ROHDE&SCHWARZ

Test and Measurement
Division

Release Notes

GSM/EDGE

Application Firmware R&S FS-K5

Release 4.20

for R&S FSP, FSU, FSQ, FSG, FSMR, FSUP, FMU
Analyzer Firmware 4.2x

New Features:

- Support for instruments R&S FSG and R&S FMU.
- Power vs Time Limit Line templates automatically adjustable for GSM900/GSM1800/GSM1900 (mobile station).

Release Note Revision: 5

Printed in the Federal
Republic of Germany

Contents

History

Date	Rel Note Rev	Changes
19 July 2007	1	First revision for R&S FS-K5 GSM/EDGE Firmware 4.20.
16 August 2007	2	FSP, FSU and FSQ added.
08 November 2007	3	Description of the update procedure adjusted to new update ZIP file.
23 November 2007	4	Supported instrument R&S FMU added.
08 October 2008	5	FSUP version added.

General Topics

Compatibility of the R&S FS-K5 GSM/EDGE Application Firmware

The following table shows the compatible version of the basic analyzer firmware version and the GSM/EDGE Application Firmware:

Table of compatible versions:

R&S FS-K5 Application Firmware	R&S FSP Basic Firmware	R&S FSU Basic Firmware	R&S FSQ Basic Firmware	R&S FSMR Basic Firmware	R&S FSUP Basic Firmware	R&S FMU Basic Firmware	R&S FSG Basic Firmware
4.20	4.20	4.21	4.25	-	4.27	4.28	4.29
4.10	4.10	4.11	4.15	-	4.17	-	-
4.00/4.00SP	4.00	4.01	4.05	-	-	-	-
3.90	3.90	3.91	3.95	3.96	3.99	-	-
3.80	3.80	3.81	3.85	3.86	-	-	-
3.70	3.70	3.71	3.75	-	-	-	-
3.60	3.60	3.61	3.65	3.66 SP1	-	-	-
3.50	3.50	3.51	3.55	-	-	-	-
3.40	3.40	3.41	3.45	-	-	-	-
3.30	3.30	3.31	3.35	-	-	-	-
3.28	3.20	3.21	3.25	-	-	-	-
3.24	3.10	3.11	3.15	-	-	-	-
3.20	3.00	-	3.05	-	-	-	-
2.80	2.80	2.81	-	-	-	-	-
2.60	2.60	2.61	-	-	-	-	-
2.40	2.40	2.41	2.45	-	-	-	-
2.30	2.30	2.31	2.35	-	-	-	-
2.28	2.20	2.21	2.25	-	-	-	-
2.24	2.10	2.11	2.15	-	-	-	-
1.20	1.80	1.81	1.85	-	-	-	-
1.10	1.70	1.71	1.65	-	-	-	-
1.07	1.50/1.60	1.51/1.61	-	-	-	-	-
1.06	1.50/1.60	1.51/1.61	-	-	-	-	-
1.05	1.40	1.41/1.42	-	-	-	-	-
1.04	-	1.31	-	-	-	-	-
1.03	1.30 / 1.32	-	-	-	-	-	-
1.02	1.20	-	-	-	-	-	-
1.01	1.16	-	-	-	-	-	-

Application firmware versions 3.xx/4.xx are running on R&S FSPs with order # 1164.4391.xx or R&S FSU with order # 1166.1660.xx or R&S FSQ with operating system XP.
Application firmware version 2.xx are running on R&S FSPs with order # 1093.4495.xx or R&S FSU with order # 1129.9003.xx or R&S FSQ with operating system NT.

Firmware Update of the R&S FS-K5 GSM/EDGE Application Firmware

Since 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 FSU 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 Application Firmware via License Key Code Entry

This section can be skipped if the option key was entered once.
After installing the application firmware package a license key for validation must be entered. The license key is printed either on a label on the rear panel of the R&S FSP or delivered as a part of the R&S FS-K5 GSM/EDGE application Firmware package.
The key sequence for entering the license key is:

SETUP - GENERAL SETUP – OPTIONS - INSTALL OPTION

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

- On a successful validation the message 'option key valid‘ will appear.

- If the validation failed, the application firmware 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 application firmware package was not installed prior to entering the license key code, a message will appear asking for installation of the application firmware package.
  In any case please make sure that the correct basic firmware version <u>and</u> the application firmware package is installed prior to entering the license key code.

Modified Functions

The behaviour of the following functions changed compared to earlier versions [the number in brackets indicates the firmware version that introduced the individual change]:

1. **[V2.60/3.60] Spectrum due to modulation and spectrum due to transient measurements are now using main pll bandwith mode narrow on R&S FSU and R&S FSQ instruments.**
2. **[V2.60/3.60] Spectrum due to modulation list measurement is now decreasing the reference level by 25 dB in ±600 kHz difference from the carrier.**
3. **[V2.60/3.60] PVT – EDGE: Lower limit lines adjusted due to current standard -15 dB changed to -20 dB.**
   If the instrument is shipped with V3.60 no action is necessary. If an update to 2.60/3.60 had been carried out the LINES | RESTORE GSM LINES function need to be carried out. All user changes to the default GSM limit lines of all measurements will be lost.
4. **[V2.60/3.60] PVT – multislot measurement: The precision of the multislot samples and limit checking is enhanced.**

   Therefore the amount of samples for a PVT trace has changed as follows:

Trace points in power versus time				
Number of active slots	over sampling 4		over sampling 8	
	older versions	V2.60/3.60 or higher	older version	V2.60/3.60 or higher
1	868	unchanged	1736	unchanged
2	1492	unchanged	2984	unchanged
3	2116	2120	4232	4240
4	2740	2744	5480	5488
8	5240	5244	10480	10488

5. **[V3.70] MOD – list measurement: The average type is changed to logarithmic averaging.**
6. **[V4.00] Improved burst search for signals with high distortion.**
7. **[V4.10] Extended Slot Configuration for mixed modulation.**
8. **[V4.20] Power vs Time Limit Line Templates automatically adjustable for GSM900/GSM1800/GSM1900 (mobile station).**
9. **[V4.20] Command syntax changed for following command:.**

   CONFigure:ECONfigure:SLOT:MODulation
   CONFigure:ECONfigure:SLOT:RLEVel:MODe
   CONFigure:ECONfigure:SLOT:RLEVel:VALue
   CONFigure:ECONfigure:SLOT:LIMit:LOWer
   CONFigure:ECONfigure:SLOT:LIMit:UPPer

   In version 4.10 the slot number is passed as a first parameter. With version 4.20 and newer, the slot number is handled by the numeric suffix at SLOT
   CONFigure:ECONfigure:SLOT<0 | [1] … 7>:..

   This change ist not backward compatible, but was required for future extensions.

Problems Eliminated

None

Known Problems with R&S FS-K5

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

1. [V1.03B] Limit Line Result of power vs. time (PVT) Rising or Falling might be FAILED, although PVT Full Burst or Top High Resolution is PASSED.
In PVT measurement the Full Burst and Top High Resolution limit checks are performed with full sample resolution. Therefore they are very precise and deliver correct results.
The limit check of PVT measurement Rising and Falling is done on extrapolated data and therefore might result in FAILED due to rounding problems.

Modifications to the Operating Manual and Supplements

For the R&S FS-K5 GSM/EDGE Application Firmware manuals please refer to the following order numbers:

- 1141.1515.44-06 (German/English) and
- 1141.1515.49-06 (English US letter format).

They can be downloaded from R&S internet – search: FS-K5:

http://www.rohde-schwarz.com

Manual Operation R&S FS-K5 GSM/EDGE Application Firmware

Menu GENERAL SETTINGS – NEXT

Press the *IF/RF PWR AS IQ TRIG* softkey in order to force the IF-power or with FSP-B6 RF-power trigger. If the trigger source is set to IF- or RF-power and an IQ measurement like PFE/MAC or PVT is used the free run trigger is selected, because a synchronization can be done with sync and burst search. Now also for these measurements the IF or RF power trigger will be selected if *IF/RF PWR AS IQ TRIG* is active. Default state is OFF.

Hint: For using the power triggers in IQ mode the detector board with the model number 03 or higher must be part of the analyzer hardware. (Without that kind of detector board the free run trigger is used.)

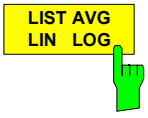
IEC/IEEE bus command:

```
:TRIGger1:SEQuence:SYNChronize:IQPower 0 | 1
```

Trigger Overview:

Measurement	Possible trigger(s)	Trigger used when trigger mode =		
		Extern	**IF Power**	**RF Power (FSP only)**
PFE	External / IF Power / RF Power / Free Run	External	Free Run / In access burst mode or if IF/RF PWR AS IQ TRIG is active: IF Power	Free Run/ In access burst mode or if IF/RF PWR AS IQ TRIG is active: RF Power
CPW	External / IF Power / RF Power	External	IF Power	RF Power
PVT	External / IF Power / RF Power / Free Run	External	Free Run / In access burst mode or if IF/RF PWR AS IQ TRIG is active: IF Power	Free Run/ In access burst mode or if IF/RF PWR AS IQ TRIG is active: RF Power
MOD	External / IF Power / RF Power	External	IF Power	RF Power
TRA	Free Run	Free Run	Free Run	Free Run
SPU	Free Run	Free Run	Free Run	Free Run

Menu MODULATION SPECTRUM



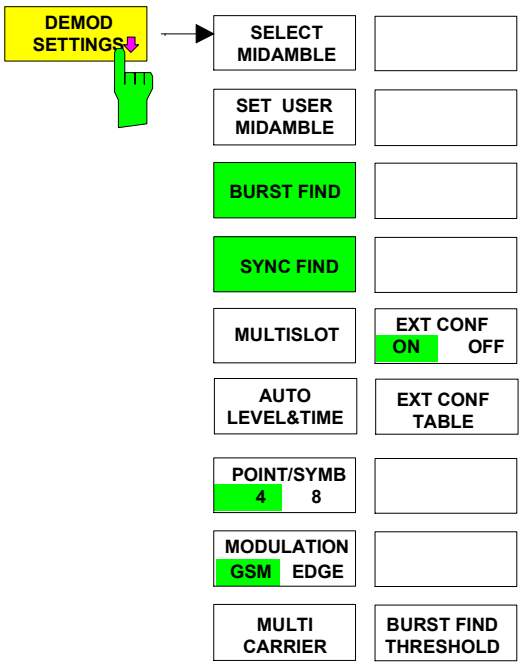
The *LIST AVG LIN/LOG* softkey toggles between linear and logarithmic (default) averaging in the modulation spectrum list measurement. In LIN mode voltages are averaged. In LOG mode levels.

IEC/IEEE bus command:

```
:CONFigure:SPECtrum:MODulation:LIST:AVERage:TYPE
 LINear | LOGarithmic
```

Extended Slot Configuration for Multi Slot measurements

Menu DEMOD SETTINGS



The R&S K5 supports several operating mode to measure GSM signals:

- **Default:**
  Single slot used, GMSK or 8PSK
- **Multi Slot:**
  1, 2, 3, 4 or 8 Slots active,
  same signal power and modulation or each slot
- **Extended Slot configuration:**
  1 or more slots active,
  different signal power and/or modulation for each slot

The following chapter describes the extended slot configuration mode

Extended Slot Configuration Mode- Basic Features – An Overview

The Multi Slot mode of the R&S K5 (GSM) firmware provides multislot capabilities, i.e., allows the software to be configured to support several active slots per frame. Here all slots must have equal power and identical modulation type.

When using the Extended Slot Configuration, the user is free to configure the 8 slots of a frame individually. The system will support mixed modulation as well as variant slot power for each individual slot. In addition, the PvT (Power vs Time) limit lines are calculated either with a fixed limit line template relative to the mean signal power or take into account some exceptions described in the GSM standards.

Of course, the user should obey a few rules when setting up the configuration in order to achieve reasonable measurement results. These rules will be explained in detail in the following sections.

The extended slot configuration feature can be used besides the yet existing multislot capability. A simple toggle switch will use either the conventional multislot measurement or the extended multislot feature.

The configuration data can be set up independently of the activity state of the extendend multislot feature. And, in order to ease accessing these configuration data, the controls of the Extended Slot Configuration are additionally located in the PvT side menu.

Some settings of the extended slot configuration are interpreted in a manner which allows a consistent usage of the measurements besides the PvT measurement, especially the PFE/MAC and the CPW measurement. Details are given below.

Extended Slot Configuration Mode- Configuration Settings

General Settings

A few settings are "global" in a sense that the overall behaviour of the measurement depends on them. These settings are:

- Selected Standard
- LongSlot Feature (Equal Slot Length)
- Only One Frame YES/NO
- Trigger Reference
- Midamble
- Absolute Level Settings

The Selected Standard controls some details about how the limit lines of the PvT measurement will be assembled. The default case 'MS/BTS DYNAMIC' uses a set of predefined or user defined limit lines. In addition the user can select between either MS-GSM900, MS-GSM1800 (formerly named DCS1800) or MS-GSM1900 (formerly PCS1900). When any one of the GSM standards has been choosen, the limit line is calculated internally by taking into account special user settings as 'control level' and 'absolute level' (see below for further details).

The LongSlot Feature supports the two different timing models of the GSM system.
If the "Equal Slot Length" is checked, all eight slots are assumed to have equal length each. In the other case, two slots must be denoted which will last for a time period of 157 symbols; the remaining 6 slots will be assumed to last for a period of 156 symbols each. This feature is important for the assembly and exact positioning of the limit lines regarding the time scale.

Only One Frame controls the limit line interpolation between end of last slot and begin of first slot.
If NO is selected, the limit line is continued at the end of the frame for 3/4 of a slot. That means the limit at the end of slot 7 is equal to the begin of slot 0 and vice versa.

If YES is selected, the limit check is only done in the active slot period.

These two settings are common to all standards and valid as well for the "dynamic" case. All other settings are special to the selected standard so the user can operate with individual settings for each standard.

The Trigger Reference specifies the slot which is used as the reference for time and level positioning.
It is the mean power of this slot which will be returned as the result of the premeasurement and which will be used as the level reference for proper adjustment of limit lines and measurement device.

And starting from this slot, the time scale is fixed into the measurement data using the well known GSM timing model.

The Midamble will be used to identify the reference slot within the stream of data.
Because now we cannot assume in general a well defined power ramp, the burst searching mechanism is switched off and the identification of the reference slot is achieved just by matching the specified midamble.

Thus, in order to get best use of the extended slot measurement capabilities, it is mandatory to specify a unique midamble sequence for the reference slot and to set up the device under test in a manner which grants for this uniqueness. Otherwise, instable trigger will be the result and the measurement will not be reliable at all.

When switching into the other measurements of the K5 option, it is the reference slot which will be used as the basis for the measurement. Especially, the kind of modulation of this slot and the midamble will be used to control the PFE/MAC measurement and to address the proper data within the sampled stream.

Absolute Level Settings are available only when one of the GSM standards has been selected before. They consist of an activation field (Yes/No state) and two values to be provided by the user in case of

activated absolute levels. Both values restrict the relative step height (the edge) of the upper limit line to an absolute base value as formulated in the GSM standard description: "… -30 dBc or -17 dBm whichever is higher" as an example for the GSM900 standard. The first value provides the absolute base value for the region beyond 28 µs apart from the useful area at either side of the burst; the second value specifies the base value for the region between 18 µs and 28 µs distant to the useful part of the slot at either side.

The absolute level settings are necessary because the K5 option normally allows the PvT measurement to be executed independent of any restriction to absolute power. The GSM norm on the other hand is restricted to absolute power values in some details. To overcome the discrepany between flexible measurement and GSM strict absolute power values, this kind of setting has been introduced; thus, the user is free to perform GSM-like measurements regardless of the special "power situation" he actually is encountered with.

Settings specific to a Slot

For each slot, the following items can be specified individually:

- Modulation
- Reference power
- Limit (Line) Control Level

For the kind of modulation, either GMSK or 8PSK (EDGE) can be selected. The modulation controls the demodulator and the kind of limit line to be used.

The reference power specifies the way how the limit lines will be adopted for each slot. The user is free to use

- relative
- relative to slot
- absolute or
- automatic

settings for each slot.

An additional level offset (or value, respectively) will allow a fine placement of the respective lines.

Relative Denotes the placement of the limit lines relative to the "reference power" which in turn is a result of the PvT pre-measurement. An offset of 0dB will place the lines exactly to the mean power of the reference slot.

Relative to Slot Is nearly the same, but instead of the reference slot, any active slot can be used as a base for the power level calculus. This setting just makes sense if the slot level depends on the level of another slot just different to the reference slot.

Absolute Means that the lines are to be placed in a way which is consistent with a mean power of 'x' dBm, whereas 'x' is the level value provided with the configuration data.

Automatic Will place the line according to the measured power of the pre-measurement.

A detailed explanation of the placing of the limit lines is given in the next section.

Limit (Line) Control Levels are necessary to calculate the edges of the limit lines located at 18 µs offset of the useful part of the burst. These edges normally are a function of the mobile's power control level. As already explained above, the control level cannot be derived by the measured power. The user must provide this value instead. The input field is available for GSM standards only and not accessible in dynamic mode.

Extended Slot Configuration Mode- Explanation of the Limit Line Calculus

Taking into account the overall settings, the PvT limit lines have to be calculated and applied to the sampled IQ data. Two tasks have to be fulfilled step by step:

- Assembly of the slot-related power profiles into a complete GSM frame.
- Proper placement of this set regarding the GSM time scale.

For each single slot, a limit line is specified according to the GSM scheme. This limit line is specified as a relative line in time as well as in level. The time zero is the symbol transition of symbol 13 to 14 (the center of the midamble) in accordance with the symmetric definition of the power profile in the GSM specs.

The "level zero" is defined by the mean power of the slot and is identical to the 0dB point in the GSM specs for the power profile. The limit line is defined relative to this zero level.

Depending on the modulation type two variants of limit lines will be used (either GMSK or 8PSK profile).

When using the extended slot configuration, the 0dB line varies from slot to slot. Therefore, the lines have to be calculated for each slot individually in order to meet the PASSED condition. In addition, for the transition region between two active slots a special rule has to be applied for the upper limit line. This rule will grant for a fairly smooth adaptation of two neighboured lines (and will not be explained in detail here).

Depending on the configured settings, the calculation of lines will work as explained below:

Relative Lines:

For relative lines, the result of the pre-measurement will be taken as usual. A configured offset is added to the lines before they are merged into the resulting line.

As a result, the relative lines will relate to the pre-measurement value plus the offset as specified in the configuration data.

For relative lines related to a specific slot, the same algorithm will be applied. In addition to the offset as specified in the configuration data, the difference between the pre-measurement value of the reference slot and the related slot will be taken into account thus yielding in a total offset which will be applied to the level values of the line just before merging it up.

That means the 0dB point of the related slot is used as a reference for the current line instead of the 0dB point of the reference slot.

Absolute Lines:

With this new kind of control of the extended slot configuration it is possible to fix a single slot mask to an absolute level, i.e. the 0dB point is assigned to a predefined dBm value as specified by the configuration settings. This value (in dBm) is independent of the result of the pre-measurement.

Automatic Lines:
This is a totally new feature, too: the 0dB point of a slot marked as "auto" is derived from the pre-measurement of the PvT measurement. In addition to the regular pre-measurement, the mean power of the auto slot is measured and taken as a base for the 0dB point.

After having adjusted the slot-specific lines, the total set is assembled to a frame-specific line.

The absolute time zero is defined to be start of symbol 0 of slot 0, i.e. the time zero is positioned at the start of the very first symbol of the GSM frame. Depending on the configured reference slot and the GSM timing model, the proper 1/4–symbol-shift between the individual slots will be taken into account.

The overall result is a set of limit lines extending over the time scale of a complete GSM frame.

Hints for a Proper Setup of the Measurement Device

From the description given so far, a few rules can be established which should (or must) be obeyed in order to achieve proper and reliable measurement results.

- The reference slot should always be the slot with the highest output power.
  Reason: The reference level of the device is controlled by the mean power of the reference slot. When another slot will yield more power an overload condition will be given.
- The midamble of the reference slot must be unique.
  Reason: The midamble sequence is the only way to setup a proper and stable timing within the IQ data stream.
- When using the AUTO level feature, the level offset normally should be 0 (zero). It should be zero as well for the reference slot, and the level setting should be 'relative'. Otherwise, some strange positioning of limit lines will be the result for these slots which will not follow this hint.
- The signal-to-noise relation of the measurement device must be taken into account! In general, it will make hardly any sense to deal with level differences of 50dB or more between the strongest and the weakest slot. The typical signal-to-noise capability of the FSQ will be about 80dB; when applying limit lines with a relative extend of typically 60dB, the ultimate level difference will be about 20dB. Otherwise, you will never get a PASSED.
- Limit Line handling in remote operation:
  The limit lines for extended slot configuration mode are automatically generated, as described above. For that reason following conventions for the CALC:LIMIT sub system has to observed:

  Up to 4 limit lines for upper and lower limits are generated. Following names are used:

  Lower limit line names: _epvtl0 ... _epvtl3
  Upper limit line names: _epvtu4 ... _epvtu7

  The digit at the end of the limit line name represents the SCPI Limit Check status bit number and therefore after adding "1" the numerical suffix used in the SCPI limit line subsystem.

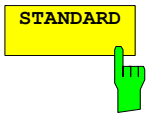
  Example: "_epvtl1"

  Power vs Time, Lower Limit Line 1

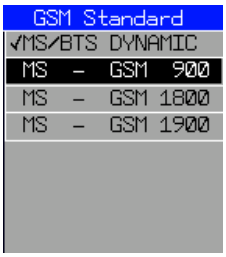
  Bit 1 of the STAT:QUES:LIM:COND register

  Addressed by: CALC:LIM2:..

  The limit line state (whether it is switch ON - "CALC:LIMx:STAT?") and the PASSED/FAILED information ("CALC:LIMx:FAIL?") has to be checked.



The softkey STANDARD controls the behaviour of the extended slot configuration mode for Power vs Time measurements.

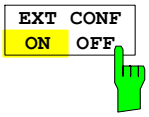


The default value DYNAMIC uses a fixed Power vs Time limit line template. Selecting GSM900, GSM1800 or GSM1900 (mobile station) the limit lines are calculated internally by taking into account special user settings as 'control level' and 'absolute level'.
The actually 4 possibilities to be choosen are:

- MS/BTS DYNAMIC
- MS - GSM 900
- MS - GSM 1800
- MS - GSM 1900

IEC/IEEE bus command:

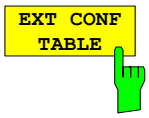
```
:CONFigure[:MS]:ECONfigure:STANdard:SELect
      DYNAMIC | GSM900 | GSM1800 | GSM1900
```



The EXT CONF ON/OFF softkey toggles between standard and extended slot configuration mode. For extended slot configuration a definition table for the GSM slots is taken into account, specifying e.g. the used modulation and the signal level for each slot.

IEC/IEEE bus command:

```
:CONFigure:ECONfigure[:STATe] ON | OFF
```



Opens the extended slot configuration table. This table defines the 8 slots of a GSM signal.

- Equal Slot Length
- Long Slots

For every Slot:

- Modulation
- Reference power mode
- Reference power
- Limit line mask

IEC/IEEE bus command:

```
:CONFigure:ECONfigure:....
```

Example for Extended Slot Configuration

A mixed GSM/EDGE signal has to be measured with following attributes:

- Slot 0: Modulation 8PSK (EDGE), TSC0, used as the reference slot
- Slot 1: OFF
- Slot 2: Modulation GMSK (GSM), relative signal power 0 dB
- Slot 3: Modulation GMSK (GSM), relative signal power -10dB
- Slot 4: Modulation GMSK (GSM), relative signal power 0 dB
- Slot 5: OFF
- Slot 6: OFF
- Slot 7: OFF

Slot 0 is used as reference slot

EXTENDED SLOT CONFIGURATION						
LONG SLOTS ACTIVE	NO			LONG SLOTS	3	7
TRIGGER REFERENCE	0			REF MIDAMBLE	TSC 0	
ONLY ONE FRAME	NO					
ABSOLUTE LEVEL	---					
LIMIT BASE VALUE	---			LIMIT STEP VAL	---	
SLOT NO	MOD.	LEVEL		LIMIT LINE		
		REF	VALUE	CTRLVL	LOWER	UPPER
0	8PSK	REL	0.0		PVTL_E	PVTU_E
1	OFF	REL	0.0			
2	GMSK	REL	0.0		PVTL_G	PVTU_G
3	GMSK	REL	-10.0		PVTL_G	PVTU_G
4	GMSK	REL	0.0		PVTL_G	PVTU_G
5	OFF	REL	0.0			
6	OFF	REL	0.0			
7	OFF	REL	0.0			

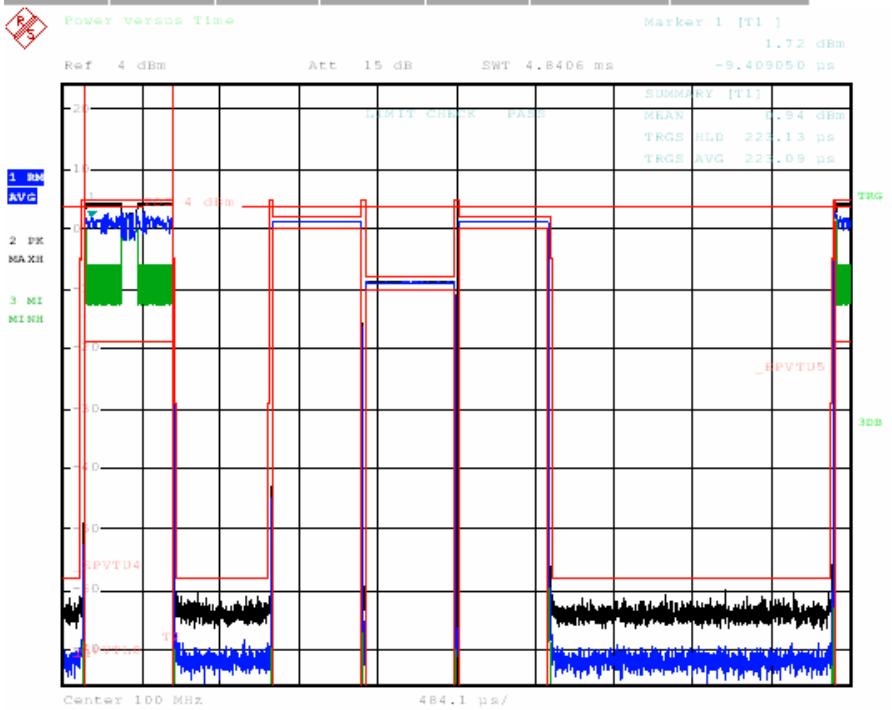


Fig. 1: Full Burst of mixed Edge/GSM signal

Fig. 1 shows the complete frame measured with Power vs Time - FULL BURST.
Using the FALL/RISE ZOOM display will show the timing between individual slots.

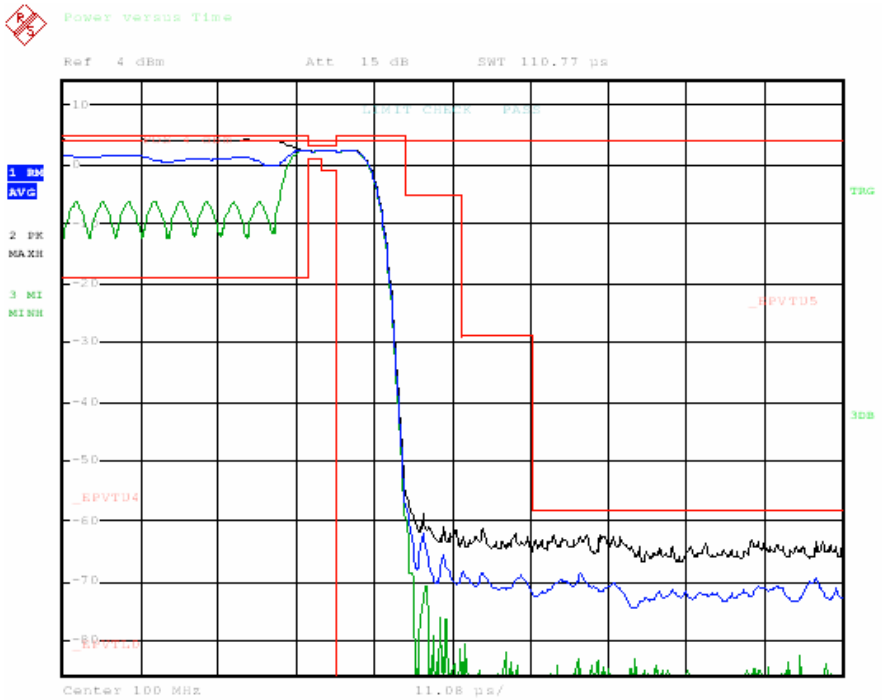


Fig. 2: FALL/RISE ZOOM Transition area between slot 1 and slot 2 selected

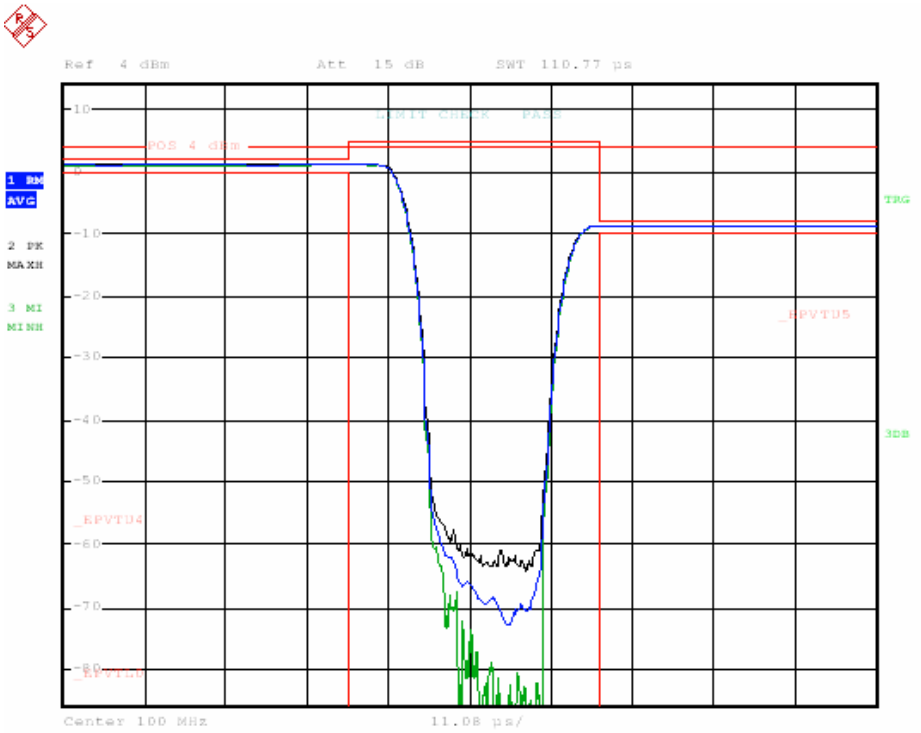


Fig. 3: FALL/RISE ZOOM Transition area between slot 2 and slot 3 selected

Remote Operation R&S FS-K5 GSM/EDGE Application Firmware

CONFigure:ECONfigure[:STATe] ON | OFF

This command activates the extended slot configuration.

Example:
"INST:SEL MGSM" 'Select GSM/EDGE application
"CONF:ECON ON " 'extended slot configuration active

Characteristics:
*RST value: OFF
SCPI: device-specific

CONFigure:ECONfigure:LSLot[:STATe] ON | OFF

This command defines whether a GSM frame contains long slots or not. If this state is switched on both positions of the long slots have to be set with command CONF:ECON:LSL:VAL.

Example:
"INST:SEL MGSM" 'Select GSM/EDGE application
"CONF:ECON:LSL 1" 'extended slot configuration with long slots

Characteristics:
*RST value: OFF
SCPI: device-specific

CONFigure:ECONfigure:LSLot:VALue < slot_number >, <slot_number>

This command defines the long slots of the GSM frame.

Example:
"INST:SEL MGSM" 'Select GSM/EDGE application
"CONF:ECON:LSL:VAL 1,4" 'Slot 1 and slot 4 are long slots

Characteristics:
*RST value: 0
SCPI: device-specific

CONFigure:ECONfigure:TREFerence <slot_number >

This command defines slot used as trigger reference in the extended slot configuration mode.

Example:
"INST:SEL MGSM" 'Select GSM/EDGE application
"CONF:ECON:TREF 4" 'Slot 4 is the trigger reference

Characteristics:
*RST value: 0
SCPI: device-specific

CONFigure:ECONfigure:MREFerence <slot_number >

This command defines the midamble of the reference slot in the extended slot configuration mode.

Example:
"INST:SEL MGSM" 'Select GSM/EDGE application
"CONF:ECON:MREF 2" 'Midamble 2 is used for the reference slot

Characteristics:
*RST value: 0
SCPI: device-specific

CONFigure:ECONfigure:OFRame ON | OFF

This command defines the limit line handling before begin of slot 0 and after end of slot 7 in the extended slot configuration mode.

As default (OFF) the limit checking is additionally done before slot 0 and after slot 7. Here a repetitive signal is required. Slot 7 signal is followed by slot 0 as defined in the configuration table.

In other cases, e.g. if an idle burst follows, it may be required to only check the time period of the frame itself but not the period before slot 0 and after slot 7. Here parameter ON has to be used.

Example:
```
"INST:SEL MGSM"                 'Select GSM/EDGE application
"CONF:ECON:OFR ON"              'only the frame is checked
```

Characteristics: *RST value: OFF
SCPI: device-specific

CONFigure:ECONfigure:SLOT<0 | [1] … 7>:MODulation GMSK | EDGE | OFF]

This command defines the modulation for the selected slot or defines the slot as inactive (OFF). The numeric suffix at SLOT is the GSM slot number.

Example:
```
"INST:SEL MGSM"                 'Select GSM/EDGE application
"CONF:ECON:SLOT1:MOD  GMSK"'Slot 1 uses GSMK,
"CONF:ECON:SLOT2:MOD  OFF"  'Slot 2 is inactive
"CONF:ECON:SLOT3:MOD  EDGE" 'Slot 3 uses EDGE (8PSK)
```

Characteristics: *RST value: 'GMSK for slot 0, OFF for slot 1..7
SCPI: device-specific

CONFigure:ECONfigure:SLOT<0 | [1] … 7>:RLEVel:MODe ABS | REL | <numeric_value>]

This command defines the Reference Level Mode for the selected slot in the extended slot configuration mode. The numeric suffix at SLOT is the GSM slot number.

Example:
```
"INST:SEL MGSM"                 'Select GSM/EDGE application
"CONF: CONF:ECON:SLOT3:RLEV:MODE ABS "      'absolute power for slot 3
```

Characteristics: *RST value: REL for all slots
SCPI: device-specific

CONFigure:ECONfigure:SLOT<0 | [1] … 7>:RLEVel:VALue numeric_value

This command defines the reference power for the selected slot in the extended slot configuration mode. The numeric suffix at SLOT is the GSM slot number.

Example:
```
"INST:SEL MGSM"                 'Select GSM/EDGE application
"CONF: CONF:ECON:SLOT3:RLEV:VAL 5.0"
                                ' sets reference power for slot 3 to 5dB
```

Characteristics: *RST value: 0 dB for all slots
SCPI: device-specific

CONFigure:ECONfigure:SLOT<0 | [1] … 7>:LIMit:LOWer string_value

This command selects the lower limit line 'string_value' for the selected slot in the extended slot configuration mode. The numeric suffix at SLOT is the GSM slot number.

Example: "INST:SEL MGSM" 'Select GSM/EDGE application
"CONF: CONF:ECON:SLOT3:LIM:LOW 'PVTL_G' "
' Use PVTL_G for slot 3.

Characteristics: *RST value: 'PVTL_G' for slot 0
SCPI: device-specific

CONFigure:ECONfigure:SLOT<0 | [1] … 7>:LIMit:UPPer string_value

This command selects the upper limit line 'string_value' for the selected slot in the extended slot configuration mode. The numeric suffix at SLOT is the GSM slot number.

Example: "INST:SEL MGSM" 'Select GSM/EDGE application
"CONF: CONF:ECON:SLOT3:LIM:UPP 'PVTU_G' "
' Use PVTU_G for slot 3.

Characteristics: *RST value: 'PVTU_G' for slot 0
SCPI: device-specific

CONFigure[:MS]:ECONfigure:SLOT<0 | [1] … 7>:LIMit:ABSolute[:STATe] ON | OFF

This command specifies whether absolute limit base values should be taken into account or not upon calculation of the upper limit line(s). In default state OFF, the absolute values are ignored.

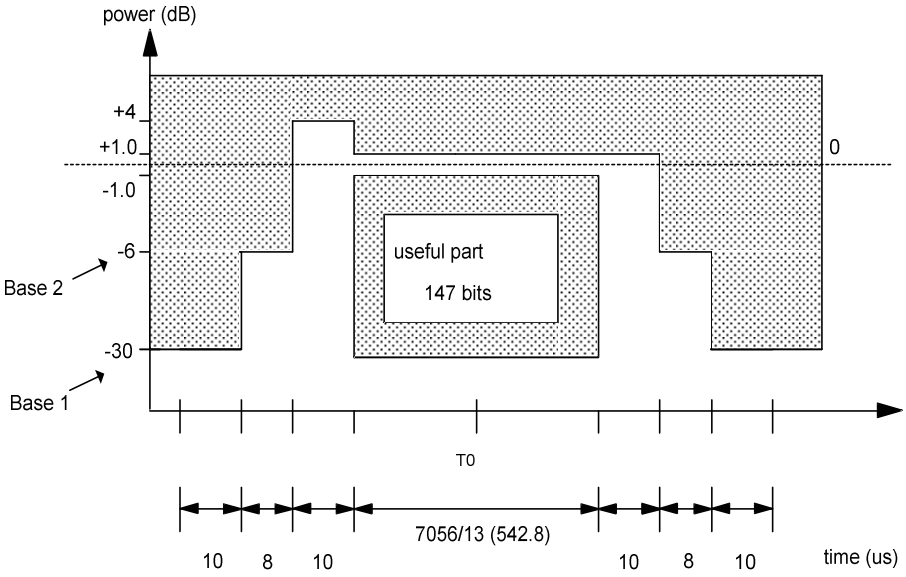
The numeric suffix at SLOT is ignored.

Example: "INST:SEL MGSM" 'Select GSM/EDGE application
"CONF:ECON:STAN:SEL GSM900" 'Select GSM standard
"CONF:ECON:SLOT:LIM:ABS ON" 'In addition uses absolute values

Characteristics: *RST value: OFF
SCPI: device-specific

CONFigure[:MS]:ECONfigure:SLOT<0 | [1] … 7>:LIMit:ABSolute:BASe<[1] | 2> <numeric value>

This command specifies which absolute limit base value should be taken into account upon calculation of the upper limit line(s). 'BASE' or 'BASE1' specifies the value for the line area situated 28 µs and more apart from either side of the useful part of the slot; 'BASE2' provides the value for the region located from 18 µs to 28 µs outside the useful part of the slot at either side.



The provided values are maintained individually for each standard.

The numeric suffix at SLOT is ignored.

Example:

```
"INST:SEL MGSM"                                  'Select GSM/EDGE application
"CONF:ECON:STAN:SEL   GSM900"                    'Select GSM standard
"CONF:ECON:SLOT:LIM:ABS:BASE      -36            'Sets base #1 to -36dBm
"CONF:ECON:SLOT:LIM:ABS:BAS2      -17            'Sets base #2 to -17dBm
```

Characteristics: *RST value: specific to standard

SCPI: device-specific

CONFigure[:MS]:ECONfigure:SLOT<0 | [1] … 7>:LIMit:CLEVel <numeric value>

This command specifies which power control level should be taken into account upon calculation of the upper limit line(s). The provided values are maintained individually for each standard and every slot.

The allowed range depends upon the GSM standard. INC/DEC work according to the absolute power assigned to the control level value. That means, that every INC will increase the nominal absolute power of the mobile even if the numerical value of the control level will decrease.

The numeric suffix at SLOT is the GSM slot number.

Example:

```
"INST:SEL MGSM"                                  'Select GSM/EDGE application
"CONF:ECON:STAN:SEL  GSM1800"                    'Select GSM standard
"CONF:ECON:SLOT0:LIM:CLEV         30             'Sets it to #30 (+34dBm) for slot #0
"CONF:ECON:SLOT7:LIM:CLEV         0              'Sets it to   #0 (+30dBm) for slot #7
```

Characteristics: *RST value: specific to standard

SCPI: device-specific

CONFigure[:MS]:ECONfigure:STANdard:SELect DYNAMIC | GSM850 | GSM900 | GSM1800 | GSM1900

This command controls the behaviour of the extended slot configuration mode. DYNAMIC uses a fixed Power vs Time limit line template. Selecting GSM850, GSM900, GSM1800 or GSM1900 (mobile station) the limit lines are calculated internally by taking into account special user settings as 'control level' and 'absolute level'.

Note: GSM850 is not supported for model R&S FSG with base system version 4.29.

Example:

```
"INST:SEL MGSM"                          'Select GSM/EDGE application
"CONF:ECON ON "                          'extended slot configuration active

"CONF:ECON:STAN:SEL  GSM1800"            'chooses GSM1800
"CONF:ECON:SLOT0:LIM:CLEV      30        'Sets it to #30 (+34dBm) for slot #0
"CONF:ECON:SLOT7:LIM:CLEV      0         'Sets it to   #0 (+30dBm) for slot #7
```

Characteristics: *RST value: DYNAMIC
SCPI: device-specific

READ:BURSt:PTEMplate:REFerence:ECONfigure[:IMMediate]?

This command start the pre-measurement of power vs time and reads out the result in the extended slot configuration mode .The result is output as a list of partial result strings for all active slots separated by ',' in the following (ASCII) format:

<slot number>,<Level1>,<Level2>,<RBW>,

<slot number>,<Level1>,<Level2>,<RBW>

<Level1>: measured level

<Level2>: level corrected by means of the bandwidth

<RBW>: bandwidth

This command is only available in GSM/EDGE mode when measurement of the power vs. time is selected and the extended slot configuration mode.

Example: " READ:BURSt:PTEM:REF:ECON?" 'read the result

Characteristics: *RST value: -
SCPI: device-specific

FETCh:BURSt:PTEMplate:REFerence:ECONfigure[:IMMediate]?

This command reads out the result of the pre-measurement of power vs time in the extended slot configuration mode.The result is output as a list of partial result strings for all active slots separated by ',' in the following (ASCII) format:

<slot number>,<Level1>,<Level2>,<RBW>,

<slot number>,<Level1>,<Level2>,<RBW>

<Level1>: measured level

<Level2>: level corrected by means of the bandwidth

<RBW>: bandwidth

This command is only available in GSM/EDGE mode when measurement of the power vs. time is selected and the extended slot configuration mode.

Example: " FETC:BURS:PTEM:REF:ECON?" 'read the result of the premeasurement

Characteristics: *RST value: -
SCPI: device-specific

Appendix: Contact to our hotline

Any questions or ideas concerning the instrument are welcome 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	888-test-rsa (888-837-8772) (opt 2)
From outside USA	+1 410 910 7800 (opt 2)
Fax	+1 410 910 7801
E-mail	Customer.Support@rsa.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.asia@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) 180 512 42 42
From outside Europe	+49 89 4129 13776
Fax	+49 (0) 89 41 29 637 78
E-mail	CustomerSupport@rohde-schwarz.com