MENU key.
  The "Bluetooth" menu is displayed.

Menu and softkey description

The following softkey menus are specific to the R&S FSV-K8 option and are described here:

- chapter 4.2.3, "Softkeys of the Bluetooth Menu", on page 36
- chapter 4.2.4, "Softkeys of the MEAS CONFIG menu", on page 51
- chapter 4.2.7, "Softkeys of the Frequency Menu (option R&S FSV-K8)", on page 57
- chapter 4.2.5, "Softkeys of the Amplitude Menu (Bluetooth Mode)", on page 52

- chapter 4.2.6, "Softkeys of the Bandwidth Menu (option R&S FSV-K8)", on page 55
- chapter 4.2.8, "Softkeys of the Sweep Menu (Bluetooth mode)", on page 58
- chapter 4.2.9, "Softkeys of the Trigger Menu (Option R&S FSV-K8)", on page 62

The span menu is not available in the "Bluetooth" mode. All other menus are provided as described for the base unit. For details refer to the corresponding menu descriptions.

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

Tasks

- chapter 4.2.2, "Adapting the settings to the characteristics of the DUT", on page 36

Measurement settings

Various measurement types are available with the Bluetooth option, see chapter 4.2.1, "Measurement Types and Result Display", on page 25.

The basic parameter settings are described in chapter 4.2.2, "Adapting the settings to the characteristics of the DUT", on page 36. The settings that can be configured individually for each measurement are the following:

- RBW (the IF bandwidth set up for modulation measurements is valid for all measurements)
- VBW
- RBW auto mode
- VBW auto mode
- trace mode
- detector
- sweep count
- sweep time auto mode
- sweep time

They are available in the corresponding menus as soon as the corresponding measurement is selected. Changes to these settings are always related to the selected measurement. The settings defined in the RF Test Specification can thus be modified individually for development or production. By using the start recall function, the individual configuration of the various tests can be preserved over a preset.

Position of a Bluetooth burst

The RF Test Specification allows different methods to determine the position of a Bluetooth burst:

- The burst is defined by the p0 bit and the automatically determined packet length ("Find Sync On").

- The burst is defined by the two 3dB points ("Find Sync Off "and "Find Burst On"). The search of the 3dB points is defined in the RF Test Specification as the alternative method compared with the p0 bit method.

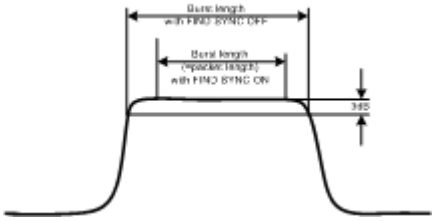


Fig. 4-3: Definition of a Bluetooth burst

Labels used in the measurement displays

- Enhancement label "TDF"

Offset values, set with the "Antenna Gain" softkey, that are larger or smaller than 0 dB activate the enhancement label "TDF" at the right diagram border.

4.2.1 Measurement Types and Result Display

The Bluetooth Measurements option provides various measurement types. The measurements and the corresponding result display are described in the following chapters. Generally, a diagram and a table with the main results are displayed.

For each measurement, the results are compared to the selected standard. If the results match the standard, the status is indicated as "Passed". If one of the results does not match the standard, that value is displayed in red, and the status of the measurement is indicated as "Failed".

4.2.1.1 Output Power Measurement

The Output Power measurement (Output Power softkey) determines the maximum and average output power during a burst of the equipment under test (EUT). For this purpose a complete packet is recorded in the time domain.

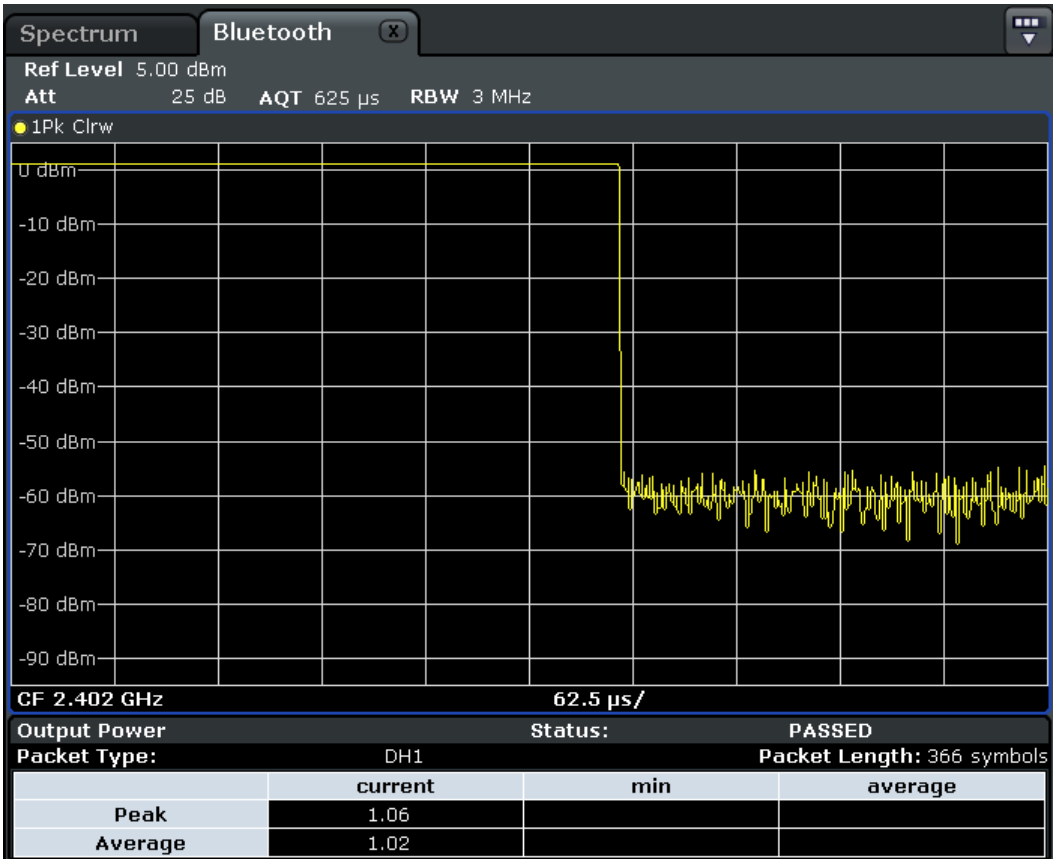


Fig. 4-4: Output power measurement

The peak value is determined from the complete contents of the measurement trace, whereas the average power is calculated from an area of at least 20% to 80% of the burst.

During the Output Power measurement the Bluetooth demodulator is active in order to determine the sync word within the signal, which is used as the trigger basis later. The Bluetooth demodulator is placed in a signal path without video filter. This is why the video filter cannot be activated with the Output Power measurement.

The EUT (equipment under test) must not exceed the following limits according to the RF Test Specification:

- P_{AV} < 100 mW (20 dBm) EIRP
- P_{PK} < 200 mW (23 dBm) EIRP
- If the EUT conforms to power class 1: P_{AV} > 1 mW (0 dBm)
- If the EUT conforms to power class 2: 0.25 mW (–6 dBm) < P_{AV} < 2.5 mW (4 dBm)
- If the EUT conforms to power class 3: P_{AV} < 1 mW (0 dBm)

A violation of these limits is marked on the screen in red color.

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length
- Peak power (current packet value, minimum and average values of all previous and current packets)
- Average power (current packet value, minimum and average values of all previous and current packets)

4.2.1.2 Adjacent Channel Power Measurement

The measurement of the TX Output Spectrum – Adjacent Channel Power measurement (TX Spec ACLR softkey) measures the power of all adjacent channels.

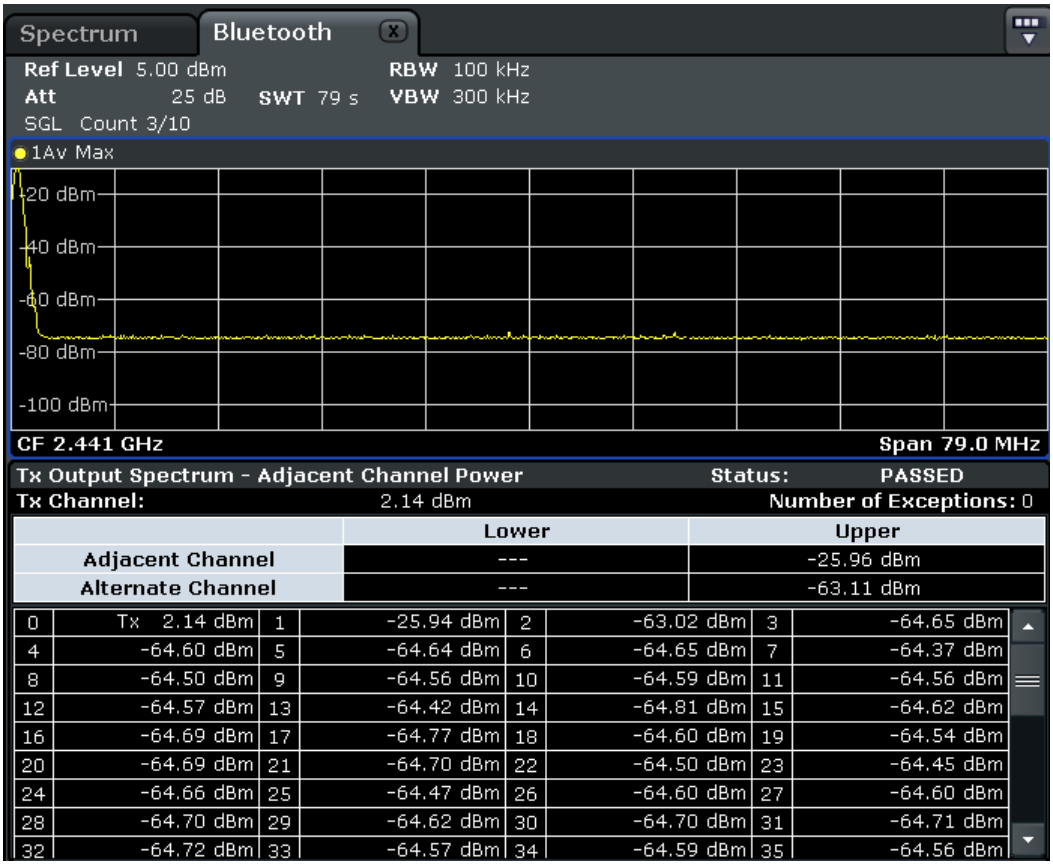


Fig. 4-5: TX Spectrum ACP measurement

The following limits are given by the RF Test Specification:

- P_{TX} (f) ≤ –20 dBm for |M–N| = 2
- P_{TX} (f) ≤ –40 dBm for |M–N| ≥ 3

with M = Transmit channel of the equipment under test, N = adjacent channel to be measured A violation of these limits is indicated on the screen by red color and an asterisk (*).

Result Summary

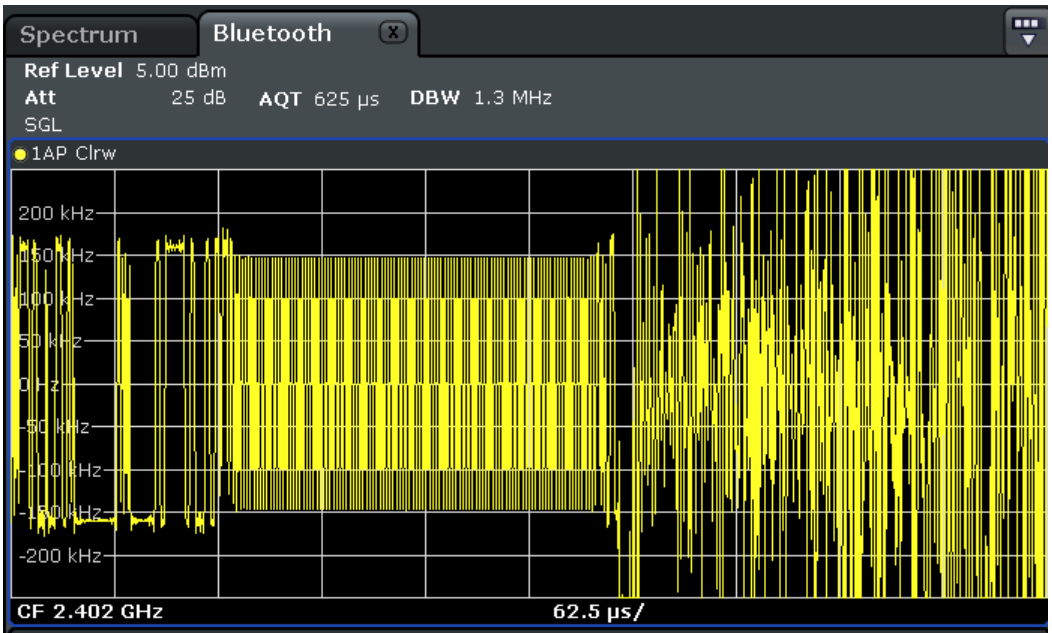
The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Tx channel
- Number of Exceptions
- Lower and upper adjacent channel
- Lower and upper alternate channel
- Channel power for each channel

4.2.1.3 Modulation Characteristics Measurement

The measurement of the modulation characteristics (Modulation Char softkey) determines the maximum frequency deviation of all 8 bit sequences of the payload.

Additionally the average value of the maximum frequency deviation of a packet is calculated. Thus, the equipment under test is configured such that packets with bit patterns "11110000" and "10101010" are transmitted alternately. According to the RF Test Specification this sequence has to be repeated 10 times.



Modulation Characteristics			Status:	PASSED	
Δf2(max) in range			100 %		
	Frequency Deviation (per bit)			Average Frequency Deviation (per packet)	
	max	min	average	max	min
Δf1(00001111)	161.34 kHz	158.32 kHz	159.76 kHz	159.76 kHz	159.76 kHz
Δf2(01010101)	150.42 kHz	145.22 kHz	146.80 kHz	146.80 kHz	146.80 kHz
Δf2/Δf1				0.92	0.92

Fig. 4-6: Modulation Characteristics measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

Label	Description
Δf2(max) in range	Maximum frequency deviation in range
Frequency Deviation (per bit)	Maximum, minimum and average frequency deviation per bit
Average Frequency Deviation (per packet)	Minimum and maximum average frequency deviation per packet
Δf1 (00001111)	Frequency deviation for bit pattern "00001111"
Δf2 (01010101)	Frequency deviation for bit pattern "01010101"
Δf2/Δf1	Ratio of the frequency deviations of both patterns

4.2.1.4 Initial Carrier Frequency Tolerance Measurement

The measurement of the Initial Carrier Frequency Tolerance (Init Carr Freq Tol softkey) determines the carrier offset of the four preamble bits. According to the RF Test Specification the calculation of the carrier offset is performed from the middle of the first preamble bit to the middle of the bit following the preamble.

With "Clear/Write" trace mode and single sweep operation the selected number of sweeps is processed and, according to the RF Test Specification, the results of all sweeps are compared with the defined tolerance. If a different trace mode is selected, alternatively, the analyzer cancombine several traces and determine the measurement results from the resulting trace.

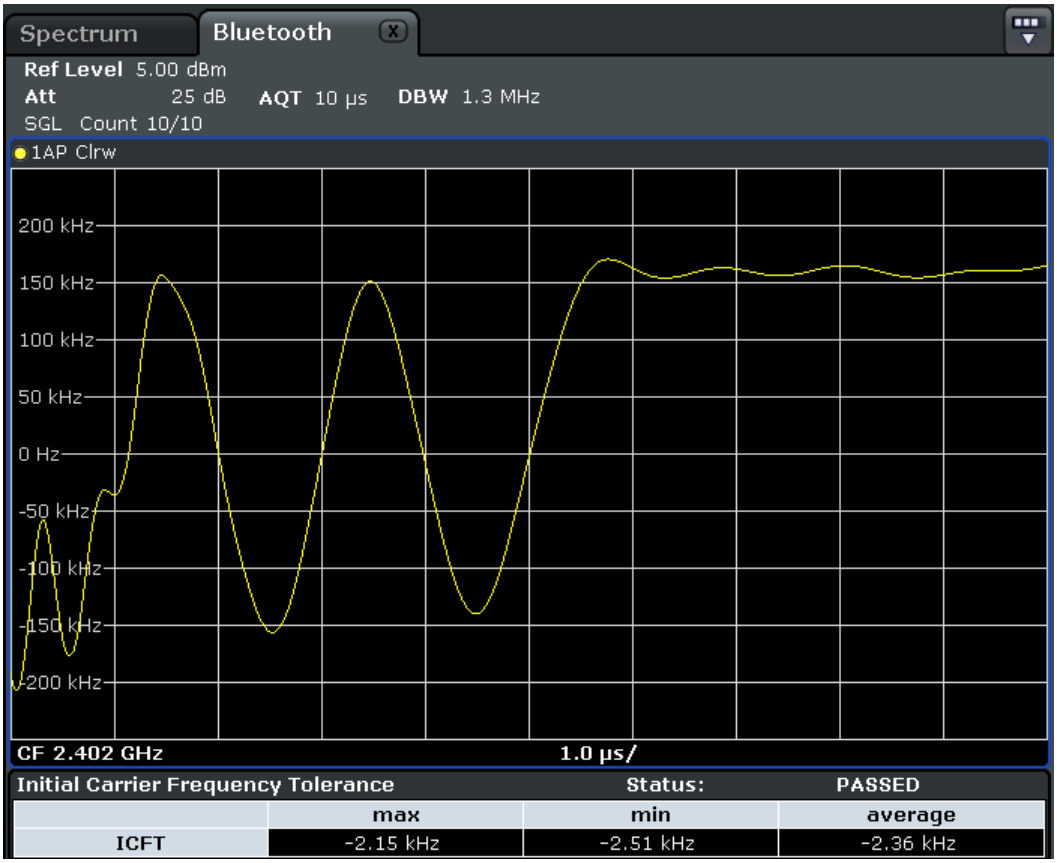


Fig. 4-7: Initial Carrier Frequency Tolerance measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Maximum, minimum and average initial carrier frequency tolerance

4.2.1.5 Carrier Frequency Drift Measurement

The measurement of the Carrier Frequency Drift (Carr Freq Drift softkey) determines the maximum frequency drift between the average value of the preamble bits and any 10 bit group of the payload. Additionally, the maximum drift rate between all 10 bit groups in the payload is determined every 50µs.

With "Clear/Write" trace mode and single sweep operation the selected number of sweeps is processed and, according to the RF Test Specification, the results of all sweeps are compared with the defined tolerance. If a different trace mode is selected, alternatively, the analyzer cancombine several traces and determine the measurement results from the resulting trace.

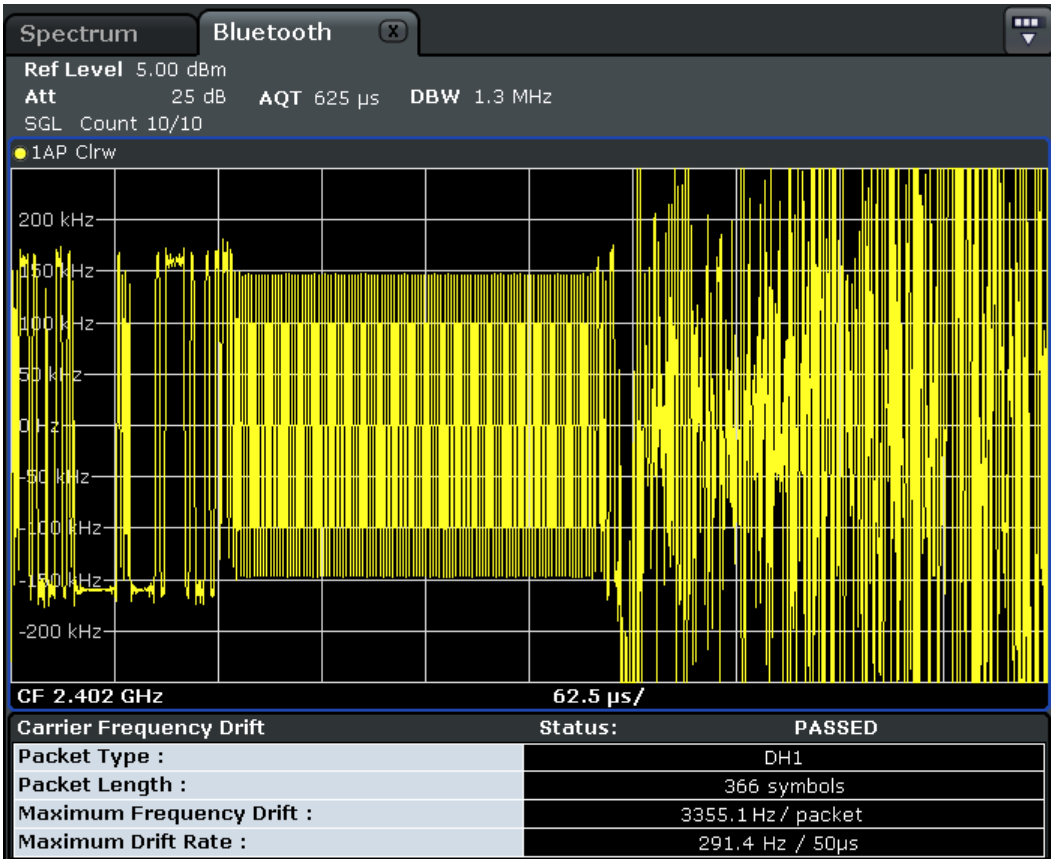


Fig. 4-8: Carrier Frequency Drift measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length in symbols
- Maximum frequency drfit per packet
- Maximum drift rate per 50 µs interval

4.2.1.6 Relative Transmit Power (EDR) Measurement

The measurement of the Relative Transmit Power (Rel TX Power softkey) is an enhanced data rate measurement (EDR). It determines the average transmission power of the GFSK and DPSK modulated parts of the signal and calculates the ratio of those values.

The measurement results must conform to the requirement:

- $(P_{GFSK} – 4dB) < P_{DPSK} < (P_{GFSK} + 1dB)$

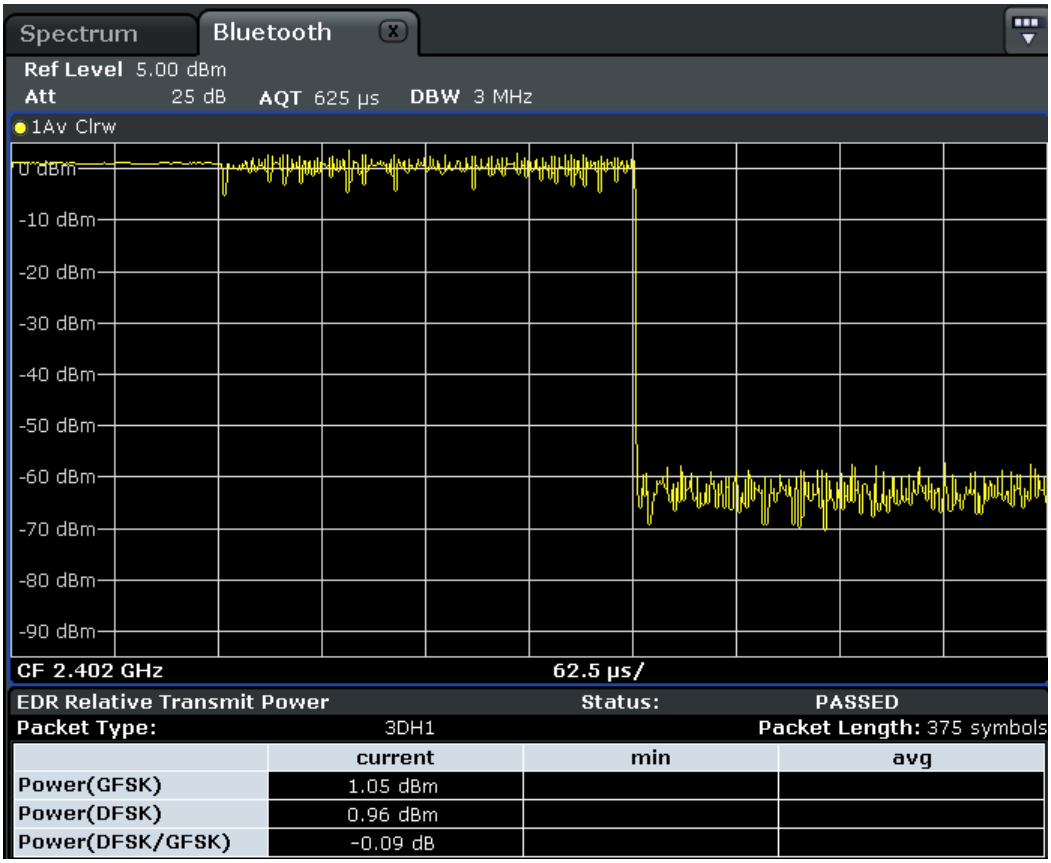


Fig. 4-9: Relative Transmit Power (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length in symbols
- Maximum, minimum and average power of the GFSK modulated part
- Maximum, minimum and average power of the DFSK modulated part
- Maximum, minimum and average ratio of the two powers

4.2.1.7 In–band Spurious Emissions (EDR) measurement

The measurement of the In–band Spurious Emissions (Spurious Emissions softkey) is an enhanced data rate measurement (EDR). It verifies whether the level of unwanted signals within the used frequency band lies below the required level. The analyzer records the signal only in those parts of the signal in which the instrument transmits DPSK–modulated data.

The signal must meet the following conditions:

- P_{TX} (f) ≤ –20 dBm for |M–N| = 2

- P_{TX} (f) ≤ –40 dBm for |M–N| ≥ 3
  with M = transmit channel of the equipment under test, N = adjacent channel to be measured
- The adjacent channel power between 1 MHz and 1.5 MHz from the carrier (Adj500kHz Low/Upp) shall be at least 26 dB below the maximum power of the carrier (TX Channel (Ref)).

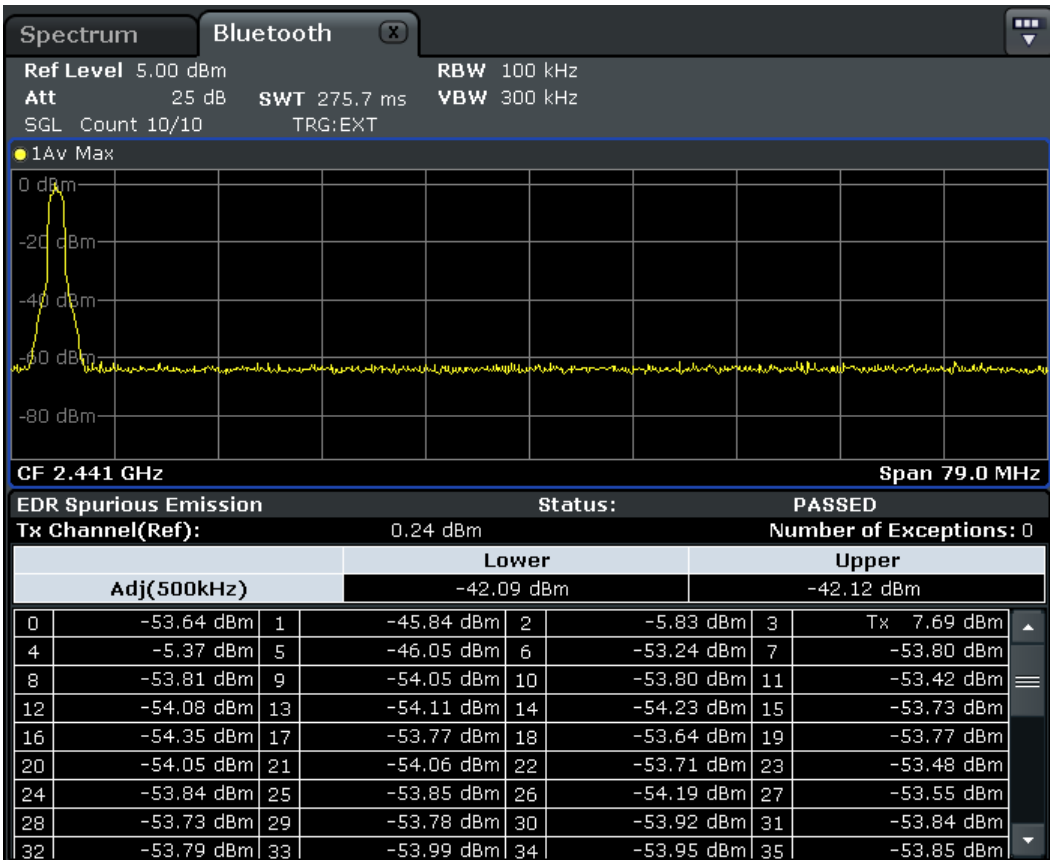


Fig. 4-10: In-band Spurious Emissions (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Upper and lower adjacent channels (500 kHz from the carrier)
- Power level for each channel

4.2.1.8 Carrier Frequency Stability and Modulation Accuracy (EDR) measurement

The measurement of the Carrier Frequency Stability and Modulation Accuracy (Carr Freq Stability softkey) is an enhanced data rate measurement (EDR). It verifies that the modulation accuracy and the frequency stability are within the required limits. According to the RF Test Specification, the software records 200 blocks, each with a length of 50 µs

for the evaluation. The number of blocks to be recorded can be changed using the Block Count (Carr Freq Stability) softkey.

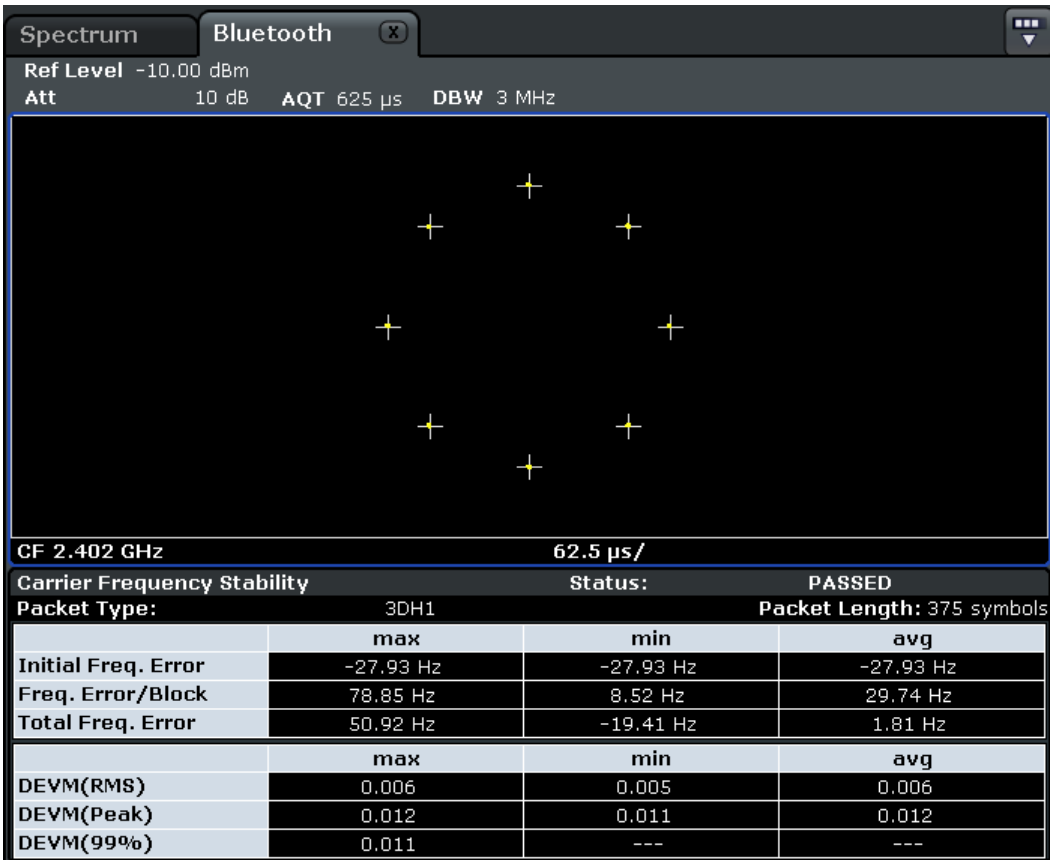


Fig. 4-11: Carrier Frequency Stability and Modulation Accuracy (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

Label	Description
Packet Type	Packet type
Packet Length	Packet length in symbols
Initial Freq. Error	Minimum, maximum and average error in the initial frequency
Freq.Error/Block	Minimum, maximum and average frequency error per block
Total Freq. Error	Minimum, maximum and average frequency error per block + initial frequency error
DEVM (RMS)	Differential error vector magnitude as RMS value

Label	Description
DEVM (Peak)	Peak differential error vector magnitude
DEVM (99%)	99-percentile of differential error vector magnitude

4.2.1.9 Differential Phase Encoding (EDR) measurement

The measurement of the Differential Phase Encoding (Diff Phase softkey) is an enhanced data rate measurement (EDR). It checks whether the instrument modulates the data correctly in the time range of the DPSK modulation. Correct modulation is assumed if a specific bit pattern (PRBS9) is received from the sender. For each packet, this pattern is checked and each positive test result is counted.

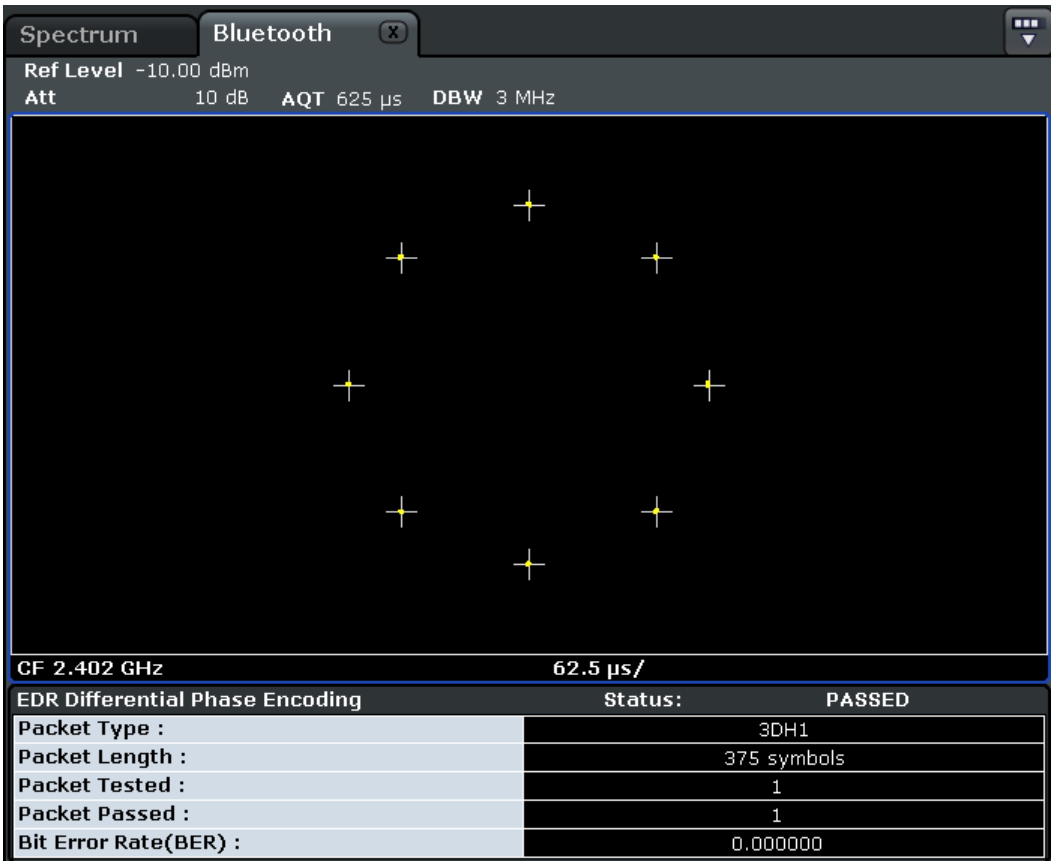


Fig. 4-12: Differential Phase Encoding (EDR) measurement

Result Summary

The results of the measurement are summarized in a table beneath the diagram. The summary contains the following results:

- Packet type
- Packet length in symbols
- Packet tested (Number of tested packets)
- Packet passed (Number of successful tests, i.e. correctly modulated packets)

- Bit error rate

4.2.2 Adapting the settings to the characteristics of the DUT

1. Set the spectrum analyzer to its default state.
   a) Press "PRESET".

   The analyzer is set to its default state.
2. Select the Bluetooth operating mode.
   a) Press "MODE" key.
   b) In the "Measurement Modes" dialog box, select "Bluetooth".

   The "Bluetooth" mode is activated and the main menu of the option is displayed.
3. Select the required measurement type to be performed.
   a) Press "Standard" and select the required standard.
   b) Press the softkey for the required measurement type.

   The measurement configuration menu is displayed.
4. Select the transmit channel.
   a) Press "Channel" softkey and enter the desired channel number.
5. Select the packet type and power class.
   a) Press "Meas Setup".
      The "Meas Setup Settings" dialag box is displayed.
   b) Select the desired packet type.
   c) Select the power class of the DUT.
   d) Press "Close".
6. Configure the sync settings (LAP).
   a) Press "Find Sync" softkey.
      The "Find Sync" dialog box is displayed.
   b) Enter the "LAP (lower address part)" of the Bluetooth device address of the DUT.
      The sync word used for the sync search is calculated.
7. Configure measurement time, measurement control and the number of measurement cycles by pressing the corresponding softkeys. For further information refer to chapter 4.2.8, "Softkeys of the Sweep Menu (Bluetooth mode)", on page 58.

4.2.3 Softkeys of the Bluetooth Menu

The following softkeys and settings are available in the main "Bluetooth" menu which is displayed when you select the "Bluetooth" mode. The same menu is also displayed when "Bluetooth" mode is selected and you press the MEAS or HOME key.

Standard
Opens a dialog box to select the standard by which the Bluetooth meaurements are performed.

Currently, the following standards are supported:

- Bluetooth 2.1 - Base Rate
- Bluetooth 2.1 - EDR

Depending on the selected standard, different measurement types are available via softkeys.

SCPI command:

Output Power
Opens a submenu to configure the Output Power measurement. For further details refer to chapter 4.2.1.1, "Output Power Measurement", on page 25.

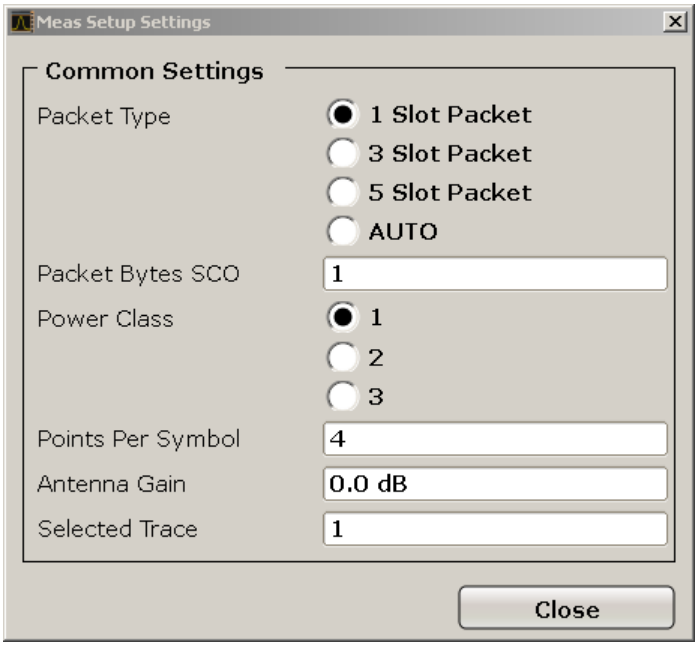
SCPI command:
`CONF:BTO:MEAS OPOW`, see `CONFigure:BTOoth:MEASurement` on page 94
`CALCulate<n>:BTOoth:OPOWer[:PEAK]` on page 82
`CALCulate<n>:BTOoth:OPOWer:AVERage` on page 82

Channel ← Output Power
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
`CONFigure:BTOoth:CHANnel` on page 93

Meas Setup ← Output Power
Opens a dialog box for common measurement settings.



Packet Type ← Meas Setup ← Output Power
Defines the number of occupied slots in the sent packet.

The number of occupied slots is used for the automatic calculation of the sweep time (Sweeptime Auto (TX Spec ACLR) softkey) and the search length of the sync word Search Len Auto setting).

The currently transmitted packet type is determined automatically by the Bluetooth demodulator (which means that the selected packet type need not necessarily correspond to the actually transmitted packet type; it will only affect the settings for sweep time and search length as described above).

"DH 1" 1 slot packet (default)

"DH 3" 3 slot packet

"DH 5 | AUTO" 5 slot packet

SCPI command:
`CONFigure:BTOoth:PTYPe` on page 97

Packet Bytes SCO ← Meas Setup ← Output Power
Defines the number of payload bytes that are transmitted in a packet. For SCO packets, the payload length must be adjusted because those packets have no payload header.

SCPI command:
`CONFigure:BTOoth:PBSCo` on page 95

Power Class ← Meas Setup ← Output Power
Selects one of the Bluetooth power classes (1 to 3). The selection of the power class determines the limits. The default setting is power class 1 (100 mW).

SCPI command:
`CONFigure:BTOoth:PCLass` on page 96

Points / Symbol ← Meas Setup ← Output Power
Defines the number of measurement samples per symbol. For Basic Rate measurements, the possible values are 2, 4, 8, 16, 32. The default value is 4. For EDR measurements, the default value is set and cannot be changed.

The RF Test Specification requests an oversampling factor of at least 4. With this oversampling factor a 5 Slot Packet corresponds to 12500 measurement samples (= 2500 samples / slot).

SCPI command:
`CONFigure:BTOoth:PRATe` on page 97

Antenna Gain ← Meas Setup ← Output Power
Defines a level offset in order to take the gain of an antenna into account for displaying power values. The default setting is 0 dB. Offset values that are larger or smaller than 0 dB activate the enhancement label "TDF" at the right diagram border.

SCPI command:
`[SENSe:]CORRection:EGAin:INPut[:MAGNitude]` on page 112

Selected Trace ← Meas Setup ← Output Power
Selects the measurement trace whose numeric results are displayed in the table below the diagram. By default, trace 1 is selected.

SCPI command:
`CONFigure:BTOoth:TRACe<t>:SELect` on page 101

Find Sync ← Output Power
Opens a dialog box to set the signal processing functions of the analyzer. They are necessary to determine the position of the first preamble bit p_0 by correlation with the sync word. Thus, a sufficient record length of the FM demodulated signal is necessary.

For further information refer to "Position of a Bluetooth burst" in chapter 4.2, "Instrument Functions for Bluetooth Measurements (K8)", on page 23.

LAP ← Find Sync ← Output Power
Defines the lower 24 bit Lower Address Part (LAP) of the Bluetooth Device Address (BD_ADDR) of the equipment under test (EUT).

The LAP is used to calculate the 64–bit sync word. The sync word in return is used to determine the start of a packet by correlation and to determine the position of the first preamble bit p0 using the method described in the RF Test Specification.

The values for the lower address part range from 000000h to FFFFFFh. The default setting is 0000000h.

SCPI command:
`[SENSe:]DDEMod:SEARch:SYNC:LAP` on page 119

Find Sync On/Off ← Find Sync ← Output Power
Activates or deactivates the search of the sync word. The default setting is activated.

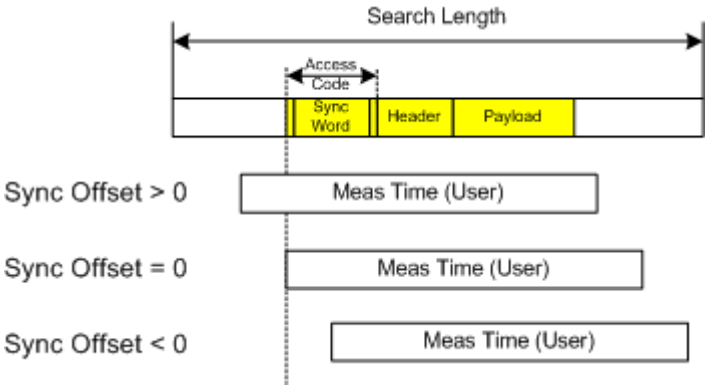
The results of the modulation measurements Modulation Characteristics, Initial Carrier Frequency Tolerance, Carrier Frequency Drift can only be calculated if the softkey is activated. The measurement of the Output Power can be performed with either this softkey or the Find Burst On/Off softkey activated. If both softkeys are activated, the search area for the sync word will be limited to the area of the detected burst. If the Find Burst On/Off softkey is not activated or no burst is identified, the total record length (search length) is investigated.

SCPI command:
`[SENSe]:DDEMod:SEARch:SYNC:STATe` on page 118

Sync Offset ← Find Sync ← Output Power
Defines the number of bits to be displayed in front of the of the first preamble bit p_0. If the sync word is identified, but the selected measurement time cannot be displayed due to the selected sync offset, the message "SYNC OFFSET INVALID" is displayed.

The value range depends on the search length and the upper limit of symbols (400001 points / symbol). The default setting for the sync offset is 0.

This softkey is only available if the Find Sync On/Off softkey is activated.



SCPI command:
`[SENSe:]DDEMod:SEARch:SYNC:OFFSet` on page 119

Find Burst On/Off (Output Power) ← Find Sync ← Output Power
Activates the burst search if the Find Sync On/Off softkey is deactivated. Beside the synchronization on the sync word, the Output Power measurement can perform a burst search to evaluate the signal according to the standard.

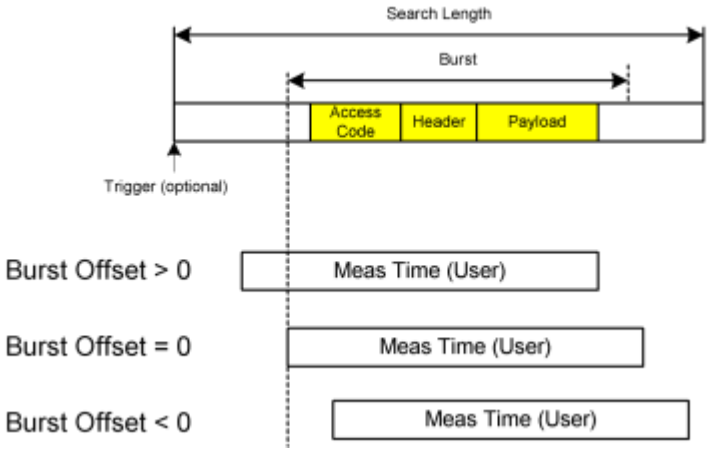
If the Find Sync On/Off softkey is not activated and no burst is identified, the message "BURST NOT FOUND" is displayed, and the corresponding bit in the `STATus:QUEStionable:SYNC` register is set during remote operation.

SCPI command:
`[SENSe:]DDEMod:SEARch:PULSe[:STATe]` on page 118

Burst Offset ← Find Sync ← Output Power
Opens an edit dialog box to define the time to be displayed before the identified burst. The values range from –10 ms to + 10 ms, with negative values moving the burst to the left, positive values to the right. The default setting for the burst offset is 0.

If the burst is identified, but the selected measurement time cannot be displayed due to the selected burst offset, the message "BURST OFFSET INVALID" is displayed.

This softkey is only available if the Find Sync On/Off is deactivated and the Find Burst On/Off (Output Power) softkey is activated.



SCPI command:
`[SENSe:]DDEMod:SEARch:PULSe:OFFSet` on page 118

Search Len Auto ← Find Sync ← Output Power
Activates or deactivates the automatic selection of the search length for the search of the sync word or the burst, depending on the selected packet type. The automatic search length is determined as follows:

Trigger free run:

search length = 3 * packet length + | sync offset or burst offset |

All other trigger modes:

search length = 1 * packet length + 1 Slot + | sync offset or burst offset |

If the selected measurement time is higher than the packet length, the following difference is added to the search length:

measurement time – packet length

In the default setting, the automatic calculation of the search length is activated.

SCPI command:
`[SENSe:]DDEMod:SEARch:TIME:AUTO` on page 120

Search Len Manual ← Find Sync ← Output Power
Opens an edit dialog box to enter the search length used for determining the sync word or the burst. The unit of the search length is seconds; the values range from 100 µs to (400001 / points per symbol) µs. The default setting is 1825 µs.

The selected number of points per symbol and the maximum search length is listed in the table below.

Points per symbol	Max. search length (number of slots)
2	104.4
4	52.2
8	26.1
16	13.1
32	6.5

For information on the correlation of trigger and record length refer to the Search Len Auto softkey.

SCPI command:

[SENSe:]DDEMod:SEARch:TIME on page 119

Power Avg Start (Output Power) ← Output Power

Opens an edit dialog box to enter the start position of the evaluation area for the average burst power. The values range is from 0 to 100%, the default setting is 20%.

For further information refer to chapter 4.1, "Introduction to Bluetooth Measurements (K8)", on page 13.

SCPI command:

CONFigure:BTOoth:POWer:AVERage:STARt on page 96

Power Avg Stop (Output Power) ← Output Power

Opens an edit dialog box to enter the stop position of the evaluation area for the average burst power. The values range from 0 to 100%, the default setting is 80%.

For further information refer to chapter 4.1, "Introduction to Bluetooth Measurements (K8)", on page 13.

SCPI command:

CONFigure:BTOoth:POWer:AVERage:STOP on page 96

TX Spec ACLR

Opens a submenu to configure the TX Spec ACLR measurement. For further details refer to chapter 4.2.1.2, "Adjacent Channel Power Measurement", on page 27.

SCPI command:

CONF:BTO:MEAS ACLR, see CONFigure:BTOoth:MEASurement on page 94

CALCulate<n>:BTOoth:ACLR[:LIST] on page 69

CALCulate<n>:BTOoth:ACLR:EXCeptions on page 69

Channel ← TX Spec ACLR

Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
CONFigure:BTOoth:CHANnel on page 93

Meas Setup ← TX Spec ACLR
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← TX Spec ACLR
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

No. of ACP Chan (TX Spec ACLR, Spurious Emissions) ← TX Spec ACLR
Opens an edit dialog box to enter the number of adjacent channels, for which the power is to be measured. The values range from 0 to 78. A minimum value of 3 is recommended. The default setting is 78 (all channels).

As with the ACP measurement of the basic instrument firmware this value refers to the number of adjacent channels on one side of the TX channel. This means that with a selected value of 10 the analyzer will measure in total 21 channels (10 lower channels + TX channel + 10 upper channels).

The frequency range required for the measurement is set up automatically. The center frequency will also be adapted automatically dependent on the selected TX channel.

The measurement of the adjacent channels is limited to the available Bluetooth frequency band, which means that at maximum 79 channels (23 channels in France) will be measured.

SCPI command:
CONFigure:BTOoth:ACLR:ACPairs on page 90
CONFigure:BTOoth:IBSemissions:ACPairs on page 94

Modulation Char
Opens a submenu to configure the Modulation Char measurement. For further details refer to chapter 4.2.1.3, "Modulation Characteristics Measurement", on page 28.

SCPI command:
CONF:BTO:MEAS MCH, see CONFigure:BTOoth:MEASurement on page 94
CALCulate<n>:BTOoth:MCHar:DF<Delta>:AVERage on page 79
CALCulate<n>:BTOoth:MCHar:DF<Delta>:MAXimum on page 80
CALCulate<n>:BTOoth:MCHar:DF2:PERCent on page 80
CALCulate<n>:BTOoth:MCHar:RATio on page 81

Channel ← Modulation Char
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
CONFigure:BTOoth:CHANnel on page 93

Meas Setup ← Modulation Char
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← Modulation Char
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

Start Test (Modulation Char) ← Modulation Char
Initiates a new measurement. All frequency deviation values obtained earlier are discarded.

The bit pattern in the payload is detected automatically. The frequency deviation of a packet is determined according to the procedure defined in the RF Test Specification.

SCPI command:
INIT;*WAI

Continue Test (Modulation Char) ← Modulation Char
Measures the frequency deviation of further packets after the bit pattern has been changed at the EUT, just like the "Start Test" softkey did for the first bit pattern type. The results of the preceding measurement are preserved and are taken into account for the new measurements.

SCPI command:
INIT:CONM;*WAI

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift) ← Modulation Char
Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

SCPI command:
[SENSe:]ADEMod:ZOOM[:STATe] on page 116
[SENSe:]ADEMod:ZOOM:STARt on page 117

Init Carr Freq Tol
Opens a submenu to configure the Init Carr Freq Tol measurement. For further details refer to chapter 4.2.1.4, "Initial Carrier Frequency Tolerance Measurement", on page 29.

SCPI command:
CONF:BTO:MEAS IFCT, see CONFigure:BTOoth:MEASurement on page 94
CALCulate<n>:BTOoth:ICFTolerance on page 78

Channel ← Init Carr Freq Tol
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
`CONFigure:BTOoth:CHANnel` on page 93

Meas Setup ← Init Carr Freq Tol
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← Init Carr Freq Tol
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift) ← Init Carr Freq Tol
Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

SCPI command:
`[SENSe:]ADEMod:ZOOM[:STATe]` on page 116
`[SENSe:]ADEMod:ZOOM:STARt` on page 117

Carr Freq Drift
Opens a submenu to configure the Carr Freq Drift measurement. For further details refer to chapter 4.2.1.5, "Carrier Frequency Drift Measurement", on page 30.

SCPI command:
`CONF:BTO:MEAS CFDR`, see `CONFigure:BTOoth:MEASurement` on page 94
`CALCulate<n>:BTOoth:CFDRift[:MAXimum]` on page 70
`CALCulate<n>:BTOoth:CFDRift:RATE` on page 70

Channel ← Carr Freq Drift
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
`CONFigure:BTOoth:CHANnel` on page 93

Meas Setup ← Carr Freq Drift
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← Carr Freq Drift
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift) ← Carr Freq Drift
Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

SCPI command:
`[SENSe:]ADEMod:ZOOM[:STATe]` on page 116
`[SENSe:]ADEMod:ZOOM:STARt` on page 117

Rel TX Power
Opens a submenu to configure the Rel TX Power measurement. For further details refer to chapter 4.2.1.6, "Relative Transmit Power (EDR) Measurement", on page 31.

SCPI command:
`CONF:BTO:MEAS RTP`, see `CONFigure:BTOoth:MEASurement` on page 94
`CALCulate<n>:BTOoth:RTPower:[DPSK]` on page 84
`CALCulate<n>:BTOoth:RTPower:GFSK` on page 85
`CALCulate<n>:BTOoth:RTPower:RATio` on page 86

Channel ← Rel TX Power
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

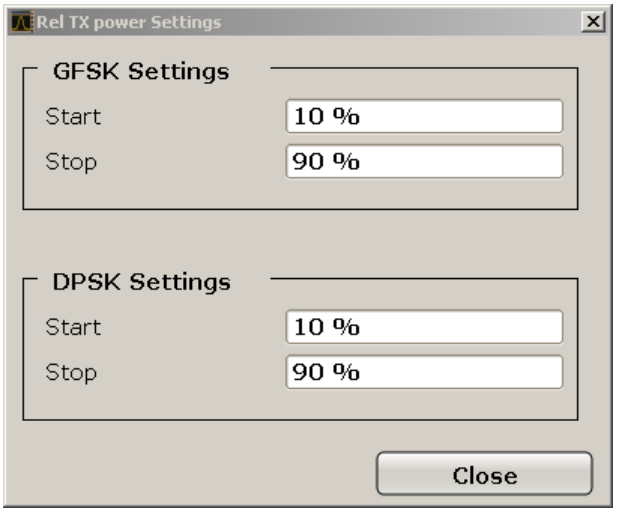
Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
`CONFigure:BTOoth:CHANnel` on page 93

Meas Setup ← Rel TX Power
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← Rel TX Power
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

Settings ← Rel TX Power
Opens a dialog box to define the start and stop times for power measurements.



GFSK Start ← Settings ← Rel TX Power
Defines the start time for the power measurement of the GFSK sections of the packet.
The default value is 10%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:GAVerage:STARt` on page 98

GFSK Stop ← Settings ← Rel TX Power
Defines the stop time for the power measurement of the GFSK sections of the packet.
The default value is 90%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:GAVerage:STOP` on page 99

DPSK Start ← Settings ← Rel TX Power
Defines the start time for the power measurement of the DPSK sections of the packet.
The default value is 10%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:DAVerage:STARt` on page 98

DPSK Stop ← Settings ← Rel TX Power
Defines the stop time for the power measurement of the DPSK sections of the packet.
The default value is 90%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:DAVerage:STOP` on page 98

Spurious Emissions
Opens a submenu to configure the Spurious Emissions measurement. For further details refer to chapter 4.2.1.7, "In–band Spurious Emissions (EDR) measurement", on page 32.

SCPI command:
`CONF:BTO:MEAS IBS`, see `CONFigure:BTOoth:MEASurement` on page 94
`CALCulate<n>:BTOoth:IBSemissions:[List]` on page 76
`CALCulate<n>:BTOoth:IBSemissions:EXCeptions` on page 77
`CALCulate<n>:BTOoth:IBSemissions:HADJacent` on page 77

Channel ← Spurious Emissions
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
`CONFigure:BTOoth:CHANnel` on page 93

Meas Setup ← Spurious Emissions
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← Spurious Emissions
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

No. of ACP Chan (TX Spec ACLR, Spurious Emissions) ← Spurious Emissions
Opens an edit dialog box to enter the number of adjacent channels, for which the power is to be measured. The values range from 0 to 78. A minimum value of 3 is recommended. The default setting is 78 (all channels).

As with the ACP measurement of the basic instrument firmware this value refers to the number of adjacent channels on one side of the TX channel. This means that with a selected value of 10 the analyzer will measure in total 21 channels (10 lower channels + TX channel + 10 upper channels).

The frequency range required for the measurement is set up automatically. The center frequency will also be adapted automatically dependent on the selected TX channel.

The measurement of the adjacent channels is limited to the available Bluetooth frequency band, which means that at maximum 79 channels (23 channels in France) will be measured.

SCPI command:
`CONFigure:BTOoth:ACLR:ACPairs` on page 90
`CONFigure:BTOoth:IBSemissions:ACPairs` on page 94

Gate Delay (Spurious Emissions) ← Spurious Emissions
Opens an edit dialog box to enter the time between trigger event and start of the DPSK packet. That is the measurement start time.

SCPI command:
`[SENSe:]SWEep:EGATe:HOLDoff` on page 113

Gate Length (Spurious Emissions) ← Spurious Emissions
Opens an edit dialog box to enter the sweep time in seconds. Usually, this is the length of the DPSK section.

SCPI command:
`[SENSe:]SWEep:EGATe:LENGth` on page 114

Adjust Gate ← Spurious Emissions
Adjusts the gate settings according to the pre–measurement results.

SCPI command:
`CONFigure:BTOoth:IBSemissions:GATE:AUTO ONCE` on page 94

Carr Freq Stability
Opens a submenu to configure the Carr Freq Stability measurement. For further details refer to chapter 4.2.1.8, "Carrier Frequency Stability and Modulation Accuracy (EDR) measurement", on page 33.

SCPI command:
`CONF:BTO:MEAS CFST`, see `CONFigure:BTOoth:MEASurement` on page 94
`CALCulate<n>:BTOoth:CFSTability:FERRor:[TOTal]` on page 73
`CALCulate<n>:BTOoth:CFSTability:FERRor:BLOCk` on page 73
`CALCulate<n>:BTOoth:CFSTability:FERRor:INITial` on page 74
`CALCulate<n>:BTOoth:CFSTability:DEVM:[RMS]` on page 71
`CALCulate<n>:BTOoth:CFSTability:DEVM:PEAK` on page 72
`CALCulate<n>:BTOoth:CFSTability:DEVM:D99Pct` on page 72
`CALCulate<n>:BTOoth:CFSTability:COUNt` on page 71

Channel ← Carr Freq Stability
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
`CONFigure:BTOoth:CHANnel` on page 93

Meas Setup ← Carr Freq Stability
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← Carr Freq Stability
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

Block Count (Carr Freq Stability) ← Carr Freq Stability
Opens an edit dialog box to enter the number of blocks to be measured. Every block has the length of 50 µs. The default value is 200 blocks.

This softkey is only available in single sweep operation.

SCPI command:
`CONFigure:BTOoth:CFSTability:BCOunt` on page 92

Diff Phase
Opens a submenu to configure the Diff Phase measurement. For further details refer to chapter 4.2.1.9, "Differential Phase Encoding (EDR) measurement", on page 35.

SCPI command:
`CONF:BTO:MEAS DPEN`, see `CONFigure:BTOoth:MEASurement` on page 94
`CALCulate<n>:BTOoth:DPENcoding:NERRor` on page 76
`CALCulate<n>:BTOoth:DPENcoding:[TOTal]` on page 75
`CALCulate<n>:BTOoth:DPENcoding:BER` on page 75

Channel ← Diff Phase
Opens an edit dialog box to enter the transmission channel number. From the number of the channel the center frequency is calculated in accordance to the RF Test Specification. The default setting is channel number 0.

Principally, setting the channel number has the same effect as changing the center frequency. The major difference is that the center frequency is not limited to available frequency band values, i.e. values outside the frequency band and between the discrete channels can be selected (see also Center softkey in the "Frequency" menu).

SCPI command:
`CONFigure:BTOoth:CHANnel` on page 93

Meas Setup ← Diff Phase
Opens a dialog box for common measurement settings, see "Meas Setup" on page 39.

Find Sync ← Diff Phase
Opens a dialog box to set the signal processing functions of the analyzer, see "Find Sync" on page 40.

4.2.4 Softkeys of the MEAS CONFIG menu

The MEAS CONFIG key provides direct access to the submenu of the currently selected measurement type. For a description of the submenus, see the corresponding keys in chapter 4.2.3, "Softkeys of the Bluetooth Menu", on page 36.

4.2.5 Softkeys of the Amplitude Menu (Bluetooth Mode)

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

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

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

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel` on page 104

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105.)
Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements.
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 102

Range
Opens a submenu to define the level display range.

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105.)
`DISP:WIND:TRAC:Y 100DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 102).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105.)
`DISP:WIND:TRAC:Y 50DB`
Sets the level display range to 50 dB (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 102).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105.)
`DISP:WIND:TRAC:Y 10DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 102).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105.)
`DISP:WIND:TRAC:Y 5DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 102).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105.)
`DISP:WIND:TRAC:Y 1DB` (see `DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 102).

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

SCPI command:
`DISP:WIND:TRAC:Y:SPAC LOG`
(To define logarithmic scaling, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105.)
Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements.
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]` on page 102

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

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

SCPI command:
`DISP:TRAC:Y:SPAC LIN`,see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105

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

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

SCPI command:
`DISP:TRAC:Y:SPAC LDB`, see `DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105

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

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

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

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

SCPI command:
`INPut:GAIN:STATe` on page 108

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

The mechanical attenuation can be set in 10 dB steps.

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

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

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

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

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

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

SCPI command:
`INPut:ATTenuation` on page 107

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

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

SCPI command:
`INPut:ATTenuation:AUTO` on page 108

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

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet` on page 104

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

Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements.

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

Not available for Carr Freq Drift, Init Carr Freq Tol, and Modulation Char measurements.

"Abs" Absolute scaling: The labeling of the level lines refers to the absolute value of the reference level. Absolute scaling is the default setting.

"Rel" Relative scaling: The upper line of the grid is always at 0 dB. The scaling is in dB whereas the reference level is always in the set unit (for details on unit settings see the "Unit" softkey).

SCPI command:
`DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE` on page 103

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

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

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

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

SCPI command:
`INPut:IMPedance` on page 108

4.2.6 Softkeys of the Bandwidth Menu (option R&S FSV-K8)

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

Sweeptime Manual (TX Spec ACLR)
Opens an edit dialog box to enter the sweep time. The valid value range is 10 µs (minimum measurement time for one channel) to 16000 s. The default setting is 79 s.

SCPI command:
`CONFigure:BTOoth:SWEep:TIME` on page 100

Sweeptime Auto (TX Spec ACLR)
Activates the automatic calculation of the sweep time. The automatic sweep time corresponds to the settings defined in the RF Test Specification. By default, it is activated.

SCPI command:
`CONFigure:BTOoth:SWEep:TIME:AUTO` on page 100

Meas Time Manual
Opens an edit dialog box to enter the measurement time. The valid value range is 1 µs to (400001 / points per symbol) µs.

This function is not available for Spurious Emissions measurements.

SCPI command:
`CONFigure:BTOoth:SWEep:TIME` on page 100

Meas Time Auto
Activates the automatic calculation of the measurement time. The automatic sweep time corresponds to the settings defined in the RF Test Specification. By default, the automatic sweep time calculation is activated.

This function is not available for Spurious Emissions measurements.

SCPI command:
`CONFigure:BTOoth:SWEep:TIME:AUTO` on page 100

Res BW Manual (Output Power, Rel TX Power)
Opens an edit dialog box to enter the resolution bandwidth. The values range from 1 MHz to 3 MHz. The default value is 3 MHz.

SCPI command:
`CONFigure:BTOoth:BANDwidth|BWIDth[:RESolution]` on page 91

Res BW Auto (Output Power, TX Spec ACLR, Rel TX Power, Spurious Emissions)
Sets the bandwidth according to the values defined in the RF Test Specification.

SCPI command:
`CONFigure:BTOoth:BANDwidth|BWIDth[:RESolution]:AUTO` on page 91

Video BW Manual (TX Spec ACLR)
The default value is 300 kHz, according to the values defined in the RF Test Specification.

For further details refer to the "Video BW Manual" softkey in the bandwidth menu of the base unit.

SCPI command:
`CONFigure:BTOoth:BANDwidth|BWIDth:VIDeo` on page 92

Video BW Auto (TX Spec ACLR, Spurious Emissions)
Sets the video bandwidth according to the values defined in the RF Test Specification.

In the In–band Spurious Emissions measurement, the video bandwidth is always adjusted automatically. Therefore the softkey is activated by default and its state cannot be changed.

SCPI command:
`CONFigure:BTOoth:BANDwidth|BWIDth:VIDeo:AUTO` on page 92

Filter Type (Output Power, TX Spec ACLR, Spurious Emissions, Rel TX Power)
Opens the "Filter Type" dialog box to select the filter type. For the measurements Output Power and Rel TX Power, a Gaussian or a channel filter can be selected. For the measurements TX Spec ACLR and Spurious Emissions, the filter type is a Gaussian filter.

SCPI command:
`[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE` on page 111

Meas Filter (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)
Activates or deactivates a filter that limits the bandwidth for the modulation measurements. Since the RF Test Specification Rev 2.0.E.3 it is required to use this filter and therefore it is activated by default.

The filter is flat within 1.04 MHz (ripple: only 0.02 dB) and has steep slopes outside this area. The filter has the following characteristics:
- passband ripple up to 550 kHz < 0.5 dB (peak to peak)
- minimum attenuation in the transition band

+- 650 kHz:	>=3 dB
+-1 MHz:	>= 14 dB
+- 2 MHz:	>= 44 dB

SCPI command:
`[SENSe:]DDEMod:FILTer:MEASurement` on page 117

4.2.7 Softkeys of the Frequency Menu (option R&S FSV-K8)

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

Center
Opens an edit dialog box to change the center frequency.

If the frequency channel was set via the "Channel" softkey (see "Channel" on page 38), you can change the center frequency, but the relation to the frequency channel will be lost, which means that the value range for the center frequency is not limited to frequencies within valid frequency channels.

The fixed relation between center frequency and Bluetooth frequency channels is restored when you press the "Channel" softkey or select another measurement. The center frequency is rounded to the nearest frequency channel.

SCPI command:
`[SENSe:]FREQuency:CENTer` on page 112

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

0.1*Chan Spacing ← CF–Stepsize
Sets the step size of the center frequency to 1/10 of the channel spacing.

SCPI command:

= Chan Spacing ← CF–Stepsize
Sets the step size of the center frequency to the size of the channel spacing.

SCPI command:

4.2.8 Softkeys of the Sweep Menu (Bluetooth mode)

The following table shows all softkeys available in the sweep menu in Bluetooth mode (SWEEP key). In the Bluetooth mode, the sweep menu is used for direct entry into the measurement menu of the currently selected measurement. It is possible that your instrument configuration does not provide all softkeys. If a softkey is only available with a special option, model or (measurement) mode, this information is delivered in the corresponding softkey description.

Continuous Sweep
Sets the continuous sweep mode: the sweep takes place continuously according to the trigger settings. This is the default setting. The trace averaging is determined by the sweep count value (see the "Sweep Count" softkey, "Sweep Count" on page 59).

SCPI command:
`INIT:CONT ON`, see `INITiate<n>:CONTinuous` on page 106

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

SCPI command:
`INIT:CONT OFF`, see `INITiate<n>:CONTinuous` on page 106

Meas Time Manual
Opens an edit dialog box to enter the measurement time. The valid value range is 1 µs to (400001 / points per symbol) µs.

This function is not available for Spurious Emissions measurements.

SCPI command:
`CONFigure:BTOoth:SWEep:TIME` on page 100

Meas Time Auto
Activates the automatic calculation of the measurement time. The automatic sweep time corresponds to the settings defined in the RF Test Specification. By default, the automatic sweep time calculation is activated.

This function is not available for Spurious Emissions measurements.

SCPI command:
`CONFigure:BTOoth:SWEep:TIME:AUTO` on page 100

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

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

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

SCPI command:
`CONFigure:BTOoth:SWEep:COUNt` on page 99

Power Avg Start (Output Power)
Opens an edit dialog box to enter the start position of the evaluation area for the average burst power. The values range is from 0 to 100%, the default setting is 20%.

For further information refer to chapter 4.1, "Introduction to Bluetooth Measurements (K8)", on page 13.

SCPI command:
`CONFigure:BTOoth:POWer:AVERage:STARt` on page 96

Power Avg Stop (Output Power)
Opens an edit dialog box to enter the stop position of the evaluation area for the average burst power. The values range from 0 to 100%, the default setting is 80%.

For further information refer to chapter 4.1, "Introduction to Bluetooth Measurements (K8)", on page 13.

SCPI command:
`CONFigure:BTOoth:POWer:AVERage:STOP` on page 96

No. of ACP Chan (TX Spec ACLR, Spurious Emissions)
Opens an edit dialog box to enter the number of adjacent channels, for which the power is to be measured. The values range from 0 to 78. A minimum value of 3 is recommended. The default setting is 78 (all channels).

As with the ACP measurement of the basic instrument firmware this value refers to the number of adjacent channels on one side of the TX channel. This means that with a selected value of 10 the analyzer will measure in total 21 channels (10 lower channels + TX channel + 10 upper channels).

The frequency range required for the measurement is set up automatically. The center frequency will also be adapted automatically dependent on the selected TX channel.

The measurement of the adjacent channels is limited to the available Bluetooth frequency band, which means that at maximum 79 channels (23 channels in France) will be measured.

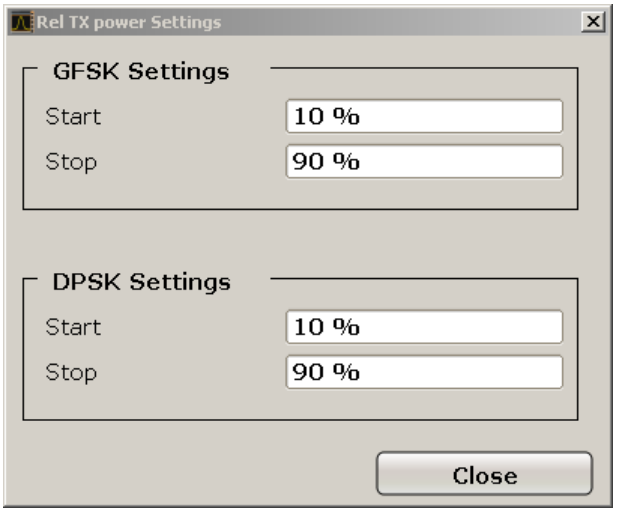
SCPI command:
`CONFigure:BTOoth:ACLR:ACPairs` on page 90
`CONFigure:BTOoth:IBSemissions:ACPairs` on page 94

Zoom (Modulation Char, Init Carr Freq Tol, Carr Freq Drift)
Activates or deactivates the zoom function. Opens an edit dialog box to enter the zoom start position. The valid value range for the zoom start position is 0 to (measurement time – 500 / sampling rate). The default setting for the zoom function is 0s (off).

With active zoom function, an area of only 501 samples is displayed.

SCPI command:
`[SENSe:]ADEMod:ZOOM[:STATe]` on page 116
`[SENSe:]ADEMod:ZOOM:STARt` on page 117

Settings
Opens a dialog box to define the start and stop times for power measurements.



GFSK Start ← Settings
Defines the start time for the power measurement of the GFSK sections of the packet. The default value is 10%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:GAVerage:STARt` on page 98

GFSK Stop ← Settings
Defines the stop time for the power measurement of the GFSK sections of the packet. The default value is 90%.

The abbreviation GFSK stands for "Gaussian Frequency Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:GAVerage:STOP` on page 99

DPSK Start ← Settings
Defines the start time for the power measurement of the DPSK sections of the packet. The default value is 10%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:DAVerage:STARt` on page 98

DPSK Stop ← Settings
Defines the stop time for the power measurement of the DPSK sections of the packet. The default value is 90%.

The abbreviation DPSK stands for "Differential Phase Shift Keying".

SCPI command:
`CONFigure:BTOoth:RTPower:DAVerage:STOP` on page 98

Gate Delay (Spurious Emissions)
Opens an edit dialog box to enter the time between trigger event and start of the DPSK packet. That is the measurement start time.

SCPI command:
`[SENSe:]SWEep:EGATe:HOLDoff` on page 113

Gate Length (Spurious Emissions)
Opens an edit dialog box to enter the sweep time in seconds. Usually, this is the length of the DPSK section.

SCPI command:
`[SENSe:]SWEep:EGATe:LENGth` on page 114

Block Count (Carr Freq Stability)
Opens an edit dialog box to enter the number of blocks to be measured. Every block has the length of 50 µs. The default value is 200 blocks.

This softkey is only available in single sweep operation.

SCPI command:
`CONFigure:BTOoth:CFSTability:BCOunt` on page 92

4.2.9 Softkeys of the Trigger Menu (Option R&S FSV-K8)

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

Trg/Gate Source
Opens the "Trigger/Gate Source" dialog box to select the trigger/gate mode.

The default setting is "Free Run". If a trigger mode other than "Free Run" has been set, the enhancement label "TRG" is displayed.

SCPI command:
`TRIGger<n>[:SEQuence]:SOURce` on page 123

Free Run ← Trg/Gate Source
The start of a sweep is not triggered. Once a measurement is completed, another is started immediately.

SCPI command:
`TRIG:SOUR IMM`, see `TRIGger<n>[:SEQuence]:SOURce` on page 123

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

SCPI command:
`TRIG:SOUR EXT`, see `TRIGger<n>[:SEQuence]:SOURce` on page 123

Video ← Trg/Gate Source
Defines triggering by the displayed voltage.

A horizontal trigger line is shown in the diagram. It is used to set the trigger threshold from 0 % to 100 % of the diagram height.

Video mode is only available in the time domain.

SCPI command:
`TRIG:SOUR VID`, see `TRIGger<n>[:SEQuence]:SOURce` on page 123

IF Power/BB Power ← Trg/Gate Source
Defines triggering of the measurement using the second intermediate frequency.

For this purpose, the analyzer uses a level detector at the second intermediate frequency. Its threshold can be set in a range between -50 dBm and -10 dBm at the input mixer. The resulting trigger level at the RF input is calculated via the following formula:

"mixerlevel_{min} + RFAtt – PreampGain ≤ Input Signal ≤ mixerlevel_{max} + RFAtt – PreampGain"

The bandwidth at the intermediate frequency is 40 MHz. The analyzer is triggered as soon as the trigger threshold is exceeded within a 6 MHz range around the selected frequency (= start frequency in the frequency sweep).

Thus, the measurement of spurious emissions, e.g. for pulsed carriers, is possible even if the carrier lies outside the selected frequency span.

SCPI command:
`TRIG:SOUR IFP`, see `TRIGger<n>[:SEQuence]:SOURce` on page 123

Time ← Trg/Gate Source
Opens an edit dialog box to define a repetition interval in which the measurement is triggered. The shortest interval is 2 ms.

SCPI command:
`TRIG:SOUR TIME`TRIGger<n>[:SEQuence]:SOURce on page 123

Trg/Gate Level
Opens an edit dialog box to enter the trigger/gate level.

In the trigger mode "Time", this softkey is not available.

SCPI command:
`TRIGger<n>[:SEQuence]:LEVel:IFPower` on page 123

Trg/Gate Polarity
Sets the polarity of the trigger/gate source.

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

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

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

SCPI command:
`TRIGger<n>[:SEQuence]:SLOPe` on page 123

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

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

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

SCPI command:
`TRIGger<n>[:SEQuence]:HOLDoff[:TIME]` on page 123

Trigger Hysteresis
Defines the value for the trigger hysteresis. The hysteresis in dB is the value the input signal must stay below the IF power trigger level in order to allow a trigger to start the measurement. The range of the value is between 3 dB and 50 dB with a step width of 1 dB.

This softkey is only available if IF Power is the selected trigger source.

SCPI command:
`TRIGger<n>[:SEQuence]:IFPower:HYSTeresis` on page 122

Trigger Holdoff
Defines the value for the trigger holdoff. The holdoff value in s is the time which must pass before triggering, in case another trigger event happens.

This softkey is only available if "IFPower" or "BBPower" is the selected trigger source.

SCPI command:
`TRIGger<n>[:SEQuence]:IFPower:HOLDoff` on page 122

4.2.10 Further Information

4.2.10.1 Selecting the Appropriate Filter Type

All resolution bandwidths are realized with digital filters.

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

The following filter types are available:

- Normal (3dB) (Gaussian) filters
  The Gaussian filters are set by default. The available bandwidths are specified in the data sheet.
- EMI (6dB) filters
  The available bandwidths are specified in the data sheet.
- Channel filters
  For details see chapter 4.2.10.2, "List of Available RRC and Channel Filters", on page 65 .
  Channel filters do not support FFT mode.
- RRC filters
  For details see chapter 4.2.10.2, "List of Available RRC and Channel Filters", on page 65 .
  RRC filters do not support FFT mode.
- 5-Pole filters
  The available bandwidths are specified in the data sheet.
  5-Pole filters do not support FFT mode.

4.2.10.2 List of Available RRC and Channel Filters

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

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

Table 4-5: Filter types

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

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

4.3 Remote Commands for Bluetooth Measurements (K8)

This chapter describes the remote commands specific to Bluetooth measurements and those required for the described programming examples.

For a description of the basic settings commands, see the base unit description.

4.3.1 CALCulate subsystem

4.3.1.1 CALCulate:BTOoth Subsystem (BLUETOOTH, K8)

CALCulate<n>:BTOoth:ACLR[:LIST]?

This command determines the power of the selected adjacent channels. The number of adjacent channel pairs is defined with the `CONFigure:BTOoth:ACLR:ACPairs` command.

This command is only available with active "Adjacent Channel Power" measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Return values:

<Result> <TX channel – n>...<TX channel – 1> <TX channel> <TX channel + 1>...<TX channel + n>

The results are returned as a list of power values.
The number of adjacent channels is limited by the Bluetooth band limits.

Example:

```
INST:SEL BTO
```
Activates the Bluetooth Measurements option.
```
INIT:CONT OFF
```
Selects single sweep operation.
```
CONF:BTO:MEAS ACLR
```
Activates the Adjacent Channel Power measurement.
```
INIT;*WAI
```
Starts the measurement with synchronization.
```
CALC:BTO:ACLR?
```
Queries the power list.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:ACLR:EXCeptions?

This command determines the number of exceptions which occurred during the adjacent channel power measurement according to the Bluetooth specification.

Note:

This command is only available with active Adjacent Channel Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: `INST:SEL BTO`
Activates the Bluetooth Measurements option.
`INIT:CONT OFF`
Selects single sweep operation.
`CONF:BTO:MEAS ACLR`
Activates the Adjacent Channel Power measurement.
`INIT;*WAI`
Starts the measurement with synchronization.
`CALC:BTO:ACLR?`
Queries the power list.
`CALC:BTO:ACLR:EXC?`
Queries the number of exceptions.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFDRift[:MAXimum]?

This command determines the maximum Carrier Frequency Drift.

Note:

This command is only available with active Carrier Frequency Drift measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:
<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124
`CONF:BTO:MEAS CFDR`
Activates the Carrier Frequency Drift measurement.
`INIT;*WAI`
Starts the measurement with synchronization.
`CALC:BTO:CFDR?`
Queries the result.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFDRift:RATE?

This command determines the maximum Carrier Frequency Drift per 50 (s.

Note:

This command is only available with active Carrier Frequency Drift measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:
<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124
`CONF:BTO:MEAS CFDR`
Activates the Carrier Frequency Drift measurement.
`INIT;*WAI`
Starts the measurement with synchronization.
`CALC:BTO:CFDR:RATE?`
Queries the result.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:COUNt?

This command reads the number of measured blocks during or after a measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:
<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124
`CONF:BTO:MEAS CFST`
Activates the Carrier Frequency Stability and Modulation Accuracy measurement.
`INIT;*WAI`
Starts the measurement with synchronization.
`CALC:BTO:CFST:COUNt?`
Reads the number of measured blocks.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:DEVM:[RMS]? <Mode>

This command reads the root mean square (RMS) of the differential error vector magnitude (DEVM) in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:
<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:DEVM? AVER
```

Reads the root mean square of the average differential error vector magnitude.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:DEVM:DPCT
CALCulate<n>:BTOoth:CFSTability:DEVM:D99Pct?

This command reads 99% of the differential error vector magnitude (DEVM) in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:DEVM:D99Pct?
```

Reads 99% of the differential error vector magnitude.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:DEVM:PEAK?

This command reads the peak of the differential error vector magnitude (DEVM) in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see CONFigure:BTOoth:MEASurement on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:DEVM:PEAK?
```

Reads the peak of the differential error vector magnitude.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:FERRor:[TOTal]? <Mode>

This command reads the carrier frequency deviation of all packets in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see CONFigure:BTOoth:MEASurement on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:FERR? MIN
```

Reads the minimum carrier frequency deviation of all packets.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:FERRor:BLOCk? <Mode>

This command reads the maximum frequency deviation of all blocks in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:FERR:BLOC? AVER
```

Reads the maximum average frequency deviation of all blocks.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:CFSTability:FERRor:INITial? <Mode>

This command reads the combined frequency deviation of all packets and all blocks in the Carrier Frequency Stability and Modulation Accuracy measurement.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS CFST
```

Activates the Carrier Frequency Stability and Modulation Accuracy measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:CFST:FERR:INIT? MAX
```

Reads the combined maximum frequency deviation of all packets and all blocks.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:DPENcoding:[TOTal]?

This command reads the number of tested packets in the Differential Phase Encoding measurement.

Note:

This command is only available with active Differential Phase Encoding measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS DPEN
```

Activates the Differential Phase Encoding measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:DPEN?
```

Reads the number of tested packets.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:DPENcoding:BER?

This command reads the bit error rate (BER) in the Differential Phase Encoding measurement.

Note:

This command is only available with active Differential Phase Encoding measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS DPEN
```

Activates the Differential Phase Encoding measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:DPEN:BER?
```

Reads the bit error rate.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:DPENcoding:NERRor?

This command reads the number of passed packets in the Differential Phase Encoding measurement.

Note:

This command is only available with active Differential Phase Encoding measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS DPEN
```

Activates the Differential Phase Encoding measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:DPEN:NERR?
```

Reads the number of passed packets.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:IBSemissions:[List]?

This command reads the power of all adjacent channels in the In–band Spurious Emissions measurement.

Note:

This command is only available with active In–band Spurious Emissions measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS IBS
```

Activates the In–band Spurious Emissions measurement.

```
CONF:BTO:CHAN 7
```

Adjust the TX channel number.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:IBS?
```

Reads the results of the In–band Spurious Emissions measurement.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:IBSemissions:EXCeptions?

This command reads the number of results that exceeded the specified limits in the In–band Spurious Emissions measurement.

Note:

This command is only available with active In–band Spurious Emissions measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS IBS
```

Activates the In–band Spurious Emissions measurement.

```
CONF:BTO:CHAN 7
```

Adjust the TX channel number.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:IBS:EXC?
```

Reads the number of results that exceeded the specified limits.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:IBSemissions:HADJacent? <Band>

This command reads the maximum power of the upper or lower frequency band (500 kHz) of the TX channel in the In–band Spurious Emissions measurement.

Note:

This command is only available with active In–band Spurious Emissions measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Band< **UPPer | LOWer**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS IBS
```

Activates the In–band Spurious Emissions measurement.

```
CONF:BTO:CHAN 7
```

Adjust the TX channel number.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:IBS:HADJ? LOW
```

Reads the maximum power of the lower frequency band.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:IBSemissions:TXReference?

This command reads the TX channel reference power.

Note:

This command is only available with active In–band Spurious Emissions measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS IBS
```

Activates the In–band Spurious Emissions measurement.

```
CONF:BTO:CHAN 7
```

Adjust the TX channel number.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:IBS:TXR?
```

Reads the TX channel reference power.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:ICFTolerance? <Mode>

This command determines the Initial Carrier Frequency Tolerance.

Note:

This command is only available with active Modulation Characteristics measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124
`CONF:BTO:MEAS ICFT`
Activates the Initial Carrier Frequency Tolerance measurement.
`CONF:BTO:SWE:COUN 20`
Initiates the sweep counter with 20.
`INIT;*WAI`
Starts the measurement with synchronization.
`CALC:BTO:ICFT? AVER`
Queries the average value.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:MCHar:DF<Delta>:AVERage? <Type>

This command determines the average frequency deviation for varying bit patterns of the payload.

Note:

This command is only available with active Modulation Characteristics measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

<Delta> 1 | 2
the frequency deviation and the bit pattern:
1 = $\Delta f1_{avg}$: 11110000
2 = $\Delta f2_{avg}$: 10101010

Parameters:

<Type> **MINimum | MAXimum**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124
`CONF:BTO:MEAS MCH`
Activates the Modulation Characteristics measurement.
`CONF:BTO:SWE:COUN 20`
Initiates the sweep counter with 20.
... EUT emits bit pattern 1111000
`INIT:IMM;*WAI`
Starts the measurement with synchronization and erase previous measurement results.
`CALC:BTO:MCH:DF1:AVER? MIN`
Queries minimum value "11110000".

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:MCHar:DF<Delta>:MAXimum? <Mode>

This command determines the maximum frequency deviation for different bit patterns of the payload.

Note:

This command is only available with active Modulation Characteristics measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

<Delta> 1 | 2
the frequency deviation and the bit pattern:
1 = $\Delta f1_{avg}$: 11110000
2 = $\Delta f2_{avg}$: 10101010

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS MCH
```
Activates the Modulation Characteristics measurement.
```
CONF:BTO:SWE:COUN 20
```
Initiates the sweep counter with 20.
... EUT emits bit pattern 1111000
```
INIT:IMM;*WAI
```
Starts the measurement with synchronization and erase previous measurement results.
```
CALC:BTO:MCH:DF1:MAX? MIN
```
Queries minimum value "11110000".

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:MCHar:DF2:PERCent?

This command determines the percentage of measurements of the frequency deviation, for which the value of $f2_{max}$ is within the allowed range. Therefore only the numeric suffix 2 is allowed for DF.

Note:

This command is only available with active Modulation Characteristics measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124
CONF:BTO:MEAS MCH
Activates the Modulation Characteristics measurement.
CONF:BTO:SWE:COUN 20
Initiates the sweep counter with 20.
... EUT emits bit pattern 10101010
INIT;*WAI
Starts the measurement with synchronization.
CALC:BTO:MCH:DF2:PERC?
Queries the percentage of "in range" measurements.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:MCHar:RATio? <Mode>

This command determines the ratio of the average frequency deviations for varying bit patterns of the payload.

Note:

This command is only available with active Modulation Characteristics measurement (see CONFigure:BTOoth:MEASurement on page 94). With all other measurements this command causes a query error.

Suffix:
<n> irrelevant

Parameters:
<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124
CONF:BTO:MEAS MCH
Activates the Modulation Characteristics measurement.
CONF:BTO:SWE:COUN 20
Initiates the sweep counter with 20.
... EUT emits bit pattern 1111000
INIT:IMM;*WAI
Starts the measurement with synchronization and erase previous measurement results.
... EUT emits bit pattern 10101010
INIT:CONM;*WAI
Starts additional measurement with synchronization.
CALC:BTO:MCH:RAT? MIN
Queries the minimum value.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:OPOWer[:PEAK]?

This command reads the peak value of the Output Power measurement according to the BLUETOOTH standard.

Note:

This command is only available with active Output Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements it causes a query error.

Suffix:

<n> irrelevant

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS OPOW
```

Activates the Output Power measurement.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:OPOW?
```

Queries the output power result.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:OPOWer:AVERage? <Mode>

This command reads the average value of the Output Power measurement according to the Bluetooth standard.

With a sweep count value of ≥ 1 (`CONFigure:BTOoth:SWEep:COUNt`) and trace mode "Clear/Write" (`DISPlay[:WINDow<n>]:TRACe<t>:MODE`) the selected number of measurements is performed when a single sweep is started (`INITiate<n>[:IMMediate]`). During these measurements the minimum and maximum values are determined. If only a single measurement is performed, the minimum and maximum value are identical.

Note:

This command is only available with active Output Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements it causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS OPOW
```
Activates the Output Power measurement.

```
CONF:BTO:SWE:COUN 20
```
Activates measurement over 20 sweeps.

```
INIT;*WAI
```
Activates measurement over 20 sweeps.

```
CALC:BTO:OPOW:AVER? MAX
```
Queries the maximum average value of the Output Power measurement.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:PLENgth?

This command reads the length of the packet analyzed by the preceding measurement.

Note:

This command is only available if a measurement was started via `INITiate<n>[:IMMediate]` before and if this measurement is completed. With a missing or incomplete measurement the command causes a query error.This command is only available with the measurements Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift (see `CONFigure:BTOoth:MEASurement` on page 94).

Suffix:

<n> irrelevant

Example:

```
INST:SEL BTO
```
Activates the Bluetooth Measurements option

```
INIT:CONT OFF
```
Selects single sweep operation

```
CONF:BTO:MEAS OPOW
```
Activates the Output Power measurement

```
INIT;*WAI
```
Starts the measurement with synchronization

```
CALC:BTO:PLEN?
```
Queries the packet length

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:PTYPe?

This command determines the type of the packet analyzed by a preceding measurement.

Note:

This command is only available if a measurement was started via `INITiate<n>[:IMMediate]` before and if this measurement is completed. With a missing or incomplete measurement the command causes a query error.This command is only available with the measurements Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift (see `CONFigure:BTOoth:MEASurement` on page 94).

Suffix:

<n> irrelevant

Parameters:

Result AUX1| DH1| DH3| DH5| DM1| DM3| DM5| FHS| HV1| HV2| HV3| DV| NULL| POLL| UNDEF

These packet types are recognized and returned as character data.

*RST: -

Example: `INST:SEL BTO`
Activates the Bluetooth Measurements option
`INIT:CONT OFF`
Selects single sweep operation
`CONF:BTO:MEAS OPOW`
Activates the Output Power measurement
`INIT;*WAI`
Starts the measurement with synchronization
`CALC:BTO:PTYP?`
Queries the packet type

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:RTPower:[DPSK]? <Mode>

This command reads the average transmission power for the DPSK sections of the packet in the Relative Transmission Power measurement. With a sweep count 1, the command returns the current value, irrespective of the parameter.

Note:

This command is only available with active Relative Transmit Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS RTP
```
Activates the Relative Transmit Power measurement.

```
CONF:BTO:SWE:COUN 10
```
Initiates the sweep counter with 10.

```
INIT;*WAI
```
Starts the measurement with synchronization.

```
CALC:BTO:RTP? MIN
```
Reads the lowest recorded average power of the DPSK section of all packets.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:RTPower:GFSK? <Mode>

This command reads the transmission power for the GFSK sections of the packet in the Relative Transmission Power measurement. With a sweep count 1, the command returns the current value, irrespective of the parameter.

Note:

This command is only available with active Relative Transmit Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS RTP
```
Activates the Relative Transmit Power measurement.

```
CONF:BTO:SWE:COUN 10
```
Initiates the sweep counter with 10.

```
INIT;*WAI
```
Starts the measurement with synchronization.

```
CALC:BTO:RTP:GFSK? MIN
```
Reads the highest recorded average power of the GFSK section of all packets.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:RTPower:RATio? <Mode>

This command reads the ratio of the transmission power for the GFSK and DPSK modulation in the Relative Transmission Power measurement (PDPSK/PGFSK). With a sweep count 1, the command returns the current value, irrespective of the parameter.

Note:

This command is only available with active Relative Transmit Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements this command causes a query error.

Suffix:

<n> irrelevant

Parameters:

<Mode> **MINimum | MAXimum | AVERage**

*RST: -

Example: For the first steps refer to chapter 4.3.14, "Programming Example", on page 124

```
CONF:BTO:MEAS RTP
```

Activates the Relative Transmit Power measurement.

```
CONF:BTO:SWE:COUN 10
```

Initiates the sweep counter with 10.

```
INIT;*WAI
```

Starts the measurement with synchronization.

```
CALC:BTO:RTP:RAT? MIN
```

Queries the minimum value.

Usage: Query only

Mode: BT

CALCulate<n>:BTOoth:STATus?

This command queries the status of a preceding measurement.

Note:

This command is only available, if a measurement was started via `INITiate<n>[:IMMediate]` before and if this measurement is completed. With a missing or incomplete measurement the command causes a query error.

Suffix:

<n> irrelevant

Return values:

<Result> **0**
PASS

1
FAIL

Example: `INST:SEL BTO`
Activates the Bluetooth Measurements option
`INIT:CONT OFF`
Selects single sweep operation
`CONF:BTO:MEAS OPOW`
Activates Output Power measurement
`INIT;*WAI`
Starts the measurement with synchronization
`CALC:BTO:STAT?`
Queries the status

Usage: Query only

Mode: BT

4.3.1.2 CALCulate:DELTamarker Subsystem (BLUETOOTH, K8)

CALCulate<n>:DELTamarker<m>:Y

This command queries the measured value of the selected delta marker in the specified window. The corresponding delta marker is activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with `CALC:NIT:POW` or on the activated measuring functions, the query result is output in the units below:

Table 4-6: Bluetooth measurements

Parameter, measuring function or result display	Output unit
OUTPUT POWER result display (R&S FSV–K8)	dB
TX SPECTRUM ACP result display (R&S FSV–K8)	dB
MODULATION CHARACTERISTICS result display (R&S FSV–K8)	Hz
INITIAL CARR FREQ TOL result display (R&S FSV–K8)	Hz
CARRIER FREQ DRIFT result display (R&S FSV–K8)	Hz
RELATIVE TX POWER (R&S FSV–K8)	dB
IN–BAND SPURIOUS EMISSIONS (R&S FSV–K8)	dB
CARRIER FREQUENCY STABILITY (R&S FSV–K8)	–
DIFF PHASE ENCODING (R&S FSV–K8)	–

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`INIT;*WAI`
Starts a sweep and waits for its end.
`CALC:DELT2 ON`
Switches on delta marker 2.
`CALC:DELT2:Y?`
Outputs measurement value of delta marker 2.

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, VSA

4.3.1.3 CALCulate:MARKer Subsystem (BLUETOOTH, K8)

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

This command defines the peak excursion, i.e. the spacing below a trace maximum which must be attained before a new maximum is recognized, or the spacing above a trace minimum which must be attained before a new minimum is recognized. The set value applies to all markers and delta markers in the window specified by the suffix <n>. The unit depends on the selected operating and display mode.

Mode/Display mode	Unit
Spectrum	dB
ADEMOD, RF display	dB
ADEMOD, AM display	PCT
ADEMOD, FM display	kHz
ADEMOD, PM display	RAD

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> irrelevant

Parameters:

<Value> **<numeric_value>**

*RST: 6dB in "Spectrum" mode and RF displays; 5 PCT in AM displays, 50 kHz in FM displays, (0.5 RAD in PM displays

Example: `CALC:MARK:PEXC 10dB`
Defines peak excursion 10 dB in "Spectrum" mode.

Mode: A, ADEMOD, BT, TDS

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

This command queries the measured value of the selected marker in the window specified by the suffix <n>. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed after the change of a parameter and before the query of the Y value. This is only possible in single sweep mode.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<m> marker number

Return values:

<Result> The measured value of the selected marker is returned.
In I/Q Analyzer mode, if the result display configuration "Real/Imag (I/Q)" is selected, this query returns the Real (Q) value of the marker first, then the Imag (I) value.

Example:

```
INIT:CONT OFF
```
Switches to single sweep mode.
```
CALC:MARK2 ON
```
Switches marker 2.
```
INIT;*WAI
```
Starts a sweep and waits for the end.
```
CALC:MARK2:Y?
```
Outputs the measured value of marker 2.
In I/Q Analyzer mode, for "Real/Imag (I/Q)", for example:
```
1.852719887E-011,0
```

Usage: Query only

Mode: ALL

4.3.1.4 Other Commands in the CALCulate subsystem

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit for power.

The unit is defined globally for all windows.

Suffix:

<n> irrelevant

Parameters:

<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere

*RST: dBm

Example:
```
CALC:UNIT:POW DBM
```
Sets the power unit to dBm.

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, WCDMA, VSA, SPECM

4.3.2 CONFigure:BTOoth Subsystem (BLUETOOTH, K8)

This subsystem contains commands to configure Bluetooth measurements.

CONFigure:BTOoth:ACLR:ACPairs <NoChannels>

This command selects the number of adjacent channel pairs during the Adjacent Channel Power measurement. The number of adjacent channels is limited as soon as the border of the Bluetooth frequency band is reached.

Note:

This command is only available with active "Adjacent Channel Power" measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Parameters:

<NoChannels> **1 to 78**

*RST: 78

Example: `CONF:BTO:ACLR:ACP 10`
Selects 10 adjacent channel pairs.

Mode: BT

CONFigure:BTOoth:BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command sets the resolution bandwidth of the analyzer for the currently selected Bluetooth measurement (see `[SENSe:]BANDwidth|BWIDth[:RESolution]` on page 110).

For the measurements of modulation characteristics, initial carrier frequency tolerance, and carrier frequency drift (see `CONFigure:BTOoth:MEASurement` on page 94), the resolution bandwidth corresponds to the IF bandwidth of the signal. If the resolution bandwidth is changed, its coupling to the settings according to the RF Test Specification is cancelled.

Note:

The settings for the measurements are valid for all three measurements.For all other Bluetooth measurements the setting is only valid for the currently active measurement (see `CONFigure:BTOoth:MEASurement` on page 94).This command is not available with active Adjacent Channel Power measurement.

Parameters:

<Bandwidth> **300kHz to 10MHz**

*RST: AUTO is set to ON

Example: `INST:SEL BTO`

Activates the Bluetooth Measurements option.

`CONF:BTO:MEAS OPOW`

Activates the Output Power measurement.

`CONF:BTO:BAND 1KHZ`

Sets the resolution bandwidth to 1kHz.

Mode: BT

CONFigure:BTOoth:BANDwidth|BWIDth[:RESolution]:AUTO <Mode>

This command couples the resolution bandwidth to the settings according to the RF Test Specification.

Note:

The settings for the measurements of Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift are common to all three measurements.For all other Bluetooth measurements the setting is only valid for the currently active measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Parameters:

<Mode> **ON | OFF**

*RST: ON

Example: `INST:SEL BTO`

Activates the Bluetooth Measurements option.

`CONF:BTO:MEAS MCH`

Activates the Modulation Characteristics measurement.

`CONF:BTO:BAND:AUTO ON`

Activates the RBW coupling.

Mode: BT

CONFigure:BTOoth:BANDwidth|BWIDth:VIDeo <Bandwidth>

This command sets the video bandwidth for the Adjacent Channel Power measurement (see CONFigure:BTOoth:MEASurement on page 94).

The available filters have a bandwidth range of 1 Hz to 10 MHz. On a change in video bandwidth its link according to the RF Test Specification is switched off.

Note:

This setting is only available for Output Power measurements.

Parameters:

<Bandwidth> **1 Hz to 10 MHz**

*RST: AUTO is set to ON

Example:
```
INST:SEL BTO
```
Activates the Bluetooth Measurements option.
```
CONF:BTO:MEAS ACLR
```
Activates the Adjacent Channel Power measurement.
```
CONF:BTO:BAND:VID 100HZ
```
Sets the video bandwidth to 100 Hz.

Mode: BT

CONFigure:BTOoth:BANDwidth|BWIDth:VIDeo:AUTO <Mode>

This command links the video bandwidth to the settings according to the RF Test Specification. It is only available for the Adjacent Channel Power measurement (see CONFigure:BTOoth:MEASurement on page 94).

Note:

This setting is only valid for the currently active measurement (see CONFigure:BTOoth:MEASurement on page 94) and it is independent of the other Bluetooth measurements.

Parameters:

<Mode> **ON | OFF**

*RST: ON

Example:
```
INST:SEL BTO
```
Activates the Bluetooth Measurements option.
```
CONF:BTO:MEAS ACLR
```
Activates the Adjacent Channel Power measurement.
```
CONF:BTO:BAND:VID:AUTO ON
```
Switches the VBW coupling on.

Mode: BT

CONFigure:BTOoth:CFSTability:BCOunt <NoBlocks>

This command sets the number of blocks to be measured.

Note:

This command is only available with active Carrier Frequency Stability and Modulation Accuracy measurement (see CONFigure:BTOoth:MEASurement on page 94).

Parameters:

<NoBlocks> **0 to 1,000,000**

*RST: 200

Example: CONF:BTO:CFST:BCO 1000

Selects 1000 blocks to be measured.

Mode: BT

CONFigure:BTOoth:CHANnel <Channel>

This command selects the frequency channel for the measurements according to the Bluetooth standard.

Parameters:

<Channel> **0 to 78**

*RST: 0

Example: CONF:BTO:CHAN 20

Selects channel 20

Mode: BT

CONFigure:BTOoth:DETector<1...4>[:FUNCtion] <Detector>

This command selects the detector for the currently selected Bluetooth measurement. The numeric suffix assigns the detector to a trace (1 to 4).

Note:

The RMS detector is not available for the measurements Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift (see CONFigure:BTOoth:MEASurement on page 94).The setting is valid for the currently selected measurement (see CONFigure:BTOoth:MEASurement on page 94) and independent of other Bluetooth measurements.

Parameters:

<Detector> APEak | NEGative | POSitive | SAMPle | RMS | AVERage

*RST: see table below

Example: INST:SEL BTO

Activates the Bluetooth Measurements option.

CONF:BTO:MEAS OPOW

Activates the Output Power measurement.

CONF:BTO:DET2 RMS

Sets the detector for trace 2 to RMS.

Mode: BT

Table 4-7: RST value depending on measurement type

Measurement type	RST value
Output Power	PEAK
Adjacent Channel Power EDR Rel TX Power EDR In-band Spurious Emissions	AVER
Modulation Characteristics Initial Carrier Frequency Tolerance Carrier Frequency Drift EDR Differential Phase Encoding EDR Carrier Frequency Stability and Modulation Accuracy	APEAK

CONFigure:BTOoth:IBSemissions:ACPairs <NoChannels>

This command selects the number of adjacent channel pairs during the In–band Spurious Emissions measurement. The number of adjacent channels will be limited as soon as the border of the Bluetooth frequency band is reached.

Note:

This command is only available with active In–band Spurious Emissions measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Parameters:

<NoChannels> **1 to 78**

*RST: 78

Example: `CONF:BTO:IBS:ACP 20`
Selects 20 adjacent channel pairs.

Mode: BT

CONFigure:BTOoth:IBSemissions:GATE:AUTO ONCE

This command adjusts the gate settings for the In–band Spurious Emissions automatically.

Note:

This command is only available with active In–band Spurious Emissions measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Example: `CONF:BTO:IBS:GATE:AUTO ONCE`
Adjusts the gate automatically once.

Mode: BT

CONFigure:BTOoth:MEASurement <MeasType>

This command selects the current measurement according to the Bluetooth standard.

Parameters:

<MeasType>

OPOWer
Output Power measurement, see chapter 4.2.1.1, "Output Power Measurement", on page 25

ACLR
Adjacent Channel Power measurement, see chapter 4.2.1.2, "Adjacent Channel Power Measurement", on page 27

MCHar
Modulation Characteristics measurement, see chapter 4.2.1.3, "Modulation Characteristics Measurement", on page 28

ICFTolerance
Initial Carrier Frequency Tolerance measurement, see chapter 4.2.1.4, "Initial Carrier Frequency Tolerance Measurement", on page 29

CFDRift
Carrier Frequency Drift measurement, see chapter 4.2.1.5, "Carrier Frequency Drift Measurement", on page 30

RTPower
Relative Transmit Power (EDR) measurement, see chapter 4.2.1.6, "Relative Transmit Power (EDR) Measurement", on page 31

IBSemissions
Spurious Emissions (EDR) measurement, see chapter 4.2.1.7, "In–band Spurious Emissions (EDR) measurement", on page 32

DPENcoding
Differential Phase Encoding (EDR) measurement, see chapter 4.2.1.9, "Differential Phase Encoding (EDR) measurement", on page 35

CFSTability
Carrier Frequency Stability and Modulation Accuracy (EDR) measurement, see chapter 4.2.1.8, "Carrier Frequency Stability and Modulation Accuracy (EDR) measurement", on page 33

*RST: OPOWer

Example:
```
CONF:BTO:MEAS ACLR
```
Selects the measurement of the adjacent channel power.

Mode: BT

CONFigure:BTOoth:PBSCo <NoBytes>

This command selects the number of payload bytes that are transmitted in a packet.

Parameters:

<NoBytes>

1 – 1000

*RST: 1

Example:
```
CONF:BTO:PBSC 50
```
Selects the number of payload bytes.

Mode: BT

CONFigure:BTOoth:PCLass <Class>

This command selects the power class for the Output Power measurement. The power class defines the limits for the output power measurement.

Parameters:

<Class> **1 to 3**

*RST: 1

Example: `CONF:BTO:PCL 3`

Selects power class 3

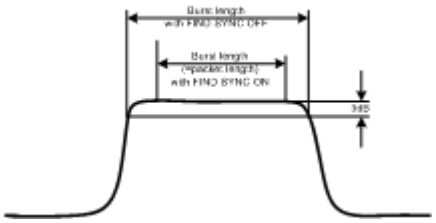
Mode: BT

CONFigure:BTOoth:POWer:AVERage:STARt <Position>

This command defines the start position for the calculation of the average power of a burst.

Note:

Depending on the setting `FIND SYNC ON` or `OFF` (see `[SENSe]:DDEMod:SEARch:SYNC:STATe` on page 118) the burst is either defined by the p0 bit and the packet length or the 3 dB points according to the RF Test Specification. As a result there are different areas within the burst for calculating the average power:



Parameters:

<Position> **0 to 100PCT**

*RST: 20%

Example: `CONF:BTO:POW:AVER:STAR 10PCT`

Sets the starting point for the calculation to 10% of the burst length.

Mode: BT

CONFigure:BTOoth:POWer:AVERage:STOP <Position>

This command defines the end position for the calculation of the average power of a burst.

Note:

Depending on the setting FIND SYNC ON or OFF (see `[SENSe]:DDEMod:SEARch:SYNC:STATe` on page 118) the burst is either defined by the p0 bit and the packet length or the 3 dB points according to the RF Test Specification. As a result there are different areas within the burst for calculating the average power (see `CONFigure:BTOoth:POWer:AVERage:STARt` on page 96).

Parameters:

<Position> **0 to 100PCT**

*RST: 80%

Example: `CONF:BTO:POW:AVER:STAR 90PCT`
Sets the end point for the calculation to 90% of the burst length.

Mode: BT

CONFigure:BTOoth:PRATe <NoSamples>

This command selects the number of measurement samples (points) per symbol for the measurement. This command is not avaiable for EDR measurements. For EDR measurements, this parameter is set to 4 points/symbol and cannot be changed.

Note:

The RF Test Specification specifies an oversampling factor of at least 4.

Parameters:

<NoSamples> **2 | 4 | 8 | 16 | 32**

*RST: 4

Example: `CONF:BTO:PRAT 16`
Selects 16 points/symbol.

Mode: BT

CONFigure:BTOoth:PTYPe <Type>

This command selects the packet type to be measured.

Parameters:

<Type> **DH1**
1 slot packet

DH3
3 slot packet

DH5
5 slot packet

AUTO
automatic selection of the packet type

*RST: DH1

Example: `CONF:BTO:PTYP DH5`
Selects type "5 slot packet".

Mode: BT

CONFigure:BTOoth:RTPower:DAVerage:STARt <Time>

This command sets the start time for the power measurement of the DPSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Parameters:

<Time> **0 to 100%**

*RST: 10%

Example: `CONF:BTO:RTP:DAV:STAR 20`
Sets the start time for the power measurement of the DPSK sections of the packet.

Mode: BT

CONFigure:BTOoth:RTPower:DAVerage:STOP <Time>

This command sets the stop time for the power measurement of the DPSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Parameters:

<Time> **0 to 100%**

*RST: 90%

Example: `CONF:BTO:RTP:DAV:STOP 80`
Sets the stop time for the power measurement of the DPSK sections of the packet.

Mode: BT

CONFigure:BTOoth:RTPower:GAVerage:STARt <Time>

This command sets the start time for the power measurement of the GFSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Parameters:

<Time> **0 to 100%**

*RST: 10%

Example: `CONF:BTO:RTP:GAV:STAR 20`
Sets the start time for the power measurement of the GFSK sections of the packet.

Mode: BT

CONFigure:BTOoth:RTPower:GAVerage:STOP <Time>

This command sets the stop time for the power measurement of the GFSK sections of the packet.

Note:

This command is only available with active Relative Transmit Power measurement (see `CONFigure:BTOoth:MEASurement` on page 94).

Parameters:

<Time> **0 to 100%**

*RST: 90%

Example: `CONF:BTO:RTP:GAV:STOP 80`
Sets the stop time for the power measurement of the GFSK sections of the packet.

Mode: BT

CONFigure:BTOoth:SWEep:COUNt <NoSweeps>

This command defines the number of sweeps for the currently selected Bluetooth measurement. This number will be started as a "single sweep". With trace mode setting clear/write (see `CONFigure:BTOoth:TRACe<t>:MODE` on page 101) the measurement results will be calculated for each sweep and taken into account for the calculation of minimum, maximum and average values. For the remaining trace settings (AVER, MAXH, MINH) the measurement results will be calculated from the resulting trace. In average mode the value 0 defines the sliding average of the measurement data over 10 sweeps.

Note:

The setting is valid only for the currently active measurement (see `CONFigure:BTOoth:MEASurement` on page 94) and independent of the other Bluetooth measurements.

Parameters:

<NoSweeps> **0 to 32767**

*RST: see table below

Example: `INST:SEL BTO`
Activates the Bluetooth Measurements option.
`CONF:BTO:MEAS OPOW`
Activates the Output Power measurement.
`INIT:CONT OFF`
Selects single sweep operation.
`CONF:BTO:SWE:COUN 20`
Sets the number of sweeps to 20.
`INIT;*OPC`
Starts a sweep with synchronization.

Mode: BT

Table 4-8: RST value depending on measurement type

Measurement type	RST value
Output Power	0
Adjacent Channel Power Modulation Characteristics Initial Carrier Frequency Tolerance Carrier Frequency Drift EDR Relative TX Power EDR In-band Spurious Emissions	10
Differential Phase Encoding	100

CONFigure:BTOoth:SWEep:TIME <Duration>

This command defines the duration of a sweep sequence for the active Bluetooth measurement.

Parameters:

<Duration> **1us to [130560us / (points per symbol)]**

*RST: AUTO is set to ON

Example:
```
INST:SEL BTO
```
Activates the Bluetooth Measurements option.
```
CONF:BTO:MEAS OPOW
```
Activates the Output Power measurement.
```
CONF:BTO:SWE:TIME 10MS
```
Sets a sweep time of 10 ms.

Mode: BT

CONFigure:BTOoth:SWEep:TIME:AUTO <Mode>

This command couples the sweep time to the settings according to the RF Test Specification.

Note:

The setting is valid only for the currently active measurement (see `CONFigure:BTOoth:MEASurement` on page 94) and independent of the other Bluetooth measurements.

Parameters:

<Mode> **ON | OFF**

*RST: ON

Example:
```
INST:SEL BTO
```
Activates the Bluetooth Measurements option.
```
CONF:BTO:MEAS OPOW
```
Activates the Output Power measurement.
```
CONF:BTO:SWE:TIME:AUTO ON
```
Switches the sweep time coupling on.

Mode: BT

CONFigure:BTOoth:TRACe<t>:MODE <Mode>

This command defines the way of displaying and evaluating the measurement curves for the selected Bluetooth measurement. WRITe corresponds to manual operating mode Clr/Write.

The number of measurement to be executed for AVERage, MAXHold and MINHold is defined with the `CONFigure:BTOoth:SWEep:COUNt` on page 99 command. Please note that a synchronization to the end of the indicated number of measurements is only possible during single sweep operation.

Note:

The setting is valid only for the currently active measurement (see `CONFigure:BTOoth:MEASurement` on page 94) and independent of the other Bluetooth measurements.

Suffix:

<t> the trace related to this setting

Parameters:

<Mode> **WRITe | VIEW | AVERage | MAXHold | MINHold | BLANk**

*RST: WRITe

Example:

```
INST:SEL BTO
```
Activates the Bluetooth Measurements option.
```
CONF:BTO:MEAS OPOW
```
Activates the Output Power measurement.
```
INIT:CONT OFF
```
Selects single sweep operation.
```
CONF:BTO:SWE:COUN 10
```
Sets the sweep count to 10.
```
CONF:BTO:TRAC2:MODE AVER
```
Switches averaging for trace 2 on.
```
INIT;*OPC
```
Starts a measurement with synchronization.

Mode: BT

CONFigure:BTOoth:TRACe<t>:SELect

This command selects the measurement curve for evaluation of the modulation characteristics.

Suffix:

<t> the trace related to this setting

Example: `INST:SEL BTO`
Activates the Bluetooth Measurements option.
`CONF:BTO:MEAS ACLR`
Activates the Adjacent Channel Power measurement.
`INIT:CONT OFF`
Selects single sweep operation.
`CONF:BTO:TRAC2:SEL`
Selects trace 2 for measurement result queries.

Mode: BT

4.3.3 DISPlay Subsystem (BLUETOOTH, K8)

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command switches on or off the display of the corresponding trace in the window specified by the suffix <n>. The other measurements are not aborted but continue running in the background.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t> trace

Parameters:
<State> ON | OFF
*RST: ON for TRACe1, OFF for TRACe2 to 6

Example: `DISP:TRAC3 ON`

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe] <Range>

This command defines the display range of the y-axis (level axis) with logarithmic scaling (`DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing` on page 105) in the window specified by the suffix <n>.

For linear scaling, the display range is fixed and cannot be modified.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t> irrelevant

Parameters:
<Range> 10 dB to 200 dB or value in Hz

*RST: 100dB

Example:
```
DISP:TRAC:Y 110dB
```

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:MODE <Mode>

This command defines the scale type of the y-axis (absolute or relative) in the window specified by the suffix <n>.

When `SYSTem:DISPlay:UPDate` is set to OFF, this command has no immediate effect on the screen (see `SYSTem:DISPlay:UPDate` on page 120).

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.
<t> irrelevant

Parameters:
<Mode> ABSolute | RELative

*RST: ABS

Example:
```
DISP:TRAC:Y:MODE REL
```

Mode: all

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:PDIVision <Value>

This remote command determines the grid spacing on the Y axis for all diagrams, where possible.

Suffix:
<n> irrelevant
<t> irrelevant

Parameters:
<Value> numeric value; the unit depends on the result display

*RST: depends on the result display

Example:
```
DISP:TRAC:Y:PDIV 10
```
Sets the grid spacing to 10 units (for example 10 dB in the Code Domain Power result display).

Mode: CDMA, BT, EVDO, TDS, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel <Value>

This command sets the reference level.

With the reference level offset <> 0, the indicated value range of the reference level is modified by the offset.

Suffix:

<n> irrelevant.

<t> irrelevant

Parameters:

<Value> <numeric_value>, range specified in data sheet

*RST: -10dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, VSA, WCDMA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RLEVel:OFFSet <Value>

This command sets the reference level offset.

Suffix:

<n> irrelevant.

<t> irrelevant

Parameters:

<Value> -200dB to 200dB

*RST: 0dB

Example: `DISP:TRAC:Y:RLEV:OFFS -10dB`

Mode: ALL

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RPOSition <Position>

This remote command defines the position of the reference value on the Y axis (1 – 100 %) in the window specified by the suffix <n>.

When using a tracking generator (only with option R&S FSV-B9 or -B10, requires active normalization), and in Bluetooth mode (option R&S FSV-K8) this command defines the position of the reference value for all windows.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<Position> 0 to 100PCT

*RST: 100 PCT = "Spectrum" mode, AF spectrum display;
50 PCT = Tracking Generator mode or time display

Example: `DISP:TRAC:Y:RPOS 50PCT`

Mode: A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD, VSA

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:RVALue <Value>

The command defines the power value assigned to the reference position in the grid.

When using a tracking generator (only with option R&S FSV-B9 or -B10), this command requires active normalization.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Value> <numeric_value>

*RST: 0 dB, coupled to reference level

Example:
```
DISP:TRAC:Y:RVAL -20dBm
```
(Analyzer)
```
DISP:TRAC:Y:RVAL 0
```
Sets the power value assigned to the reference position to 0 dB (tracking generator)

Mode: A, BT, CDMA, EVDO, TDS, WCDMA, ADEMOD

DISPlay[:WINDow<n>]:TRACe<t>:Y:SPACing <ScalingType>

This command selects the scaling for the level display range in the window specified by the suffix <n>.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

<t> irrelevant

Parameters:

<ScalingType> LOGarithmic | LINear | LDB

LOGarithmic
Selects logarithmic scaling.

LINear
Selects linear scaling in %.

LDB
Selects linear scaling in dB.

*RST: LOGarithmic

Example:
```
DISP:TRAC:Y:SPAC LIN
```

Mode: A, ADEMOD, BT, VSA

4.3.4 FORMat subsystem

FORMat[:DATA] <Format>

This command specifies the data format for the data transmitted from the instrument to the control PC. It is used for the transmission of trace data. The data format of trace data received by the instrument is automatically recognized, regardless of the format which is programmed.

Parameters:

<Format> ASCii | REAL

ASCii
ASCII data are transmitted in plain text, separated by commas.

REAL
REAL data are transmitted as 32-bit IEEE 754 floating-point numbers in the "definite length block format".

*RST: ASCII

Example:
```
FORM REAL,32
FORM ASC
```

Mode: all

4.3.5 INITiate subsystem

INITiate<n>:CONTinuous <State>

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

In the **"Spectrum" mode**, this setting refers to the sweep sequence (switching between continuous/single sweep).

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF

*RST: ON

Example:
```
INIT:CONT OFF
```
Switches the sequence to single sweep.
```
INIT:CONT ON
```
Switches the sequence to continuous sweep.

Mode: all

INITiate<n>[: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, synchronization to the end of the indicated number of measurements can be achieved with the command *OPC, *OPC? or *WAI. In continuous-sweep mode, synchronization to the sweep end is not possible since the overall measurement never ends.

Suffix:

<n> irrelevant

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`DISP:WIND:TRAC:MODE AVER`
Switches on trace averaging.
`SWE:COUN 20`
Setting the sweep counter to 20 sweeps.
`INIT;*WAI`
Starts the measurement and waits for the end of the 20 sweeps.

Mode: all

4.3.6 INPut subsystem

INPut:ATTenuation <Value>

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the DOWN command.

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

In the default state with "Spectrum" mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<Value> <numeric_value> in dB; range specified in data sheet

*RST: 10 dB (AUTO is set to ON)

Example: `INP:ATT 30dB`
Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Mode: all

INPut:ATTenuation:AUTO <State>

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<State> ON | OFF

*RST: ON

Example: `INP:ATT:AUTO ON`

Couples the attenuation set on the attenuator to the reference level.

Mode: All

INPut:GAIN:STATe <State>

This command switches the preamplifier on or off (only for option RF Preamplifier, R&S FSV-B22/B24).

With option R&S FSV-B22, the preamplifier only has an effect below 7 GHz.

With option R&S FSV-B24, the amplifier applies to the entire frequency range.

This command is not available when using Digital Baseband Interface (R&S FSV-B17).

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:GAIN:STAT ON`

Switches on 20 dB preamplification.

Mode: A, ADEMOD, BT, CDMA, EVDO, NF, PHN, WCDMA, GSM, VSA, TDS

INPut:IMPedance <Value>

This command sets the nominal input impedance of the instrument. The set impedance is taken into account in all level indications of results.

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

This function is not available if the Digital Baseband Interface (R&S FSV-B17) is active.

Parameters:

<Value> 50 | 75

*RST: 50 Ω

Example: `INP:IMP 75`

Mode: all

4.3.7 INSTrument Subsystem (BLUETOOTH, K8)

INSTrument[:SELect]

Parameters:

Parameter **BTOoth**
Bluetooth mode (option Bluetooth Measurements)

INSTrument:NSELect

Parameters:

Parameter **12**
Bluetooth mode (option Bluetooth Measurements)

4.3.8 SENSe Subsystem (BLUETOOTH, K8)

[SENSe:]AVERage<n>:COUNt <NoMeasurements>

This command defines the number of measurements which contribute to the average value in the window specified by the AVERage<n> suffix.

Note that continuous averaging is performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

This command has the same effect as the `[SENSe<source>:]SWEep:COUNt` command. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements applies to all traces in the window.

Suffix:

<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:

<NoMeasurements> 0 to 32767

*RST: 0

Example: `SWE:CONT OFF`
Switching to single sweep mode.
`AVER:COUN 16`
Sets the number of measurements to 16.
`AVER:STAT ON`
Switches on the calculation of average.
`INIT;*WAI`
Starts the measurement and waits for the end of the 16 sweeps.

Mode: all

[SENSe:]AVERage<n>:TYPE <FunctionType>

This command selects the type of average function in the window specified by the AVERage<n> suffix.

Suffix:
<n> window; For applications that do not have more than 1 measurement window, the suffix <n> is irrelevant.

Parameters:
<FunctionType> VIDeo | LINear | POWer

VIDeo
The logarithmic power values are averaged.

LINear
The power values are averaged before they are converted to logarithmic values.

POWer
The power level values are converted into unit Watt prior to averaging. After the averaging, the data is converted back into its original unit.

*RST: VIDeo

Example: `AVER:TYPE LIN`
Switches to linear average calculation.

Mode: A, ADEMOD, BT, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command defines the resolution bandwidth.

The available resolution bandwidths are specified in the data sheet. For details on the correlation between resolution bandwidth and filter type refer to chapter 4.2.10.1, "Selecting the Appropriate Filter Type", on page 65.

If the resolution bandwidth is modified, the coupling to the span is automatically switched off.

Parameters:
<Bandwidth> refer to data sheet

*RST: (AUTO is set to ON)

Example: `BAND 1 MHz`
Sets the resolution bandwidth to 1 MHz

Mode: all, except ADEMOD

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command either automatically couples the resolution bandwidth of the instrument to the span or cancels the coupling.

The automatic coupling adapts the resolution bandwidth to the currently set frequency span according to the relationship between frequency span and resolution bandwidth. The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available are not set by the automatic coupling.

The ratio resolution bandwidth/span can be modified with the `[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio` command.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:AUTO OFF`
Switches off the coupling of the resolution bandwidth to the span.

Mode: A-F, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio resolution bandwidth (Hz)/span (Hz). The ratio to be entered is reciprocal to the ratio span/RBW used in manual operation.

Parameters:

<Ratio> 0.0001 to 1

*RST: 0.01

Example: `BAND:RAT 0.1`

Mode: A, BT, CDMA, EVDO, TDS, WCDMA

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command switches the filter type for the resolution bandwidth.

For detailed information on filters see chapter 4.2.10.1, "Selecting the Appropriate Filter Type", on page 65 and chapter 4.2.10.2, "List of Available RRC and Channel Filters", on page 65.

When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.

5 Pole filters are not available when using the sweep type "FFT".

Parameters:

<FilterType>

NORMal
Gaussian filters

FFT
FFT filters

CFILter
channel filters

RRC
RRC filters

PULSe
EMI (6dB) filters

P5
5 Pole filters

*RST: NORMal

Example: `BAND:TYPE NORM`

Mode: all, except ADEMOD

[SENSe:]CORRection:EGAin:INPut[:MAGNitude]

This command makes an external gain known to the analyzer, which will take it into account during the display of measurement results. With this function the gain of an antenna or of an external preamplifier can be taken into account for the measurement values.

This command is only available with option K8, B9 or B10 installed.

Parameters:

-200...200dB

*RST: 0 dB

Example: `CORR:EGA:INP 10DB`
Takes 10 dB external gain into account.

Mode: A, BT

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency of the analyzer or the measuring frequency for span = 0.

Parameters:

<Frequency> <numeric_value>

Range: 0 to fmax
*RST: fmax/2
Default unit: Hz
f_{max} is specified in the data sheet. min span is 10 Hz

Example: `FREQ:CENT 100 MHz`

Mode: all

[SENSe:]SWEep:COUNt <NumberSweeps>

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameters:

<NumberSweeps> 0 to 32767

*RST: 0 (GSM: 200)

Example:
```
SWE:COUN 64
```
Sets the number of sweeps to 64.
```
INIT:CONT OFF
```
Switches to single sweep mode.
```
INIT;*WAI
```
Starts a sweep and waits for its end.

Mode: A, ADEMOD, BT, CDMA, EVDO, PHN, TDS, WCDMA, GSM, NF

[SENSe:]SWEep:COUNt:CURRent

This query command returns the current number of started sweeps. A sweep count value should be set and the device should be in single sweep mode.

Parameters:

*RST: 0

Example:
```
SWE:COUNt 64
```
Sets sweep count to 64
```
INIT:CONT OFF
```
Switches to single sweep mode
```
INIT
```
Starts a sweep (without waiting for the sweep end!)
```
SWE:COUN:CURR?
```
Queries the number of started sweeps

Mode: A, BT, ADEMOD, TDS

[SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

This command defines the delay time between the external gate signal and the continuation of the sweep.

Note: Using gate mode "level" (see `[SENSe:]SWEep:EGATe:TYPE` on page 114) and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 123), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

Parameters:

<DelayTime> 0 s to 30 s

*RST: 0s

Example:
```
SWE:EGAT:HOLD 100us
```

Mode: A, ADEMOD, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:LENGth <TimeInterval>

In case of edge triggering, this command determines the time interval during which the instrument sweeps.

Parameters:

<TimeInterval> 125 ns to 30 s

*RST: 400µs

Example: `SWE:EGAT:LENG 10ms`

Mode: A, BT, EVDO, TDS

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command determines the polarity of the external gate signal. The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:

<Polarity> POSitive | NEGative

*RST: POSitive

Example: `SWE:EGAT:POL POS`

Mode: A, ADEMOD, BT, EVDO, TDS, WCDMA

[SENSe:]SWEep:EGATe:TYPE <Type>

This command sets the type of triggering by the external gate signal.

A delay between applying the gate signal and the start of recording measured values can be defined, see `[SENSe:]SWEep:EGATe:HOLDoff` on page 113.

Parameters:

<Type> LEVel | EDGE

LEVel
The gate is level-triggered:
After detection of the gate signal, the gate remains open until the gate signal disappears. The gate opening time cannot be defined with the command `[SENSe:]SWEep:EGATe:HOLDoff`.
Note: Using gating with gate mode "level" and an IFP trigger (see `TRIGger<n>[:SEQuence]:SOURce` on page 123), the holdoff time for the IFP trigger is ignored for frequency sweep, FFT sweep, zero span and IQ mode measurements.

EDGE
The gate is edge-triggered:
After detection of the set gate signal edge, the gate remains open until the gate delay (`[SENSe:]SWEep:EGATe:HOLDoff`) has expired.

*RST: EDGE

Example: `SWE:EGAT:TYPE EDGE`

Mode: A, ADEMOD, BT, EVDO, TDS

[SENSe:]SWEep:MODE <Mode>

This command changes from "Spectrum" to "Spectrum Emission Mask" or "Spurious Emissions" measurement mode and back.

Parameters:

<Mode> AUTO | ESPectrum | LIST

AUTO
Switches to "Spectrum" measurement mode or stays in the current mode if it is not ESP/LIST

ESPectrum
"Spectrum Emission Mask" measurement mode

LIST
"Spurious Emissions" measurement mode

*RST: AUTO

Example: `SWE:MODE ESP`
Sets the Spectrum Emission Mask measurement mode.

Mode: A, BT, CDMA, EVDO, PHN

[SENSe:]SWEep:POINts <NumberPoints>

This command defines the number of measurement points to be collected during one sweep.

Note: For Spurious Emissions measurements the maximum number of sweep points in all ranges is limited to 100001.

Parameters:

<NumberPoints> 101 to 32001

*RST: 691 (NF: 11)

Example: `SWE:POIN 251`

Mode: A, ADEMOD, BT, CDMA, EVDO, TDS, NF, PHN, WCDMA

[SENSe:]SWEep:TIME <Time>

This command defines the sweep time.

The range depends on the frequency span.

If this command is used in analyzer mode, automatic coupling to resolution bandwidth and video bandwidth is switched off.

Parameters:

<Time> refer to data sheet

*RST: (AUTO is set to ON)

Example: `SWE:TIME 10s`

Mode: ALL

[SENSe:]SWEep:TIME:AUTO <State>

In realtime mode, this command automatically sets the sweep time to 32 ms.

In analyzer mode, this command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings. If `[SENSe:]SWEep:TIME` is used, automatic coupling is switched off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `SWE:TIME:AUTO ON`
Activates automatic sweep time.

Mode: A, BT, CDMA, EVDO, RT, TDS, NF, WCDMA

[SENSe:]SWEep:TYPE <Type>

Parameters:

<Type> SWE | AUTO | FFT

SWE
Sweep list

AUTO
Automatic selection of the sweep type.

FFT
FFT mode

*RST: AUTO
Sets the sweep type.

Example: `SWE:TYPE FFT`

Mode: all

4.3.9 SENSe:ADEMod Subsystem (BLUETOOTH, K8)

[SENSe:]ADEMod:ZOOM[:STATe] <Mode>

The command enables or disables the zoom function. Depending on the selected measurement time and the demodulation bandwidth, the number of recorded measurement points may be greater than that shown on the display.

If the zoom function is enabled, 501 test points of the result memory are displayed from the start time specified by the [SENSe:]ADEMod:ZOOM:STARt command.

If the zoom function is disabled, data reduction is used to adapt the measurement points to the number of points available on the display.

Note:

The zoom function is only available for the Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift measurements.

Parameters:

<Mode> **ON | OFF**

*RST: OFF

Example: `ADEM:ZOOM ON`

Switches on the zoom function

Mode: BT

[SENSe:]ADEMod:ZOOM:STARt <Time>

The command sets the start time for the display of individual measured values.

The zoom function is enabled or disabled by the `[SENSe:]ADEMod:ZOOM[:STATe]` command.

Note:

The zoom function is only available for the Output Power, Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift measurements.

Parameters:

<Time> **0 s to (meas time – 500 / sampling rate)**

*RST: 0 s

Example: `ADEM:ZOOM ON`

Switches on the zoom function

`ADEM:ZOOM:STAR 500us`

Sets the starting point of the display to 500 µs.

Mode: BT

4.3.10 SENSe:DDEMod Subsystem (BLUETOOTH, K8)

[SENSe:]DDEMod:FILTer:MEASurement <ReceiveFilter>

This command selects the receive filter for the signal to measure.

Note:

This command is only available with active Modulation Characteristics, Initial Carrier Frequency Tolerance, and Carrier Frequency Drift measurement (see `CONFigure:BTOoth:MEASurement` on page 94). With all other measurements it will lead to a query error.

Parameters:

<ReceiveFilter> **OFF | BTOoth**

*RST: ON

Example: `DDEM:FILT:MEAS BTO`

Activates the Bluetooth measurement filter.

Mode: BT

[SENSe:]DDEMod:SEARch:PULSe[:STATe] <Mode>

This command switches the search for a signal burst on or off.

Parameters:

<Mode> **ON | OFF**

*RST: ON

Example: `DDEM:SEAR:PULS OFF`

Mode: BT

[SENSe:]DDEMod:SEARch:PULSe:OFFSet <Time>

This command defines the time to be recorded before a signal burst is recognized.

Parameters:

<Time> **0 to 10 ms**

*RST: 0

Example: `DDEM:SEAR:PULS:OFFS 1MS`

Sets the burst offset to 1ms before the start of the burst.

Mode: BT

[SENSe]:DDEMod:SEARch:SYNC:STATe <PatternSearch>

This command switches the search for a sync sequence on or off.

Setting parameters:

<PatternSearch> ON | OFF

*RST: OFF

Example: `DDEM:SEAR:SYNC ON`

Switches the sync search on.

Mode: BT, VSA

[SENSe:]DDEMod:SEARch:SYNC:LAP <Bits>

This command determines the 24 least significant bits (LAP) of the DUT 'Bluetooth device address'. They are used to define the synchronization pattern to determine the start of a packet.

Parameters:

<Bits> **0 to FFFFFF hex**

*RST: #H0

Example: `DDEM:SEAR:SYNC:LAP #HA3F45B`

Sets on LAP A3F45B Hex

Mode: BT

[SENSe:]DDEMod:SEARch:SYNC:OFFSet <NoBits>

This command defines the number of bits to be recorded before the first preamble bit is detected.

Parameters:

<NoBits> **0 to 10000**

*RST: 0

Example: `DDEM:SEAR:SYNC:OFFS 10`

Sets the sync offset to 10 bits before the preamble bits.

Mode: BT

[SENSe:]DDEMod:SEARch:TIME <RecLength>

This command selects manual setting of the record length and defines the record length to be used for the search of sync word and burst.

Note:

For information on the correlation of trigger and record length refer to `[SENSe:]DDEMod:SEARch:TIME:AUTO` on page 120

Parameters:

<RecLength> **100ms to [130560ms / (points per symbol)]**

*RST: 1875 us

Example: `DDEM:SEAR:TIME 100US`

Sets the record length for sync word and burst search to 100 us.

Mode: BT

Table 4-9: Max. record length depending on points per symbol

Points per Symbol	Maximum record length
2	104.4 slots
4	52.2 slots
8	26.1 slots

Points per Symbol	Maximum record length
16	13.1 slots
32	6.5 slots

[SENSe:]DDEMod:SEARch:TIME:AUTO <Mode>

This command activates the automatic setting of the record length for the sync word and burst search, depending on the selected packet type.

The automatic record length is determined a follows:

Trigger free run:

search length = 3 * packet length + | sync offset or burst offset |

All other trigger modes:

search length = 1 * packet length + 1 Slot + | sync offset or burst offset |

If the selected measurement time is higher than the packet length, the following difference is added to the search length:

measurement time – packet length

Parameters:

<Mode> **ON | OFF**

*RST: ON

Example: `DDEM:SEAR:TIME:AUTO OFF`

Selects manual input for the record length

Mode: BT

4.3.11 SYSTem subsystem

SYSTem:DISPlay:UPDate <State>

In remote control mode, this command switches on or off the instrument display. If switched on, only the diagrams, traces and display fields are displayed and updated.

The best performance is obtained if the display output is switched off during remote control.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `SYST:DISP:UPD ON`

Mode: all

4.3.12 TRACe subsystem

TRACe<n>[:DATA]? <ResultType>

This command returns the current trace data or measurement results. In case of several result displays, you have to use specific parameters to query the results.

Suffix:

<n> 1...4
window; For applications that have only one measurement screen, the suffix is irrelevant.

Query parameters:

<ResultType> TRACe1 | TRACe2 | TRACe3 | TRACe4 | TRACe5 | TRACe6 | SPECtrogram | SGRam | LIST | SPURious

Selects the type of result to be returned.

TRACe1 | ...| TRACe6
The query returns a list of results with one value for each sweep point in the currently set level unit.
For details see table 4-10

LIST
Returns the results of the list evaluation of the Spectrum Emission Mask and Spurious Emissions measurement (Spectrum mode only). For a description of the syntax see table 4-11 below.

SPURious
Returns the peak list of the Spurious Emissions measurement (Spectrum mode only)

Example: `TRAC? TRACe1`
Returns the trace data for Trace 1.

Usage: Query only

Mode: A, ADEMOD, BT, NF, PHN, TDS

Table 4-10: Results for <TRACe...> ResultTypes

The query returns a list of results with one value for each sweep point in the currently set level unit. By default, the list contains 691 values. The currently used number of sweep points can be determined using SWE:POIN?, see `[SENSe:]SWEep:POINts` on page 115.
`FORMat REAL,32` is used as format for binary transmission, and `FORMat ASCii` for ASCII transmission.
With the auto peak detector, only positive peak values can be read out.
In **IQ Analyzer mode**, if the result display configuration "Real/Imag (I/Q)" is selected, this query returns the I values of each trace point first, then the Q values:
<result>= I_1,I_2,...,I_n, Q_1,Q_2,...,Q_n

Table 4-11: Results for <LIST> ResultType

Using the LIST parameter, the query returns the results of the list evaluation of the Spectrum Emission Mask and Spurious Emissions measurement (Spectrum mode only) with the following syntax:	
<no>, <start>, <stop>, <rbw>, <freq>, <power abs>, <power rel>, <delta>, <limit check>, <unused1>, <unused2>	
where:	
<no>:	peak number

<start>:	start frequency of range
<stop>:	stop frequency of range
<rbw>:	resolution bandwidth of range
<freq>:	frequency of peak
<power abs>:	absolute power in dBm of peak
<power rel>:	relative power in dBc (related to the channel power) of peak
<delta>:	distance to the limit line in dB (positive indicates value above the limit, fail)
<limit check>:	limit fail (pass = 0, fail =1)
<unused1>:	reserved (0.0)
<unused2>:	reserved (0.0)

4.3.13 TRIGger subsystem

TRIGger<n>[:SEQuence]:IFPower:HOLDoff <Value>

This command sets the holding time before the next IF power trigger event.

Suffix:

<n> irrelevant

Parameters:

<Value> <numeric_value> in s: 150 ns to 1000 s

*RST: 150 ns

Example:
```
TRIG:SOUR IFP
```
Sets the IF power trigger source.
```
TRIG:IFP:HOLD 200 ns
```
Sets the holding time to 200 ns.

Mode: A-F, ADEMOD, CDMA, EVDO, GSM, VSA, OFDM, OFDMA/ WiBro, TDS, WCDMA

TRIGger<n>[:SEQuence]:IFPower:HYSTeresis <Value>

This command sets the limit that the hysteresis value for the IF power trigger has to fall below in order to trigger the next measurement.

Suffix:

<n> irrelevant

Parameters:

<Value> <numeric_value> in dB: 3 dB to 50 dB

*RST: 3 dB

Example:
```
TRIG:SOUR IFP
```
Sets the IF power trigger source.
```
TRIG:IFP:HYST 10DB
```
Sets the hysteresis limit value.

Mode: ALL

TRIGger<n>[:SEQuence]:HOLDoff[:TIME] <Delay>

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in zero span only.

Suffix:
<n> irrelevant

Parameters:
<Delay>
Range: zero span: -sweeptime (see data sheet) to 30 s; span: 0 to 30 s
*RST: 0 s

Example: `TRIG:HOLD 500us`

Mode: All

TRIGger<n>[:SEQuence]:LEVel:IFPower <TriggerLevel>

This command sets the level of the IF power trigger source.

Suffix:
<n> irrelevant

Parameters:
<TriggerLevel> -50 to +20 DBM

*RST: -20 DBM

Example: `TRIG:LEV:IFP -30DBM`

Mode: All

TRIGger<n>[:SEQuence]:SLOPe <Type>

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Suffix:
<n> irrelevant

Parameters:
<Type> POSitive | NEGative

*RST: POSitive

Example: `TRIG:SLOP NEG`

Mode: all

TRIGger<n>[:SEQuence]:SOURce <Source>

This command selects the trigger source for the start of a sweep.

Suffix:
<n> irrelevant

Parameters:

<Source>

IMMediate
Free Run

EXTern
External trigger

IFPower
Second intermediate frequency

VIDeo
Video mode is only available in the time domain and only in Spectrum mode.

BBPower
Baseband power (for digital input via the Digital Baseband Interface, R&S FSV-B17)

*RST: IMMediate

Example:
```
TRIG:SOUR EXT
```
Selects the external trigger input as source of the trigger signal

Mode: ALL

4.3.14 Programming Example

Adapting the settings to the characteristics of the DUT

```
INST:SEL BTO
```

Activates the Bluetooth Measurements option

```
INIT:CONT OFF
```

Selects single sweep operation

```
CONF:BTO:CHAN 10
```

Selects channel 10

```
CONF:BTO:PCL 1
```

Selects power class 1

```
CONF:BTO:PRAT 4
```

Selects 4 points per symbol

```
CONF:BTO:PTYP DH1
```

Selects 1 slot packet

```
DDEM:SEAR:SYNC ON
```

Activates the FIND SYNC function

```
DDEM:SEAR:SYNC:OFFS 0
```

Sets the sync offset = 0

```
DDEM:SEAR:SYNC:LAP #H0
```

Sets the lower address part = 0

```
DDEM:SEAR:TIME:AUTO ON
```

Selects automatic search length

List of Commands

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