



ROHDE & SCHWARZ

Test and Measurement
Division

Release Notes

GSM / EDGE / EDGE Evolution Measurement Application R&S FS-K10 Release 4.60

for R&S FSQ, FSG Analyzer Firmware V4.6x

New Features:

- Modulation Spectrum measurement at offset frequencies up to 5.8 MHz
- Support for R&S FSQ-B71 Baseband Inputs
- New parameter "Filter Type" for spectrum list measurements
- New parameter "IQ Correlation Threshold" to control "sync failed" sensitivity
- New parameter "Symbol Decision" in Measurement Settings
- New parameter "Tail & TSC Bits" in Measurement Settings

Release Note Revision: 2

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History

Date	Rel Note Rev	Changes
6 August 2010	1	First revision of K10 Measurement Application for V4.60.
19 October 2010	2	New hot line phone number for calls from Europe.

General Topics

Compatibility of the R&S FS-K10 with other Firmware Releases

The following table shows the compatible versions of the basic analyzer firmware and the GSM / EDGE / EDGE Evolution Measurement Application.

Note:

The FS-K5U fully upgrades an installed GSM/EDGE Application Firmware R&S FS-K5 to the FS-K10. The FS-K5 remains still available.

Table of compatible versions:

R&S FS-K10 Measurement Application	R&S FSQ Basic Firmware	R&S FSG Basic Firmware
4.60	4.65	4.69
4.51	4.55 SP2	4.59 SP1
4.50 SP1	4.55 SP1	4.59
4.50	4.55	-
4.40	4.45 SP2	4.49 SP2

Firmware Update of the R&S FS-K10

Since the basic firmware version 4.2x, a ZIP file with the update sets of the basic system firmware and all available applications is provided. This ZIP file is available in the instruments FIRMWARE section, e.g. R&S FSQ of the Service Board on GLORIS.

Please follow the steps described in the instrument's basic firmware release note to perform a complete firmware update.

Enabling the Measurement Application via License Key Code Entry

This section can be skipped if the option key code was entered once.

After installing the measurement application package a license key code for validation must be entered. The license key code is printed either on a label on the rear panel of the instrument or delivered as a part of the R&S FS-K10 GSM / EDGE / EDGE Evolution Measurement Application package.

The key sequence for entering the license key code is:

SETUP - GENERAL SETUP – OPTIONS - INSTALL OPTION

Use the numeric keypad to input the license key code number and press ENTER.

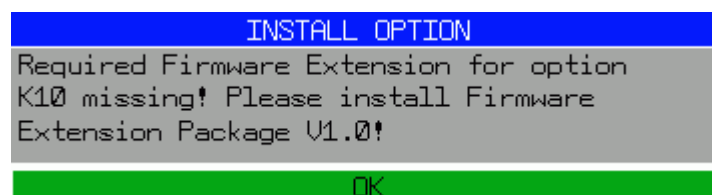
- On a successful validation the message "option key valid" will appear. The instrument will perform an automatic reboot.
- If the validation failed, the measurement application is not installed.
The most probable reason will be that the instrument is not equipped with the correct basic firmware version. Therefore a message box will appear asking for installation of the correct basic firmware version.

If the measurement application package was not installed prior to entering the license key code, a message will appear asking for installation of the measurement application package.

In any case please make sure that the correct basic firmware version and the measurement application package are installed prior to entering the license key code.

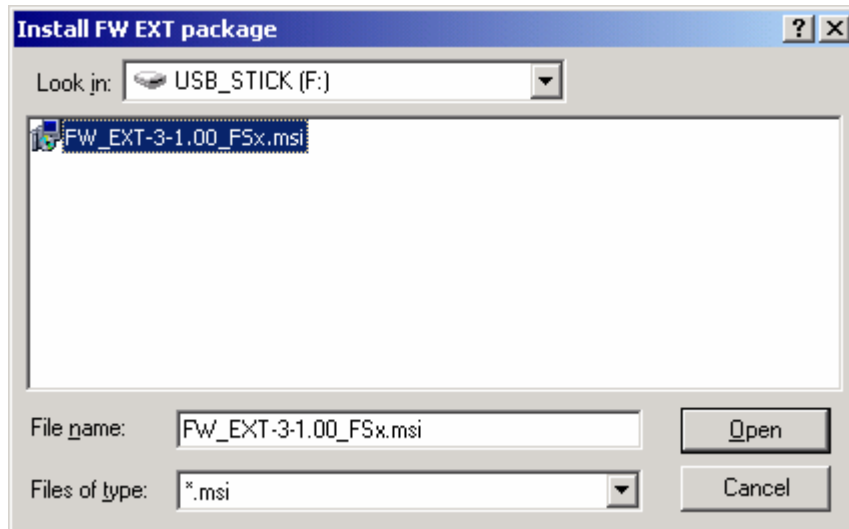
If upgrading to FS-K10 from FS-K5 then an FS-K5U upgrade key code is supplied. This key code needs to be entered (as described above) in addition to the existing FS-K5 key code.

The K10 GSM / EDGE / EDGE Evolution Measurement Application requires an *FW_EXT_Vx.xx_FSt.msi* firmware extension package. If this package is already available on your instrument, the package will be installed after entering the valid K10 option key code. If this package is not available on your instrument the following message will appear after entering the valid K10 option key code:



Please visit the [Rohde & Schwarz](http://www.rohde-schwarz.com) web site and go to DOWNLOAD SEARCH. Select FSQ as product. Then choose FIRMWARE FOR WINDOWS XP and press OK. Download the R&S® *Firmware Extension Installer*

and transfer the *FW_EXT-x-x.xx_FSx.msi* file (e.g. *FW_EXT-3-1.00_FSx.msi*) either via USB memory stick or LAN to the instrument. The valid K10 (or K5U) option key code enabled an INSTALL FW EXT softkey in the SETUP - GENERAL SETUP - OPTIONS menu. This softkey will bring up the *Install Fw EXT package* dialog.



Use the roll key, up/down/left/right keys to navigate to the directory in which the *FW_EXT-x-x.xx_FSx.msi* package is located. Select it and press *Open*. This will install the required software on the instrument.

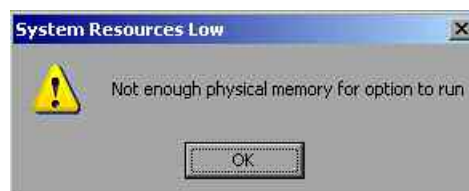
Enter the K10 (or K5U) option key code again in order to complete enabling the GSM / EDGE / EDGE Evolution Measurement Application.

Finally switch the instrument off, wait until the shut down is finished and switch the instrument on again.

Important Note: Due to the installer package size it is not permitted to install the FW Extension package on instruments with option FSQ-B18 (Removable hard disk) and therefore the INSTALL FW EXT softkey is not available in that case.

System Memory Requirements

For the FS-K10 GSM / EDGE / EDGE Evolution Measurement Application an installed system memory of 512 MByte is essential. The FS-K10 firmware will generate an error message during activation, if available system memory does not meet the requirements. In some rare cases this may happen for FS-K10 if FSQ-K92/K93/K94, FS-K30, FS-K40, FSQ-K70, FSQ-K90/91, or FS-K110 was active before starting FS-K10.



A reboot of the instrument after using NOISE (FS-K30), PHASE NOISE (FS-K40), VSA (FSQ-K70), WLAN (FSQ-K90/91), WIMAX (FSQ-K92/K93/K94), or TETRA II (FS-K110) will allow FS-K10 to be activated without memory extension.

The system memory size can be easily checked by pressing SETUP – SYSTEM INFO – STATISTICS, item "Memory size".

GSM / EDGE / EDGE Evolution Measurement Application R&S FS-K10

New Functions

The version numbers in brackets indicate the version in which the new function was introduced:

- **[V4.60] Modulation Spectrum measurement at offset frequencies up to 5.8 MHz**
New Wide Modulation spectrum list measurement and new SCPI commands:
[CONFigure:WSPpectrum:MODulation\[:IMMediate\]](#)
[READ:WSPpectrum:MODulation\[:ALL\]?](#)
- **[V4.60] Support for R&S FSQ-B71 Baseband Inputs**
New SCPI commands:
[INPut:SElect AIQ](#)
[DISPlay:WINDow:TRACe:Y:SCALE:RLEVel:IQ 1](#)
[INPut:IQ:IMPedance LOW](#)
[INPut:IQ:BALanced:STATe ON](#)
[SENSe:IQ:DITHer:STATe ON](#)
[SENSe:IQ:LPASs:STATe ON](#)
- **[V4.60] New parameter "Filter Type" for spectrum list measurements**
Either a "Normal" (Gauss 3 dB) or a 5 pole filter can be selected as resolution filter.
SCPI: [SENSe1:BANDwidth:RESolution:TYPE P5](#)
- **[V4.60] New parameter "IQ Correlation Threshold" to control "sync failed" sensitivity.**
SCPI: [CONFigure:MS:SYNC:IQCThreshold 85](#)
- **[V4.60] New parameter "Symbol Decision" in Measurement Settings**
Improved demodulator performance by the use of a sequence estimator.
SCPI: [CONFigure:MS:DEMod:DECision AUTO | LINear | SEquence](#)
- **[V4.60] New parameter "Tail & TSC Bits" in Measurement Settings**
Use standard or detected Tail and TSC bits for the generation of the ideal signal.
SCPI: [CONFigure:MS:DEMod:STDBits STD | DETected](#)

Improvements in V4.60

The version numbers in brackets indicate the version in which the issue was observed for the first time.

1. [V4.60] Restricted availability of PCL / Dynamic PCL SCPI command

Issuing the SCPI command `CONFigure:MS:CHANnel:SLOT0:PCL?` requires the slot to be active.

Otherwise an error is returned. Please use the following workaround to query the PCL / Dynamic PCL of an inactive slot:

`CONFigure:MS:CHANnel:SLOT0:STaTe ON`

`CONFigure:MS:CHANnel:SLOT0:PCL?`

`CONFigure:MS:CHANnel:SLOT0:STaTe OFF`

This issue is solved.

2. [V4.60] Slow-down caused by mode change

Switching from spectrum mode to K10 and back slows down switching time.

This issue is solved.

Known Issues

The version numbers in brackets indicate the version in which the issue was observed for the first time.

1. [V4.50] Multi Carrier parameters do not affect Modulation Spectrum limit lines yet

The parameters "No. of active Carriers" and "BTS Class" are not taken into account for the limit line calculation yet.

Modified Functions

The version numbers in brackets indicate the version in which the function was modified.

1. **[V4.50] New SCPI command for parameter "Equal Timeslot Length":**
[CONFigure:MS:CHANnel:FRAME:EQual ON](#)
2. **[V4.50] New parameter "Capture Time" and SCPI command:**
[SENSe1:SWEep:TIME 100 MS](#)
3. **[V4.50] Demodulation of several frames / slots in the capture buffer:**
Seamless analysis of up to 200 frames (1 s capture time).
4. **[V4.50] New parameter "Synchronization" added to General Settings dialog.**
Choose one of the following synchronization modes to time-align the GSM signal: "Burst + TSC", "TSC", "Burst" or "None". New SCPI command [CONFigure:MS:SYNC:MODE ALL](#).
For FS-K5 backwards compatibility the following commands are provided:
[CONFigure:MS:BSEarch ON](#) (burst search) and
[CONFigure:MS:SSEarch ON](#) (TSC search).
5. **[V4.50] New parameter "Measure only on Sync" added to General Settings dialog.**
If activated, only results from frames (slots) where the "Slot to measure" was found are displayed and taken into account in the averaging of the results. The behavior of this option depends on the value of the Synchronization parameter.
New SCPI command [CONFigure:MS:SYNC:ONLY ON](#)
6. **[V4.50] New parameter "PvT Filter" in the Advanced tab of the Measurement Settings dialog**
to select a pre-filter for Power vs Time measurements on single carrier signals.
The SCPI command [CONFigure:BURSt:PTEMplate:FILTer G500](#) now provides FS-K5 backwards compatibility.
7. **[V4.50] New parameter "Enable Left / Right Limit" + SCPI command added.**
These parameters control the left / right limit check of the spectrum trace (spectrum graph measurement) and which offset frequencies in the table (spectrum list measurement) are checked against the limit. These parameters effect the Modulation Spectrum and Transient Spectrum measurements and are intended to measure the left- / right-most channel in a multi carrier scenario. New SCPI commands:
[CONFigure:SPECTrum:LIMit:LEFT ON](#)
[CONFigure:SPECTrum:LIMit:RIGHT ON](#)
8. **[V4.50] New support for measurements on multi carrier GSM base stations:**
Multi Carrier tab added to the Measurement Settings dialog, providing the following parameters and SCPI commands:
 - "Multi Carrier BTS": Activate this parameters for measurements on multi carrier base stations. An additional multi carrier filter is switched into the demodulation path of the K10. This filter can, for example, suppress up to six adjacent channels with a channel spacing of 600 kHz from the measured channel and 30 dB higher power compared to the measured channel.
[CONFigure:MS:MCARrier:MCBTs ON](#)
 - "No. of active Carriers": Total number of active carriers.
[CONFigure:MS:MCARrier:ACTCarriers 1](#)
 - "BTS Class": Base station class.
[CONFigure:MS:MCARrier:BTSClass 1](#)
 - "PvT Filter": Special multi carrier pre-filter for the Power vs Time measurement.
[CONFigure:MS:MCARrier:FILTer MC400](#)
 - Support of FS-K5 backwards compatible command
[CONFigure:MS:MCARrier ON](#)
9. **[V4.50] Parameter PCL Attenuation removed from the burst dialog.**
The corresponding SCPI command [CONF:MS:CHAN:SLOT0:PCL:ATT](#) is not supported any more.

10.[V4.50] SCPI conflict of SCPI commands to query the burst power of all slots (PvT measurement) and the burst power of the 'Slot to measure' (Modulation Accuracy measurement) solved.

Now, the following commands to measure burst power are provided:

[FETCh:BURSt:SPOWer:SLOT<s>:ALL:AVERAge?](#) measures slot <s> in PvT

[READ:BURSt:SPOWer:SLOT<s>:ALL:AVERAge?](#) measures slot <s> in PvT

[FETCh:BURSt:MACCuracy:BPOWer:AVERAge?](#) measures 'Slot to measure' in ModAcc.

[READ:BURSt:MACCuracy:BPOWer:AVERAge?](#) measures 'Slot to measure' in ModAcc.

11.[V4.50 SP1] New parameter: "Swap IQ" + SCPI command added (with Service Pack 1).

Swaps the I and Q signals., SCPI command [SENSe1:SWAPiQ ON](#)

12.[V4.51] New SCPI command to determine the gating interval for modulation spectrum:

[READ:SPECTrum:WMOdulation:GATing?](#)

Use the FS-K10 to determine the gating interval and the spectrum analyzer mode to perform modulation spectrum list measurements at user-definable offset frequencies (e.g. at a 5.8 MHz offset frequency).

13.[V4.51] New SCPI command to select the spectrum meas. mode (Softkey: Display Graph/List):

[CONFigure:MS:SPECTrum:SElect](#)

14.[V4.51] New parameter "Limit Time Alignment" + SCPI command added

Limit lines of the Power vs Time measurement can be either time-aligned "Per Slot" or the slot centers are derived from the "Slot to measure" only.

[CONFigure:BURSt:PTEmplate:TALign PSLot](#)

15.[V4.60] Restricted availability of PCL / Dynamic PCL SCPI command

Issuing the SCPI command [CONFigure:MS:CHANnel:SLOT0:PCL?](#) requires the slot to be active.

Otherwise an error is returned. Please use the following workaround to query the PCL / Dynamic PCL of an inactive slot:

[CONFigure:MS:CHANnel:SLOT0:STATe ON](#)

[CONFigure:MS:CHANnel:SLOT0:PCL?](#)

[CONFigure:MS:CHANnel:SLOT0:STATe OFF](#)

This issue is solved.

16.[V4.60] Slow-down caused by mode change

Switching from spectrum mode to K10 and back slows down switching time.

This issue is solved.

17.[V4.60] Modulation Spectrum measurement at offset frequencies up to 5.8 MHz

New Wide Modulation spectrum list measurement and new SCPI commands:

[CONFigure:WSPECTrum:MODulation\[:IMMediate\]](#)

[READ:WSPECTrum:MODulation\[:ALL\]?](#)

18.[V4.60] Support for R&S FSQ-B71 Baseband Inputs

New SCPI commands:

[INPut:SElect AIQ](#)

[DISPlay:WINDow:TRACe:Y:SCALE:RLEVel:IQ 1](#)

[INPut:IQ:IMPedance LOW](#)

[INPut:IQ:BALanced:STATe ON](#)

[SENSe:IQ:DITHer:STATe ON](#)

[SENSe:IQ:LPASs:STATe ON](#)

19.[V4.60] New parameter "Filter Type" for spectrum list measurements

Either a "Normal" (Gauss 3 dB) or a 5 pole filter can be selected as resolution filter.

SCPI: [SENSe1:BANDwidth:RESolution:TYPE P5](#)

20.[V4.60] New parameter "IQ Correlation Threshold" to control "sync failed" sensitivity

SCPI: [CONFigure:MS:SYNC:IQThreshold 85](#)

21.[V4.60] New parameter "Symbol Decision" in Measurement Settings

Improved demodulator performance by the use of a sequence estimator.

SCPI: [CONFigure:MS:DEMod:DECision AUTO | LInear | SEquence](#)

22.[V4.60] New parameter "Tail & TSC Bits" in Measurement Settings

Use standard or detected Tail and TSC bits for the generation of the ideal signal.

SCPI: [CONFigure:MS:DEMod:STDBits STD | DETected](#)

Modifications to the Operating Manual

The R&S FS-K10 GSM / EDGE / EDGE Evolution is described in the operating manual with the order number

- 1309.9722.42-04 (English)

Modified Chapters for manual operation

Wide Modulation Spectrum

The "Wide Modulation Spectrum" measurement measures the spectrum due to modulation at offset frequencies up to 5.8 MHz from the carrier. In principle, this measurement provides the same functionality as the existing "Modulation Spectrum List" measurement (see "Modulation Spectrum"), however the offset frequencies measured are extended past the current limit of 1.8 MHz up to 5.8 MHz. The full list of measured frequencies and filter bandwidths are listed in Table 1.

To start a "Wide Modulation Spectrum" measurement, select "Wide Spectrum > Wide Mod Spectrum".

Table 1: Frequencies and filter bandwidths in wide modulation spectrum measurements

Offset (kHz)	RBW (kHz)	VBW (kHz)
±100	30	30
±200	30	30
±250	30	30
±400	30	30
±600	30	30
±800	30	30
±1000	30	30
±1200	30	30
±1400	30	30
±1600	30	30
±1800	30	30
±2000	100	100
±2200	100	100
±2400	100	100
±2600	100	100
±2800	100	100
±3000	100	100
±3200	100	100
±34000	100	100
±36000	100	100
±38000	100	100
±4000	100	100
±4200	100	100
±4400	100	100
±4600	100	100
±4800	100	100
±5000	100	100
±5200	100	100
±54000	100	100
±56000	100	100
±58000	100	100

The measurement can be performed using either the "EXTERNAL" or "POWER" trigger modes. The trigger signal must be received once per GSM frame.



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

Power trigger operation is not recommended for modulation formats that have no constant envelope (i.e. all except GMSK). Therefore, the power trigger should only be used for GMSK bursts. For QPSK, 8PSK, 16QAM and 32QAM bursts an external trigger should be used.

The measurement is performed in gated zero-span mode, where the gating parameters (offset and length) are calculated based on the user-defined "Trigger Offset" and "Frame Configuration" settings. 50-90 % of the active part of the "Slot to Measure" (excluding TSC) are measured.



It is recommended that you use the "Auto Set" functionality of the R&S FS-K10 application before starting the list measurement. This automatically determines the appropriate "Trigger Offset" and "Frame Configuration" for the signal under test.

Figure 1: Results Table in Wide Modulation Spectrum

Wide Modulation Spectrum: List						
Offset /kHz	/dB	Lower /dBm	Δ to Lim	/dB	Upper /dBm	Δ to Lim
100	- 7.9	- 16.0	8.38	- 8.1	- 16.2	8.56
200	- 36.1	- 44.2	6.08	- 35.6	- 43.8	5.63
250	- 40.9	- 49.1	7.89	- 41.0	- 49.1	7.96
400	- 68.1	- 76.3	12.12	- 66.9	- 75.1	10.90
600	- 76.6	- 84.7	19.72	- 76.9	- 85.1	20.07
800	- 79.3	- 87.5	22.51	- 79.9	- 88.1	23.10
1000	- 81.5	- 89.7	24.70	- 80.8	- 88.9	23.93
1200	- 83.4	- 91.5	26.52	- 83.1	- 91.3	26.28
1400	- 84.6	- 92.8	27.77	- 84.0	- 92.2	27.21
1600	- 85.4	- 93.6	28.57	- 84.3	- 92.5	27.47
1800	- 86.3	- 94.4	29.45	- 85.8	- 93.9	28.93
2000	- 81.4	- 89.6	24.57	- 80.8	- 88.9	23.91
2200	- 81.7	- 89.8	24.84	- 81.4	- 89.5	24.54
2400	- 82.3	- 90.5	25.46	- 81.7	- 89.9	24.89
2600	- 82.2	- 90.4	25.40	- 82.1	- 90.2	25.22
2800	- 82.2	- 90.4	25.38	- 82.5	- 90.6	25.64
3000	- 82.4	- 90.6	25.61	- 82.6	- 90.8	25.79

Remote commands

The "Wide Modulation Spectrum" measurement is started using the `CONFIGure:WSPpectrum:MODulation[:IMMEDIATE]` command.

The gating parameters of the "Wide Modulation Spectrum" measurement can be queried using `READ:SPECTrum:WMODulation:GATING?`.

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

IQ Correlation

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

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

Remote: CONF:SYNC:IQCT 0

Filter Type

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

Remote: SENS:BAND:RES:TYPE

Baseband Analog

Input Impedance
IQ Path
Balanced
Low Pass
Dither

Input Impedance

Allows the selection of the impedance of the baseband inputs (R&S FSQ-B71). Either 50 Ω or 1 M Ω can be selected. The Input Impedance parameter is only available when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:IMP LOW

IQ Path

This parameter is set to "I+j*Q" and can not be changed. Use the parameter Swap IQ if the I and Q cables are interchanged.

The IQ Path parameter is only available when Baseband Analog is selected as Signal Source..

Remote: INP:IQ:TYPE IQ

Balanced

Switches the baseband inputs between symmetrically (balanced) and asymmetrical (unbalanced).

The *Balanced* parameter is only available when Baseband Analog is selected as Signal Source.

Remote: INP:IQ:BAL ON

Low Pass

When switched on the *LowPass* parameter specifies that an analog anti-aliasing filter is internally applied to all the IQ inputs.

The filter must be turned on if there might be frequency components (harmonics) above about 40 MHz.

The amplitude and phase equalized single sided bandwidth of the analog baseband inputs is for

- Low pass = On: 30 MHz
- Low pass = Off: 36 MHz

The *Low Pass* parameter is only available when Baseband Analog is selected as Signal Source..

Remote: SENS:IQ:LPAS ON

Dither

When switched on the *Dither* parameter specifies that a 2 MHz wide noise signal at 42.67 MHz is injected into the signal path of the analog baseband input. It appears in the spectrum at 38.92 MHz.

The dither signal distinctly improves the linearity of the A/D converter at very low signal levels (low drive level at the A/D converter) and thus the accuracy of the level displayed.

The *Dither* parameter is only available when Baseband Analog is selected as Signal Source.

Remote: SENS:IQ:DITH ON

Modified Chapters for remote operation

CONFigure:WSPpectrum:MODulation[:IMMediate]

This command selects the measurement of the wide spectrum due to modulation (WMOD). The wide modulation spectrum measurement uses a series of zero span mode measurements and can measure offset frequencies up to 5.8 MHz. This command is only available for IF power or external trigger mode. Make sure that the Trigger Offset (in the General Settings dialog) is set correctly, e.g. using the Auto Set (Trigger) functionality of the K10.

Characteristics

RST value: none (Execute command)

SCPI: device specific

Example

```
// Preset the instrument
*RST

// Enter the GSM option K10
INSTRument:SElect GSM

// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;;:ABORt

// Switch display on
SYSTem:DISPlay:UPDate ON

// Activate slot 0
CONFigure:MS:CHANnel:SLOT0:STATe ON

// Deactivate all other slots(1-7)
CONFigure:MS:CHANnel:SLOT1:STATe OFF
CONFigure:MS:CHANnel:SLOT2:STATe OFF
CONFigure:MS:CHANnel:SLOT3:STATe OFF
CONFigure:MS:CHANnel:SLOT4:STATe OFF
CONFigure:MS:CHANnel:SLOT5:STATe OFF
CONFigure:MS:CHANnel:SLOT6:STATe OFF
CONFigure:MS:CHANnel:SLOT7:STATe OFF

// Set slot 0 to Normal Burst, GMSK, TSC 0
CONFigure:MS:CHANnel:SLOT0:TYPE NB
CONFigure:MS:CHANnel:SLOT0:MTYPE GMSK

// Set center frequency to 900 MHz
SENSe:FREQuency:CENTer 900MHZ

// Set the Ref level to 0 dbm
DISPlay:WINDow1:TRACe1:Y:SCALE:RLEVel:RF 0

// Read back the Ref Level
DISPlay:WINDow1:TRACe1:Y:SCALE:RLEVel:RF?

// Choose the Wide Modulation spectrum measurement
CONFigure:WSpectrum:MODulation:IMMediate

// Trigger Mode should be set to Power mode by default
TRIGger1:SEquence:SOURce IFPower

// Run Auto Trigger (determine the trigger level and offset)
CONFigure:MS:AUTO:TRIGger ONCE;*OPC?

// Read out the trigger level
TRIGger1:SEquence:LEVel:IFPower?

// Read out the Trigger Offset
TRIGger1:SEquence:HOLDoff:TIME?

// Set the statistic count to 50
```

```
SENSe:SWEp:COUNT 50
```

```
// Do one measurement and read out the results for all offset frequencies
```

```
READ:WSPpectrum:MODulation:ALL?
```

READ:WSPpectrum:MODulation[:ALL]?

This command starts the measurement and reads out the result of the measurement of the wide modulation spectrum of the mobile or base station. This command is only available when the wide modulation spectrum measurement is selected (see CONFigure:WSPpectrum:MODulation[:IMMediate]).

Characteristics

RST value: none (Query only command)

SCPI: device specific

Example

```
READ:WSPpectrum:MODulation:ALL?
```

INPut:SElect <Source>

This command selects the signal source, i.e. the input where the signal to be analyzed comes from.

Parameter

Value	Description
-------	-------------

AIQ	Baseband Analog (Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.)
-----	---

RF	RF Input
----	----------

Characteristics

RST value: RF

SCPI: device specific

Example

```
INPut:SElect AIQ
```

DISPlay[:WINDow<1|2>]:TRACe<1>:Y[:SCALe]:RLEVel:IQ <Value>

This command can be used to retrieve or set the current internal instrument reference level for analog baseband inputs used when performing measurements.

Parameter

<Double value>

Reference level for analog baseband inputs in Volts. (Unit: V)

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required. All numerical suffixes are irrelevant for this command.

Characteristics

RST value: 1 V

SCPI: device specific

Example

```
DISPlay:WINDow1:TRACel:Y:SCALE:RLEVel:IQ 1 V
```

INPut:IQ:IMPedance <Value>

This command specifies the input impedance for the analog baseband I/Q inputs.

Parameter**Value Description**

LOW 50 Ohm

HIGH 1 kOhm or 1 MOhm (depending on the instrument configuration)

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: LOW

SCPI: device specific

Example

```
INPut:IQ:IMPedance LOW
```

INPut:IQ:BALanced[:STATe] <State>

This command specifies whether the analog baseband I/Q inputs are symmetrical (balanced) or asymmetrical (unbalanced).

Parameter

<Boolean value>

State, 1 = balanced, 0 = unbalanced.

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: 1

SCPI: device specific

Example

```
INPut:IQ:BALanced:STATe ON
```

[SENSe]:IQ:DITHer[:STATe] <State>

If activated this command links a 2 MHz broad dithering signal at 42.67 MHz into the signal path of the analog baseband inputs.

Parameter

<Boolean value>

State, 1 = dither signal active, 0 = no dither signal.

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: 0

SCPI: device specific

Example

```
SENSe:IQ:DITHer:STATe ON
```

[SENSe]:IQ:LPASs[:STATe] <State>

If activated this command switches an anti-aliasing filter into the I and Q branches of the analog baseband inputs.

Parameter

<Boolean value>

State, 1 = filter active, 0 = filter inactive.

Note

Option R&S FSQ-B71 baseband inputs DC to 36 MHz required.

Characteristics

RST value: 0

SCPI: device specific

Example

```
SENSe:IQ:LPASs:STATe ON
```

[SENSe]:BANDwidth[:RESolution]:TYPE <Type>

This command switches the filter type for the resolution filter between "normal" (3 dB Gauss filter) or a 5-pole filter (according to the GSM standard) for the "Modulation Spectrum", "Transient Spectrum" and "Wide Modulation Spectrum" measurements.

Parameter

Value	Description
NORMal	Gaussian filter with a 3 dB bandwidth of either 30 kHz or 100 kHz. This value is retained for compatibility with R&S FS-K5 only.
P5	5 pole filter with a 3 dB bandwidth of either 30 kHz or 100 kHz. This filter is required by the GSM standard specification.

Characteristics

RST value: P5

SCPI: device specific

Example

```
SENSe:BANDwidth:RESolution:TYPE NORMal
```

CONFigure[:MS]:SYNC:IQCThreshold <Value>

This command sets the IQ correlation threshold. The IQ correlation threshold decides whether a burst is accepted if "Measure only on Sync" is activated. If the correlation value between the ideal IQ signal of the given TSC and the measured TSC is below the IQ correlation threshold then K10 reports "Sync not found" in the status bar. Additionally such bursts are ignored if "Measure only on Sync" is activated.

Parameter

<Integer value>

IQ Correlation Threshold

Characteristics

RST value: 85

SCPI: device specific

Example

```
CONFigure:MS:SYNC:IQCThreshold 0
```

CONFigure[:MS]:DEMod:DECision <Value>

This command determines how the symbols are detected in the demodulator. The setting of this parameter does not effect the demodulation of Normal Bursts with GMSK modulation. For Normal Bursts with 8PSK, 16QAM, or 32QAM modulation or Higher Symbol Rate Bursts with QPSK, 16QAM or 32QAM modulation use this parameter to get a trade-off between performance (symbol error rate of the K10) and measurement speed.

Parameter

Value	Description
AUTO	Auto: Automatically selects the symbol decision method.
LINear	Linear symbol decision: Uses inverse filtering (kind of zero-forcing filter) and a symbol-wise decision method. This method is recommendable to be used for high symbol to noise ratios, but not for Higher Symbol Rate Bursts with the narrow pulse. The inverse filter colors the noise inside the signal bandwidth and therefore is not recommended for narrow-band signals or signals with a low signal to noise ratio. Peaks in the EVM vs Time measurement may occur if the 'Linear' symbol decision algorithm fails. In that case use the 'Sequence' method. Linear is the fastest option.
SEquence	Symbol decision via sequence estimation: This method uses an algorithm that minimizes the symbol errors of the entire burst. It requires that the 'Tail' bits in the analyzed signal are correct. It has a better performance (lower symbol error rate) compared to the 'Linear' method especially at low signal to noise ratios at a price of measurement speed. It is recommended to use this method for Normal Bursts with 16QAM or 32QAM modulation and for Higher Symbol Rate bursts with the narrow pulse.

Characteristics

RST value: AUTO

SCPI: device specific

Example

```
// Preset the instrument
*RST

// Enter the GSM option K10
INSTRument:SElect GSM

// Switch to single sweep mode and stop sweep
INITiate:CONTinuous OFF;:ABORT

// Activate EVM vs Time measurement
CONFigure:BURSt:ETIME:IMMediate

// Set slot 0: Higher Symbol Rate burst, 16QAM, Wide Pulse & TSC 0
```

```

CONFigure:MS:CHANnel:SLOT0:STATe ON
CONFigure:MS:CHANnel:SLOT0:TYPE HB
CONFigure:MS:CHANnel:SLOT0:MTYPE QAM16
CONFigure:MS:CHANnel:SLOT0:FILTer WIDE
CONFigure:MS:CHANnel:SLOT0:TSC 0

```

```

// Use 'sequence estimator' for the symbol decision
CONFigure:MS:DEMod:DECision SEquence
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Read the averaged EVM RMS value
FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?

```

```

// Use the 'linear' method for the symbol decision
CONFigure:MS:DEMod:DECision LINEar
// Run a (blocking) single sweep
INITiate:IMMediate;*WAI
// Read the averaged EVM RMS value
FETCh:BURSt:MACCuracy:EVM:RMS:AVERage?

```

CONFigure[:MS]:DEMod:STDBits <Value>

This command selects whether the detected Tail and TSC bits or the standard bits (as set in the Burst dialog) are used for the construction of the ideal (reference) signal. The K10 demodulator requires the bits of the burst (Tail, Data, TSC, Data, Tail) to provide an ideal version of the measured signal. The 'Data' bits can be random and are typically not known inside the demodulator of the K10. 'Tail' and 'TSC' bits are specified in the burst dialog. Using the standard bits can be advantageous to verify whether the device under test sends the correct Tail and TSC bits. Incorrect bits would lead to peaks in the EVM vs Time trace at the positions of the incorrect bits.

Parameter

Value	Description
DETEcted	Measures Tail and TSC bits (detection during symbol decision) . Take the measured bits to generate the ideal signal. Incorrect Tail and TSC bits have no effect on the EVM vs Time measurement.
STD	Use standard-specified Tail and TSC bits (as set in the Burst dialog) in the demodulated bit stream and to generate the ideal signal. The measured (detected) bits are replaced. Incorrect Tail and TSC bits do effect the EVM vs Time measurement. Peaks occur at the positions of the incorrect bits.

Characteristics

RST value: DETected

SCPI: device specific

Example

```
// Preset the instrument
```

*RST

// Enter the GSM option K10

INSTRument:SElect GSM

// Switch to single sweep mode and stop sweep

INITiate:CONTinuous OFF;:ABORt

// Activate EVM vs Time measurement

CONFigure:BURSt:ETIMe:IMMediate

// Replace detected Tail & TSC bits by the standard bits

CONFigure:MS:DEMod:STDBits STD

// Run a (blocking) single sweep

INITiate:IMMediate;*WAI

// Read the averaged EVM RMS value

FETCH:BURSt:MACCuracy:EVM:RMS:AVERage?

Appendix: Contacting our Hotline

Any questions or ideas concerning the instrument are welcomed by our hotline:

USA & Canada

Monday to Friday (except US public holidays)

8:00 AM – 8:00 PM Eastern Standard Time (EST)

Tel. from USA 1-888-TEST-RSA (1-888-837-8772)

From outside USA +1 410 910 7800

Fax +1 410 910 7801

E-mail CustomerSupport@rohde-schwarz.com

East Asia

Monday to Friday (except Singaporean public holidays)

8:30 AM – 6:00 PM Singapore Time (SGT)

Tel. +65 6 513 0488

Fax +65 6 846 1090

E-mail CustomerSupport@rohde-schwarz.com

Rest of the World

Monday to Friday (except German public holidays)

08:00 – 17:00 Central European Time (CET)

Tel. from Europe +49 (0) 89 4129 12345

From outside Europe +49 (0) 89 4129 13776

Fax +49 (0) 89 4129 63778

E-mail CustomerSupport@rohde-schwarz.com