ROHDE&SCHWARZ

Test and Measurement
Division

Release Notes

Firmware Update FSIQ 4.40.3

4.40 with Service Pack 3

for FSIQ3, FSIQ7, FSIQ26, FSIQ40

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Contents

General Information

Manuals for FSIQ Family

The instruments of the FSIQ family are supplied with the following manuals:

Operating Manual, Signal Analyzer FSIQ3, FSIQ7, FSIQ26, FSIQ40; Order No. 1119.5063.xx-02

where xx = 11   (German)
12   (English)
19   (English, US letter format)

Service Manual Instrument, Signal Analyzer FSIQ3, FSIQ7, FSIQ26, FSIQ40; Order No. 1119.5063.xx-02

where xx = 81   (German)
82   (English)
89   (English, US letter format)

Operating Manual, Signal Analyzer FSIQ3, FSIQ7, FSIQ26, FSIQ40; Order No. 1119.5063.13-02

where 13 = 11   French (service manual not included)

Operating Manual, External Mixer Output FSE-B21, Order No. 1084.7350.xx-02-

where xx = 15   (German, English and French)
19   (English, US letter format, -02-)

Manual, Harmonic Mixer, FS-Zxx, Order No. 1089.0982.xx-03-

where xx = 35   (German, English and French)
39   (English, US letter format, -02-)

Software Manual, GSM/DCS/PCS Mobile Tests FSE-K10, Order No. 1057.3140.xx-03

where xx = 41   (German)
42   (English)

„Software Manual EDGE Mobile Tests FSE-K20" Order No. 1106.4105.xx-01

where xx = 41   (German)
42   (English)
49   (English, US letter format)

Software Manual 850 MHz GSM Mobile Tests FSE-K30 Order No. 1140.5117.xx-01

where xx = 44   (German, English)

Software Manual GSM/DCS/PCS Base Station Tests FSE-K11, Order No. 1057.3440.xx-03

where xx = 41   (German)
42   (English)

„Software Manual EDGE Base Station Tests FSE-K21" Order No. 1106.4205.xx-01

where xx = 41   (German)
42   (English)
49   (English, US letter format)

Software Manual 850 MHz GSM Base Station Tests FSE-K31 Order No. 1140.5217.xx-01

where xx = 44   (German, English)

Software Manual cdmaOne Base Station Tests FSIQK71, Order No. 1126.4500.xx-02

where xx =   12   (English)
             19   (English, US letter format)

„Software Manual 3GPP Base Station Test FSIQK72/74" Order No. 1126.4769.xx-07

where xx =   14   (German/English)
             19   (English, US letter format)

„Software Manual 3GPP Mobile Test FSIQK73" Order No. 1153.1038.xx-01

where xx =   14   (German/English)
             19   (English, US letter format)

Update Procedure

The update instructions given in section 1 of this release note are up to date; any deviating instructions in the operating manual are to be ignored.

If you have received this document together with a new analyzer, you can skip section 1.

If you have received the document together with a firmware update kit or as a download together with a self-extracting archive file, you should read section 1.

Documentation of Firmware Modifications

This document covers modifications to the instrument firmware not yet included in the current operating manual.

1 Firmware Update

System Requirements

None

Preparations for Update

No preparations are required.

Contents of Firmware Update Kit

The update kit comprises the following:

- nine 3.5"/1.44 Mbyte disks labeled as follows:

  Disk 1 : „V4.40.2 DISK 1"
  Disk 2 : „V4.40.2 DISK 2"
  Disk 3 : „V4.40.2 DISK 3"
  Disk 4 : „V4.40.2 DISK 4"
  Disk 5 : „V4.40.2 DISK 5"
  Disk 6 : „V4.40.2 DISK 6"
  Disk 7 : „V4.40.2 DISK 7"
  Disk 8 : „V4.40.2 DISK 8"
  Disk 9 : „V4.40.2 DISK 9"

- This document

Update Procedure

1. If you have received a self-extracting archive file per e-mail or as a download

a set of disks must first be created from the archive file.

Proceed as follows:

Ø   Check if you have received all files

disk1.bin	self extracting ZIP file, used to generate update disk 1
data2.cab	packed contents of disk 2, automatically unpacked during FW update
data3.cab	packed contents of disk 3, automatically unpacked during FW update
data4.cab	packed contents of disk 4, automatically unpacked during FW update
data5.cab	packed contents of disk 5, automatically unpacked during FW update
data6.cab	packed contents of disk 6, automatically unpacked during FW update
data7.cab	packed contents of disk 7, automatically unpacked during FW update
data8.cab	packed contents of disk 8, automatically unpacked during FW update
data9.cab	packed contents of disk 9, automatically unpacked during FW update

Keep nine DOS-formatted 3.5" / 1.44 Mbyte disks ready.

Ø   Label disks as follows

FSIQ V4.40.2   DISK1
FSIQ V4.40.2   DISK2
FSIQ V4.40.2   DISK3
FSIQ V4.40.2   DISK4
FSIQ V4.40.2   DISK5
FSIQ V4.40.2   DISK6
FSIQ V4.40.2   DISK7
FSIQ V4.40.2   DISK8
FSIQ V4.40.2   DISK9

Ø   Create a temporary directory on your PC (e.g. FSIQTEMP on C:\). For this you require about 14 Mbyte free memory capacity on your hard disk..

Ø   Copy file disk1.bin to this temporary directory

Ø   Rename file disk1.bin to disk1.exe

Ø   Execute disk1.exe, e.g. by using the following command sequence for Windows95/NT:

   <CTRL><ESC> - RUN – C:\FSIQTEMP\DISK1 - <ENTER> (English version) or
   <CTRL><ESC> - AUSFÜHREN – C:\FSIQTEMP\DISK1 - <ENTER> (German version)

   The files are extracted.

Ø   Delete file disk1.exe in the temporary directory.
   The temporary directory should contain the following files:

inst32i.ex	_isdel.exe	_setup.dll	_sys1.cab	_user1.cab
data.tag	data1.cab	dskcount.txt	lang.dat	layout.bin
os.dat	readme.txt	setup.exe	setup.ini	setup.ins
setup.iss	setup.lid			

Ø   Copy all files to update disk 1 (FSIQ V4.40.2 DISK1).
   Check if all files are on the disk with their correct names. In particular, the underscores ("_" as in "_inst32i_ex_") are essential for a successful update.

Ø   The contents of the other 8 disks are already in the format needed for the update. Files data2.cab, data3.cab, ..., data8.cab must be copied to the corresponding disks DISK2, DISK3, ..., DISK9 .

The disks are now ready, and you can continue with section 2 "If you have received a firmware update kit on a disk ...".

Notes: *If any error messages are output during creation of a disk, the installation process for the disk in question must be repeated. Before re-creating the disk, check if the write protection has been removed.*

2.   If you have received a firmware update kit on a disk ...

You can load the firmware directly from the disk to your signal analyzer.

Ø   Insert the disk DISK 1 into the drive.

Ø   Press the SETUP key and change to the side menu by pressing → key.

Ø   Press the FIRMWARE UPDATE softkey.

Ø   Start the update by pressing the UPDATE softkey and follow the instructions on the analyzer display.

First, the contents of the update disks are copied to the hard disk of the instrument. Then the files are extracted and copied in the directories accordingly. After the extraction, the instrument is rebooted.

The firmware update is complete.

The previous firmware version may be restored using softkey *RESTORE*.
Perform a total calibration (CAL - CAL TOTAL menu) after the firmware update.

3.   If problems occur during the firmware update ...

The new firmware can if necessary also be loaded under NT. This should be done only with an external keyboard and a mouse. Log-in has to be made using the ADMINISTRATOR function, and the device firmware has to be terminated.

Log in as administrator. This procedure is described in the operating manual (PC function), too.

Ø   Press key combination ALT SYSREQ to switch to NT screen if not yet displayed.

Ø   Call up the NT task bar START – SHUT DOWN.

Ø   Select 'Close all programs and logon as different user'.

Ø   Hold the SHIFT key down and press the YES key to leave the input window until the login window
appears.

Ø   Release the SHIFT key as soon as the login window appears.

Ø   Now enter administrator as user name and 894129 as password.

Terminate the device firmware:

Ø   Press the keys CTRL ALT DEL on the external keyboard simultaneously.

Ø   Select the Task Manager.

Ø   Select the Application R&S Analyzer Instrument and terminate it with End Task.

Now the new firmware can be loaded:

Ø   Insert DISK 1 into drive A:

Ø   Start the installation with START RUN A:SETUP. You will be prompted to insert the remaining disks one after the other.

After loading the software, the operating system is rebooted. Then change back from administrator to instrument (password instrument) for the login (see operating manual). This is done in the same way as changing of login to administrator.

Note: *If the firmware is installed in this way, the previous version cannot be restored.*

2 Modifications concerning the Operating Manual

- Extension of the adjacent channel power measurement.
- Setting the input attenuation to 0 dB via roll-key no longer possible
- Method of trace averaging selectable (Analyzer mode, FSE-K10/11/20/21/30/31)
- Input of comment for Trace Export
- Trace Export in vector analyzer mode
- Two additional digital cdma2000 standards in vector analyzer mode
- Recording and transmitting IQ data via remote control (option FSIQB70)
- Level Auto Adjust for the transmission of IQ data by remote control if option FSIQB70 is fitted.
- THD measurement (analog demodulation)
- Changed sweeptime for higher measurement accuracy (FSIQK73))
- Extended range for scrambling code (option FSIQK73)
- Extension of RSIB interface functions for UNIX operating system
- Extension of the IEEE-bus commands

Correction of Operating Manual, Section "Windows-NT Software Installation"

The stated path for starting the reinstallation is only valid for software pack 3 (**"C:\SP3\I386\update"**). To start the reinstallation of software pack 5 path **"C:\SP5\I386\update\update"** has to be entered into the command line.

Additional adjacent channel power standards

ACP STANDARD

ACP STANDARD soft key activates the selection of a digital mobile-radio standard. The parameters for the adjacent channel power measurement are set according to the regulations of the selected standard.

ACP STANDARD
NONE
NADC
TETRA
PDC
PHS
CDPD
CDMA800 FWD
CDMA800 REV
CDMA1900 FWD
CDMA1900 REV
W-CDMA FWD
W-CDMA REV
W-CDMA 3GPP FWD
W-CDMA 3GPP REV
CDMA2000 MC
CDMA2000 DS
CDMA ONE 800 FWD
CDMA ONE 800 REV
CDMA ONE 1900 FWD
CDMA ONE 1900 REV
TD-SCDMA

The following standards can be selected:

NADC (IS-54 B)
TETRA
PDC (RCR STD-27)
PHS (RCR STD-28)
CDPD
CDMA800FWD
CDMA800REV
CDMA1900REV
CDMA1900FWD
W-CDMA FWD
W-CDMA REV
W-CDMA 3GPP FWD
W-CDMA 3GPP REV
CDMA2000 Multi Carrier
CDMA2000 Direct Sequence
CDMA ONE 800 FWD
CDMA ONE 800 REV
CDMA ONE 1900 REV
CDMA ONE 1900 FWD
TD-SCDMA

Input Attenuation 0 dB can no longer be set via Roll-key

In order to prevent the input attenuation from being inadvertently switched off, value 0 dB can only be set via manual input. The input attenuation can only be reduced up to 10 dB via roll-key or UP/DOWN keys.

ASCII Trace Export

The *ASCII CONFIG* menu was extended by softkey COMMENT:

```
                    ASCII
                    CONFIG
 ┌───────────┐     ┌───────────┐
 │  ASCII    │ ⇨   │ EDIT PATH │
 │  CONFIG ⬇ │     └───────────┘
 └───────────┘
                   ┌───────────┐
                   │ DECIM SEP │
                   │  .     ,  │
                   └───────────┘
                   ┌───────────┐
                   │   NEW     │
                   │  APPEND   │
                   └───────────┘
                   ┌───────────┐
                   │  HEADER   │
                   │ ON   OFF  │
                   └───────────┘
                   ┌───────────┐
                   │  ASCII    │
                   │ COMMENT   │
                   └───────────┘
                        ·
                        ·
                        ·
                        ·
                        ⬆
```
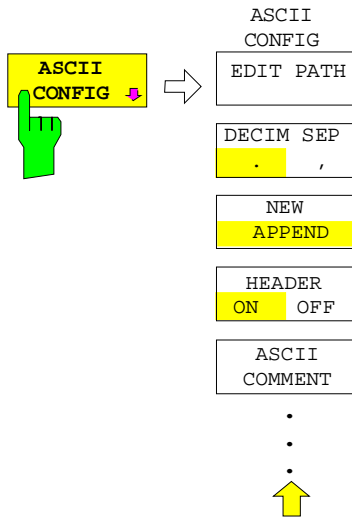
The *ASCII COMMENT* softkey activates the entry of comment concerning the current ASCII data set. A total of 60 characters are available for this purpose.

ASCII trace export is available now in VECTOR ANALYZER mode

```
 ┌───────────┐
 │  ASCII    │
 │  EXPORT   │
 └───────────┘
```

In vector analyzer mode, the *ASCII EXPORT* softkey stores the corresponding trace in a file with ASCII format. For measurement results that are output in tables (Symbol Table, Error Summary, Modulation Summary), this function is not available.
Upon pressing the ASCII EXPORT softkey, a file name can be entered. The default name is TRACE.DAT. Then the measured data of the trace are stored. The function can be configured in the *ASCII CONFIG* submenu (see trace export for analyzer mode).

Structure of the ASCII file:

The file consists of the header containing important measurement and scaling parameters and a data section containing the trace data.
The data of the file header consist of three columns, each separated by a semicolon:
parameter name; numeric value; basic unit
The data section starts with the keyword " Trace <n> " (<n> = number of stored trace), followed by the measured data in one or several columns (depending on measurement) which are also separated by a semicolon.
This format can be read in from spreadsheet calculation programs, e.g. MS-Excel. It is necessary to define ';' as a separator.

1) Format for digital demodulation

	Content of file	Description
File header	Type;FSIQ7;	Instrument model
	Version;4.20;	Firmware version
	Date;13. Feb 2001;	Date of data set storage
	Comment;Test 1;	Comment
	Mode;digital demodulation;	Instrument mode
	Signal;Meas Signal;	Signal: Measurement, reference or error signal
	Measurement;PHASE;	Selected measurement
	Digital Standard;GSM;	Selected digital standard
	Demodulator;DMSK;	Selected demodulation type
	Center Freq;1930200000;Hz	Center frequency
	Freq Offset;0;Hz	Frequency offset
	Ref.Level;-30;dBm	Reference level
	Level Offset;0;dB	Level offset
	RF Att;20;dB	Input attenuator
	Symbol Rate;270833.33;Hz	Symbol rate
	Meas Filter;NONE;	Input filter
	Ref Filter;gauss;	Filter for ideal reference signal
	Alpha BT;0.3000000;	Roll Off factor orproduct of bandwidth/symbol duration
	Result Length;148;Symbols	Number of indicated symbols
	Frame Length;400;Symbols	Number of evaluated symbols
	Points per Symbol;4;	Points per symbol
	Memory Size;16384;	Memory size
	x-Axis Start;0.0;Symbols;	Start value of x axis
	x-Axis Stop;147.75;Symbols;	Stop value of x axis
	y per div;45.0;deg;	Y axis scaling, per division
	Ref Value y-Axis;0.0;deg;	y axis scaling, reference value
	Ref Value Position;50.0;%;	y axis scaling, position of reference value
	Sweep Count;20;	Number of sweeps
	Trace Mode;CLR/WRITE	Trace mode: CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD
Data section of the file	Trace 1:	Selected trace
	x-Unit;Symbols;	Unit of x values:
	y-Unit;deg;	Unit of y values:
	Values;592;	Number of test points
		Measured values:
		<x value>,, <y1>, <y2>
	0.00;44.919303894;	
	0.25;35.109680176;	<y2> being only available with Polar Vector or Polar Constellation.
	0.50;31.512094498;	
	0.75;36.470279694;	
	1.00;49.823390961;	
	...;...;	

Example 1a: GSM Phase Measurement

```
Type;FSIQ7;
Version;4.20;
Date;13. Feb 2001;
Comment;PCS BTS;
Mode;digital demodulation;
Signal;Meas Signal;
Measurement;PHASE;
Digital Standard;GSM;
Demodulator;DMSK;
Center Freq;1930200000.000000;Hz;
Freq Offset;0.000000;Hz;
Ref. Level;-10.000000;dBm;
Level Offset;0.000000;dB;
RF Att;20.000000;dB;
Symbol Rate;270833.333330;Hz;
Meas Filter;NONE;
Ref Filter;gauss;
Alpha BT;0.300000;
Result Length;148;Symbols;
Frame Length;400;Symbols;
Points per Symbol;4;
Memory Size;16384;
x-Axis Start;0.000000;Symbols;
x-Axis Stop;147.750000;Symbols;
y per div;45.000000000;deg;
Ref Value y-Axis;0.000000;deg;
Ref Value Position;50.000000;%;
Sweep Count;0;
Trace Mode;CLR/WRITE;
TRACE 1:
x-Unit;Symbols;
y-Unit;deg;
Values;592;
0.000000;44.919303894;
0.250000;35.109680176;
0.500000;31.512094498;
0.750000;36.470279694;
1.000000;49.823390961;
…
```

Example 1b: Polar Vector Measurement

```
Type;FSIQ7;
Version;4.20;
Date;13. Feb 2001;
Comment;;
Mode;digital demodulation;
Signal;Error Signal;
Measurement;IQ POLAR VECTOR;
Digital Standard;None;
Demodulator;DMSK;
Center Freq;1930200000.000000;Hz;
Freq Offset;0.000000;Hz;
Ref. Level;-10.000000;dBm;
Level Offset;0.000000;dB;
RF Att;20.000000;dB;
Symbol Rate;270833.333330;Hz;
Meas Filter;NONE;
Ref Filter;raised cos;
Alpha BT;0.300000;
Result Length;148;Symbols;
Frame Length;400;Symbols;
Points per Symbol;4;
Memory Size;16384;
x-Axis Start;-12.500000;NONE;
x-Axis Stop;12.500000;NONE;
y per div;2.000000000;%;
Ref Value y-Axis;0.000000;%;
Ref Value Position;50.000000;%;
Sweep Count;0;
Trace Mode;CLR/WRITE;
TRACE 1:
x-Unit;NONE;
y-Unit;%;
Values;592;
0.000000;-1.167166233;0.299441814;
0.250000;7.433214664;5.665826797;
0.500000;16.573915482;9.026193619;
0.750000;22.309810638;12.612837791;
1.000000;19.233440399;17.377298355;
…
```

2) Format for analog demodulation

	Content of file	Description
File header	Type;FSIQ7;	Instrument model
	Version;4.20;	Firmware version
	Date;13. Feb 2001;	Date of data set storage
	Comment;Test 1;	Comment
	Mode;analog demodulation;	Instrument mode
	Signal;AF Signal;	AF mode
	Measurement;AM Signal;	Type of demodulation (AM, FM, PM)
	Coupling;AC COUPLING;	AC or DC coupling
	Real Time;OFF;	Real time demodulation (on/off)
	Center Freq;930200000;Hz;	Center frequency
	Freq Offset;0.000000;Hz;	Frequency offset
	Ref. Level;-10.000000;dBm;	Reference level
	Level Offset;0.000000;dB;	Level offset
	RF Att;20.000000;dB;	Input attenuation
	Demod BW;100000.000000;Hz;	Demodulation bandwidth
	x-Axis Start;0.000000;s;	Start value of x axis
	x-Axis Stop;0.005000000;s;	Stop value of x axis
	y per div;50.0;%;	Y axis scaling, per division
	Ref Value y-Axis;0.0;%;	Y axis scaling, reference value
	Ref Value Position;50.0;%;	Y axis scaling, position of reference value
	Sweep Count;0;	Number of sweeps set
	Trace Mode;CLR/WRITE;	Trace mode: CLR/WRITE,AVERAGE,MAXHOLD,MINHOLD
Data section of the file	Trace 1:	Selected trace
	x-Unit;s;	Unit of x values
	y-Unit;%;	Unit of y values
	Values;625;	Number of test points
		Measured values:
		$\quad$ <x value>; <y value>;
	0.0;-28.4;	
	0.008e-003;-28.4;	
	0.016e-003;-28.5;	
	0.024e-003;-28.5;	
	0.032e-003;-28.4;	
	...;...;	

Example 2: Analog Demodulation

```
Type;FSIQ7;
Version;4.20;
Date;13. Feb 2001;
Comment;Test 1;
Mode;analog demodulation;
Signal;AF Signal;
Measurement;AM Signal;
Coupling;AC COUPLING;
Real Time;OFF;
Center Freq;1930200000.000000;Hz;
Freq Offset;0.000000;Hz;
Ref. Level;-10.000000;dBm;
Level Offset;0.000000;dB;
RF Att;20.000000;dB;
Demod BW;100000.000000;Hz;
```

```
x-Axis Start;0.000000;s;
x-Axis Stop;0.005000000;s;
y per div;50.000000000;%;
Ref Value y-Axis;0.000000;%;
Ref Value Position;50.000000;%;
Sweep Count;0;
Trace Mode;CLR/WRITE;
TRACE 1:
x-Unit;s;
y-Unit;%;
Values;625;
0.000000;-28.418941498;
0.008012821e-003;-28.434963226;
0.016025641e-003;-28.550777435;
0.024038462e-003;-28.536586761;
0.032051282e-003;-28.461055756;
```

Selection of Trace Averaging Method

Section "Trace Selection and Setup" of the operating manual was extended to include the selection of the trace averaging mode.

TRACE 1 right side menu:

The *AVERAGE LIN/LOG* softkey switches between linear and logarithmic averaging in case of logarithmic level display.
In case of logarithmic averaging, the dB values of the display voltage are averaged, in case of linear averaging the level values in dB are converted into linear voltages or powers prior to averaging. These voltages or powers are averaged and then again converted into level values.

For stationary sinewave signals the two averaging methods yield the same result.

Logarithmic averaging is recommended if sinewave signals are to clearly stand out against the noise since, with this averaging, noise suppression is greater while the sinewave signals remain unchanged.

IEC/IEEE command   :[SENSe<1|2>:]AVERage:TYPE VIDeo|LINear

This softkey is also available for GSM application firmware FSE-K10/K11 in Power vs. Time and Carrier Power measurements.

New Digital cdma2000 Standards

The two new digital standards cdma2000 SR1/DS FWD and cdma2000 SR1/DS REV were implemented in addition to existing standard cdma2000 SR3/DS FWD.

Extended DIGITAL STANDARDS menu:

```
┌──────────┐      DIGITAL      DIGITAL      DIGITAL        CDMA 2000
│ DIGITAL  │ ►   STANDARDS    STANDARDS    STANDARDS   ┌──────────────┐
│STANDARDS │    ┌──────────┐ ┌──────────┐ ┌──────────┐ │  CDMA 2000   │
└──────────┘    │  PDC UP  │ │IS95-CDMA │ │   CT2    │ │ SR1/DS FWD   │
   👆           │          │ │ FWD CH   │ │          │ └──────────────┘
                └──────────┘ └──────────┘ └──────────┘ ┌──────────────┐
                ┌──────────┐ ┌──────────┐ ┌──────────┐ │  CDMA 2000   │
                │ PDC DOWN │ │IS95-CDMA │ │  ERMES   │ │ SR1/DS REV   │
                │          │ │ REV CH   │ │          │ └──────────────┘
                └──────────┘ └──────────┘ └──────────┘ ┌──────────────┐
                ┌──────────┐ ┌──────────┐ ┌──────────┐ │  CDMA 2000   │
                │  NADC    │ │ W-CDMA   │ │ MODACOM  │ │ SR3/DS FWD   │
                │ FWD CH   │ │4.096 FWD │ │          │ └──────────────┘
                └──────────┘ └──────────┘ └──────────┘ ┌──────────────┐
                ┌──────────┐ ┌──────────┐ ┌──────────┐ │              │
                │  NADC    │ │ W-CDMA   │ │ FLEX16_2 │ └──────────────┘
                │ REV CH   │ │4.096 REV │ │          │
                └──────────┘ └──────────┘ └──────────┘
```
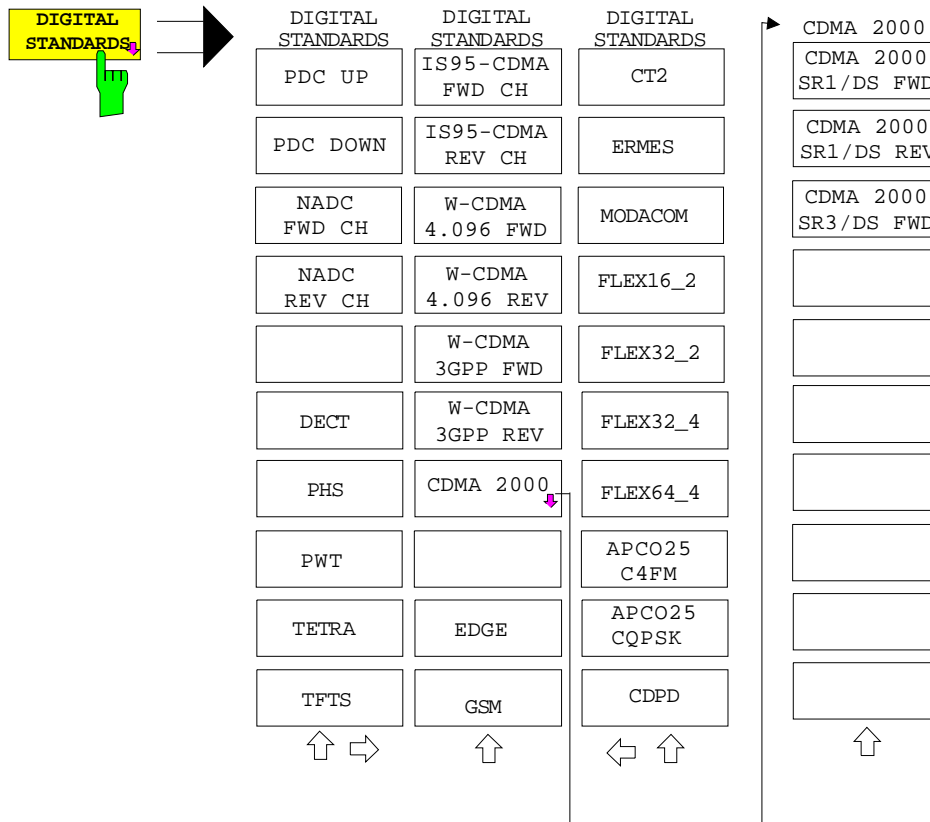
Extension of table "Standard Settings"

Modulation/ standard	Symbol rate	Meas filter	Ref filter	Alpha BT	Synchro- nization	Sync pattern	SYNC offset	Points/ symbol
CDMA 2000 SR3/DS FWD QPSK	3.6864 MHz	IS95_FM	IS95_FR	--	--	--	--	4
CDMA2000 SR1/DS FWD QPSK	1.2288 MHz	IS95_FM	IS95_FR	--	--	--	--	4
CDMA2000 SR1/DS REV QPSK	1.2288 MHz	IS95_RM	IS95_RR	--	--	--	--	4

THD Measurement (VECTOR ANALYZER Mode, Analog Demodulation)

```
┌──────────────┐           SUMMARY
│   SUMMARY     │           SETTINGS
│  SETTINGS ↓   │─────►  ┌──────────────┐
└──────────────┘        │   AVERAGE/    │
   👆                    │   HOLD ON     │
                         └──────────────┘
                         ┌──────────────┐
                         │    SWEEP      │
                         │    COUNT      │
                         └──────────────┘
                         ┌──────────────┐
                         │   REL UNIT    │
                         │   %      dB   │
                         └──────────────┘
                         ┌──────────────┐
                         │  INDICATION   │
                         │  ABS    REL   │
                         └──────────────┘
                         ┌──────────────┐
                         │     SET       │
                         │  REFERENCE    │
                         └──────────────┘
                         ┌──────────────┐
                         │   MEAS->REF   │
                         └──────────────┘
                         ┌──────────────┐
                         │               │
                         └──────────────┘
                         ┌──────────────┐
                         │  SINAD 1kHz   │
                         │  ON     OFF   │
                         └──────────────┘
                         ┌──────────────┐
                         │    %THD       │
                         │  ON     OFF   │
                         └──────────────┘
```

```
┌──────────────┐
│    % THD      │
│  ON     OFF   │
└──────────────┘
   👆
```
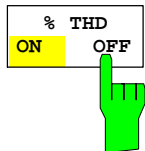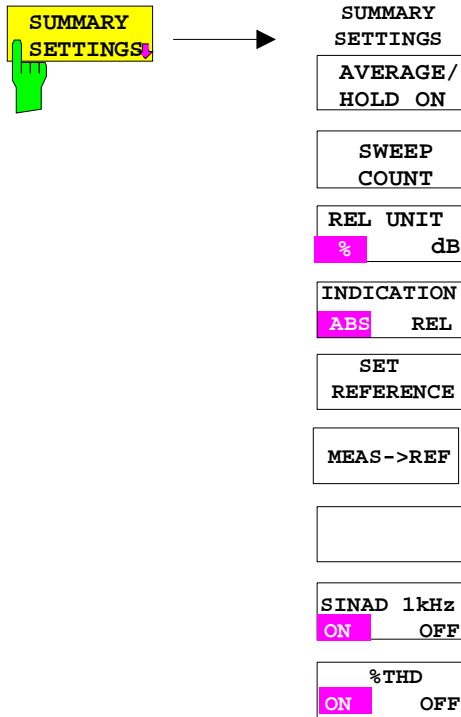
REAL TIME ON only.

The *%THD ON/OFF* softkey activates the %THD measurement (= similar to SINAD measurement, but result displayed in %) for the main modulation signal.

Irrespective of the signal applied, the main modulation signal is compared with the main modulation signal which is filtered by a 1-kHz notch filter. The display unit is %.

When a signal modulated with 1 kHz is applied, the %THD value is thus displayed correctly.
Default setting is *%THD OFF*.

With **REAL TIME OFF** (no real-time demodulation) no *%THD* measurement is possible, the softkey cannot be operated.

IEC/IEEE-bus command: `:CALC:MARK:FUNC:ADEM:SIN:THD[:STAT] ON`
                       `:CALC:MARK:FUNC:ADEM:SIN:RES?`

FSIQK73: Modified sweeptime for higher measurement accuracy

Within the SPECTRUM EMISSION measurement the default sweeptime has been changed to two seconds in order to reach a higher measurement accuracy. The sweeptime can be manually changed by the user.

FSIQK73: Extended range for scrambling code

The range for the scrambling code now reaches from 0 to 0xFFFFFF (0 .. 2^{24} –1). In FW release 4.20 the range was 0 to 0xFFFFF (0 .. 2^{20} –1), in earlier versions it was 0 .. 0xFFFF (0 .. 2^{16} –1).

RSIB Interface - Unix Environment

An Unix operating system can be installed on an external computer in addition to a Windows operating system. In this case, the control applications are created either in C or C++. The supported Unix operating systems include:

- · Sun Solaris 2.6 Sparc Station
- · Sun Solaris 2.6 Intel Platform
- · Red Hat Linux 6.2 x86 Processors

In order to access the measuring equipment via the RSIB interface, copy the `librsib.so.X.Y` file to a directory for which the control application has read rights. `X.Y` in the file name indicates the version number of the library, for example `1.0`.

The `librsib.so.X.Y` library is created as a *shared library*. The applications using the library have nothing to do with versions. They simply link the library with the `lrsib` option. The following instructions have to be observed so that linking can be successfully performed and the library can be found during the program run:

File link:
- Use the operating system command *ln* to create a file with the link name `librsib.so` and pointing to `librsib.so.X.Y` in a directory for which the control application has read rights. Example:

      $ ln –s /usr/lib/librsib.so.1.0 /usr/lib/librsib.so

Linker options for creating applications:
- `–lrsib` : import library

- `-Lxxx` : path information where the import library can be found. This is where the above file link has been created. Example: `–L/usr/lib`.

Additional linker options for creating applications (only under Solaris):
- `–Rxxx`: path information where the library is searched for during the program run: `–R/usr/lib`.

Run-time environment:
- Set environment variable `LD_RUN_PATH` to the directory in which the file link has been created. This is necessary only if `librsib.so` cannot be found in the standard search path of the operating system and the `–R` linker option (only Solaris) was not specified.

For C/C++ programming, the declarations of the library functions and the definition of error codes are contained in:

C/C++:   'RSIB.H'   (D:\R_S\Instr\RSIB)

RSIB Interface Functions

This section describes all functions of DLL `"RSIB.DLL"`, `"RSIB32.DLL"` or `"librsib.so"` by means of which control applications can be written.

Error variable iberr

If the ERR bit (8000h) is set in the status word, `iberr` contains an error code that specifies the error. The RSIB has error codes of its own independent of the National Instrument interface.

Error	Error code	Description
`IBERR_FILE`	7	Error in reading from or writing to a file.

RSDLLibfind()

The function provides a handle for access to the device with the name `udName`.

C format (Unix): `short RSDLLibfind( char *udName, short *ibsta, short *iberr, unsigned long *ibcntl)`

RSDLLibwrt

This function sends data to the device with the handle `ud`.

C format (Unix): `short RSDLLibwrt( short ud, char *Wrt, short *ibsta, short *iberr, unsigned long *ibcntl )`

RSDLLilwrt

This function sends `Cnt` bytes to a device with the handle `ud`.

C format (Unix): `short RSDLLilwrt( short ud, char *Wrt, unsigned long Cnt, short *ibsta, short *iberr, unsigned long *ibcntl)`

RSDLLibwrtf

This function sends `Cnt` bytes to a device with the handle `ud`.

C format (Unix): `short RSDLLilwrt( short ud, char *Wrt, unsigned long Cnt, short *ibsta, short *iberr, unsigned long *ibcntl)`

RSDLLibrd()

The function reads data from the device with the handle `ud` into the string `Rd`.

C format (Unix): `short RSDLLibrd( short ud, char *Rd, short *ibsta, short *iberr, unsigned long *ibcntl )`

RSDLLilrd

This function reads `Cnt` bytes from the device with the handle `ud`.

C format (Unix): `short RSDLLilrd( short ud, char *Rd, unsigned long Cnt, short *ibsta, short *iberr, unsigned long *ibcntl )`

RSDLLibrdf()

Reads data from the device with the handle `ud` into the file `file`.

C format (Unix): `short RSDLLibrd( short ud, char *file, short *ibsta, short`
`              *iberr, unsigned long *ibcntl )`

RSDLLibtmo

This function defines the timeout for a device. The default value for the timeout is set to 5 seconds.

C format (Unix): `short RSDLLibtmo( short ud, short tmo, short *ibsta, short`
`              *iberr, unsigned long *ibcntl )`

RSDLLibsre

This function sets the device to the 'LOCAL' or 'REMOTE' state.

C format (Unix): `short RSDLLibsre( short ud, short v, short *ibsta, short`
`              *iberr, unsigned long *ibcntl)`

RSDLLibloc

This function temporarily switches the device to the 'LOCAL' state.

C format (Unix): `short RSDLLibloc( short ud, short *ibsta, short *iberr,`
`              unsigned long *ibcntl)`

RSDLLibeot

This function enables or disables the END message after write operations.

C format (Unix): `short RSDLLibsre( short ud, short v, short *ibsta, short`
`              *iberr, unsigned long *ibcntl)`

RSDLLibrsp

This function performs a serial poll and provides the status byte of the device.

C format (Unix): `short RSDLLibrsp( short ud, char *spr, short *ibsta, short`
`              *iberr, unsigned long *ibcntl)`

RSDLLibonl

This function switches the device to 'online' or 'offline' mode. When it is switched to 'offline' mode, the interface is released and the device handle becomes invalid. By calling RSDLLibfind again, the communication is set up again.

C format (Unix): `short RSDLLibonl( short ud, short v, short *ibsta, short`
`              *iberr, unsigned long *ibcntl)`

RSDLLTestSRQ

This function checks the status of the SRQ bit.

C format (Unix):   `short RSDLLTestSrq( short ud, short *result, short *ibsta,`

RSDLLWaitSrq

This function waits until the device triggers an SRQ with the handle `ud`.

C format (Unix): `short RSDLLWaitSrq( short ud, short *result, short *ibsta, short *iberr, unsigned long *ibcntl)`

RSDLLSwapBytes

This function changes the display of binary numbers on non-Intel platforms.

VB format:	Not provided at present since it is required only on non-Intel platforms.
C format:	`void FAR PASCAL RSDLLSwapBytes( void far *pArray, const long size, const long count)`
C format (Unix):	`void RSDLLSwapBytes( void *pArray, const long size, const long count)`
Parameter:	`pArray` Array in which modifications are made
	`size` Size of a single element in `pArray`
	`count` Number of elements in `pArray`
Example:	`RSDLLSwapBytes( Buffer, sizeof(float), ibcntl/sizeof(float))`

This function swaps the display of various elements from *Big Endian* to *Little Endian* and vice versa. It is expected that a coherent storage area of elements of the same file type (`size` byte) is transferred to `pArray`. This function has no effect on Intel platforms.

Different types of processor architecture store data in different byte sequences. For example, Intel processors store data in the reverse order of Motorola processors. Comparison of byte sequences:

Byte sequence	Use in	Display in memory	Description
Big Endian	Motorola processors, network standard	Most significant byte at least significant address	The *most significant* byte is at the left end of the word.
Little Endian	Intel processors	Least significant byte at least significant address	The *most significant* byte is at the right end of the word.

Additional IEEE-Bus Commands

This firmware was extended by the following IEEE-bus commands or IEC/IEEE command parameters.

The commands are listed in alphabetical order. In the individual description, the complete notation of the command is given. An example for each command, the *RST value and the SCPI information is written out at the end of the individual description. The modes for which a command can be used are indicated by the following abbreviations:

A	Spectrum analysis
A-F	Spectrum analysis - frequency domain only
A-Z	Spectrum analysis - time domain only (zero span)
VA	Vector signal analysis
VA-D	Vector signal analysis - digital demodulation
VA-A	Vector signal analysis - analog demodulation
BTS	GSM BTS analysis (option FSE-K11)
MS	GSM MS analysis (option FSE-K10)
CDP	cdma One Base Station Tests (option FSIQK71)
WCDP	3GPP Base Station or Mobile Tests (option FSIQK72/FSIQK73/FSIQK74)

Note: *The spectrum analysis (analyzer) and vector signal analysis (vector analyzer) modes are implemented in the basic unit For the other modes, the corresponding options are required.*

CALCulate - Subsystem

:CALCulate<1|2>:LIMit<1 to 8>:ACTive?

This command queries the names of all activated limit lines. The names are output in alphabetical order. If no limit line is activated, an empty string will be output. The numeric suffixes in CALCulate<1|2> and LIMit<1 to 8> are not significant.

Example: `":CALC:LIM:ACT?"`

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

Mode: A, VA, BTS, MS

:CALCulate<1|2>:LIMit<1...8>:BURSt:PFERror?

This command queries the total result of the phase/frequency measurement.

Parameter: Result: 1   PASS
                 0   FAILED

Example: `"CALC:LIM:BURS:PFER?"`
           `Result:`   `1`

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

Mode: BTS, MS

This command is a query and therefore not assigned a *RST-value. The numeric suffixes <1|2> and <1...8> are not significant for this command.

:CALCulate<1|2>:LIMit<1...8>:ESPectrum:MODE AUTO | MANual | USER

This command switches on or off the automatic selection of limit lines for spectrum emission mask measurements.

Parameter:	AUTO	the set limit line depends on the measured channel power
	MANUAL	one of four fixed limit lines is activated. The limit line is selected using command `CALC:LIM:ESP:VAL`
	USER	only query possible, user-defined limit lines are switched on (see manual of option for description of limit line functions)
Example:	`":CALC:LIM:ESP:MODE AUTO"`	
Features:	*RST value:	AUTO
	SCPI:	device-specific
Mode:	WCDP	

The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

:CALCulate<1|2>:LIMit<1...8>:ESPectrum:VALue <numeric_value>

This command switches to manual selection of limit lines. The limit line is selected by entering the value of the expected power. Depending on this value one of four fixed limit lines is activated. The table also shows the corresponding value returned by the query.

Expected power in dBm	selected limit line	returned value
value $\geq$ 43	"P $\geq$ 43"	43
39 $\leq$ value < 43	"39 $\leq$ P < 43"	39
31 $\leq$ value < 39	"31 $\leq$ P < 39"	31
value < 31	"P < 31"	0

Example:	`":CALC:LIM:ESP:VAL 41"`	limit line "39 $\leq$ P < 43" is activated
Features:	*RST value:	0
	SCPI:	device-specific
Mode:	WCDP	

The numeric suffixes <1|2> or <1 to 8> are not significant for this command.

:CALCulate<1|2>:LIMit<1 to 8>:LOWer:STATe ON | OFF

This command defines the selected limit line as lower limit line.

Example:	`":CALC:LIM:LOWer:STAT ON"`	
Features:	*RST value:	OFF
	SCPI:	conforming
Modes:	A, VA, BTS, MS	

The limit check is switched on with command `CALCulate:LIMit:STATe ON`. The result of the limit check can be queried with `CALCulate:LIMit:FAIL?`.

:CALCulate<1|2>:LIMit<1 to 8>:UPPer:STATe ON | OFF

This command defines the selected limit line as upper limit line.

Example:	`":CALC:LIM:UPPer:STAT ON"`	
Features:	*RST value:	OFF
	SCPI:	conforming
Modes:	A, VA, BTS, MS	

The limit check is switched on with command `CALCulate:LIMit:STATe ON`. The result of the limit check can be queried with `CALCulate:LIMit<1 to 8>:FAIL?`.

:CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:SINad:RESult?

This command queries the results of the SINAD or of the THD measurement. For SINAD the result is given in dB, for THD in percent.

Example:	`":CALC:MARK:FUNC:ADEM:SIN:RES?"`

Features:	*RST-Value:	-
	SCPI:	device-specific

Mode:	VA-A

This command is only a query which is why it is not assigned an *RST value.

:CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:SINad:THD[:STATe] ON | OFF

This command switches the THD measurement on or off. SINAD and THD can not be active at the same time. The result is queried with the same command as the result of the SINAD measurement (see above).

Example:	`":CALC:MARK:FUNC:ADEM:SIN:THD ON"`

Features:	*RST-Value:	OFF
	SCPI:	device-specific

Mode:	VA-A

This command is valid only in the analog demodulation mode with Real Time ON.

:CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:CRESt?

This command queries the crest factor of the time domain measurement of applications FSIQK71/K72/K73.

Example:	`"CALC:MARK:FUNC:CRES?"`

Features:	*RST value:	-
	SCPI:	device-specific
Mode:	CDP, WCDP	

:CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:PRESet
      NADC | TETRA | PDC | PHS | CDPD | FWCDma | RWCDma | FW3Gppcdma |
      RW3Gppcdma| F8CDma | R8CDma | F19Cdma | R19Cdma | M2CDma| D2CDma |
      FO8Cdma | RO8Cdma | **FO19CDMA | RO19CDMA | TCDMa** | NONE

This command selects the settings for power measurement of one of the standards.

Example:	`"CALC:MARK:FUNC:POW:PRES NADC"`

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

Mode:	A-F

F8CDma	CDMA800 forward	R8CDma	CDMA800	reverse
F19Cdma	CDMA1900 forward	R19Cdma	CDMA1900	reverse
FWCDma	W-CDMA forward	RWCDma	W-CDMA	reverse
FW3Gppcdma	W-CDMA 3GPP forward	RW3Gppcdma	W-CDMA 3GPP	reverse
M2CDma	CDMA2000 Multi Carrier	D2CDma	CDMA2000 Direct Sequence	
FO8Cdma	CDMA One 800 forward	RO8Cdma	CDMA One 800	reverse
FO19CDMA	**CDMA One 1900 forward**	**RO19CDMA**	**CDMA One 1900**	**reverse**
TCDMa	**TC-SCDMa**			

The selection of a standard influences the parameters weighting filter, channel bandwidth and spacing, resolution and video bandwidth, as well as detector and sweep time.

:CALCulate<1|2>:MARKer<1...4>:FUNCtion:WCDPower[:BTS]:RESult?
    PTOTal | FERRor | TFRame | TOFFset | MACCuracy | PCDerror | EVMRms | EVMPeak |
    CERRor | CSLot | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOFfset | IQIMbalance |
    MTYPE

This command queries the measured and calculated results of the WCDMA code domain power measurement.

PTOTal	total power	FERRor	frequency error in Hz
TFRame	trigger to frame	TOFFset	timing offset
MACCuracy	composite EVM	PCDerror	peak code domain error
EVMRms	error vector magnitude RMS	EVMPeak	error vector magnitude peak
CERRor	chip rate error	CSLot	channel slot number
SRATe	symbol rate	CHANnel	channel number
CDPabsolute	channel power absolute	CDPRelative	channel power relative
IQOFfset	IQ offset	IQIMbalance	IQ imbalance
MTYPE	modulation type (2: QPSK, 4: 16QAM, 15: slot switched off)		

Mode: WCDP (K72, K73, K74)

Example: `":CALC:MARK:FUNC:WCDP:RES? PTOT"`

Features: *RST value: `--`
                    SCPI: device-specific

CONFigure - Subsystem

:CONFigure[:BTS]:ARFCn   <numeric_value>

This command selects the number of the transmission channel of the base station.

Parameter: <numeric_value>::=

	1 to 124	(P-GSM phase I/II)
	0 to 124, 975 to 1023	(E-GSM)
	0 to 124, 955 to 1023	(R-GSM)
	512 to 885	(DCS1800 phase I/II/II+)
	512 to 810	(PCS1900)
	128 to 251	**(GSM850)**

Example: `":CONF:ARFC 67"`

Features: *RST value: 1   (P-GSM phase I/II)
                                 0   (E-GSM; R-GSM)
                                 512   (DCS1800 phase I/II/II+)
                                 512   (PCS1900)
                                 128   **(GSM850)**
                  SCPI: device-specific

Mode: BTS

:CONFigure[:BTS]:LIMit:PPEak <numeric_value>

This command determines the phase error limits in degrees for the phase/frequency measurement (peak value).

Example: `":CONF:LIM:PPE 66"`

Features: *RST value: depends on selected standard
                  SCPI: device specific

Mode: BTS

For firmware 4.20 and higher, the query `:CONFigure[:BTS]:LIMit:PPEak?` reads out the error limits currently used in the measurement. I.e., if the standard limits are used, these limits are read out, and if the user limits are used, the set user limits are read out. For firmware versions < 4.20, always the user limits were read out even if the standards limits were used.
This modification also applies to the following commands:

:CONFigure[:BTS]:LIMit:PRMS
:CONFigure[:BTS]:LIMit:EVMRms
:CONFigure[:BTS]:LIMit:EVMPeak
:CONFigure[:BTS]:LIMit:OSUPpress
:CONFigure[:BTS]:LIMit:PERCentile
:CONFigure[:BTS]:LIMit:FREQuency
:CONFigure[:MS]:LIMit:PPEak
:CONFigure[:MS]:LIMit:PRMS
:CONFigure[:MS]:LIMit:EVMRms
:CONFigure[:MS]:LIMit:EVMPeak
:CONFigure[:MS]:LIMit:OSUPpress
:CONFigure[:MS]:LIMit:PERCentile
:CONFigure[:MS]:LIMit:FREQuency

:CONFigure[:BTS]:POWer:CLASs <numeric_value> | M1 | M2 | M3 | P1

This command selects the power class of the base station.

Parameter:	<numeric_value>	::= 1...8 (P-GSM Phase I/II, E-, R-GSM, **GSM850**)
		::= 1...4 (PCS1900, DCS1800 Phase I/II/II+)
	M1, M2, M3	::= Power Classes for Micro BTS
	P1	::= Power Class for Pico BTS
Example	`":CONF:BTS:POW:CLAS 4"`	
Features:	*RST value:	4 (P-GSM Phase I/II, E-GSM, RGSM, **GSM850**)
		1 (DCS1800, PCS1900)
	SCPI:	device specific
Mode:	BTS	

:CONFigure[:BTS]:POWer:EXPected   <numeric_value>

This command enters directly the rated output level of the base station specified by the manufacturer.

Example:	`":CONF:POW:EXP 43DBM"`	
Features:	*RST value:	46 dBm (P-GSM phase I/II, E-GSM, R-GSM, **GSM850**)
		43 dBm (DCS1800, PCS1900)
	SCPI:	device-specific
Mode:	BTS	

:CONFigure:BURSt:PFERror:CONDition NORMal | EXTReme

This command defines the conditions for phase-frequency measurement.

Example:	`":CONF:BURS:PFER:COND EXTR"`	
Features:	*RST value:	NORMal
	SCPI:	device-specific

Modes: BTS, MS

:CONFigure:IS95:MEASurement   POWer | ACPR | MODulation | CDPower | FDOMain | TDOMain

This command selects the measurement mode of application FSIQK71, cdmaOne base station tests. The defined settings of the modes are described in detail in the operating manual of the application.

Parameter:	POWer	Channel power measurement with defined settings.
	ACPR	Adjacent channel power measurement with defined settings.
	MODulation	RHO factor measurement in vector analyzer mode.
	CDPower	Code domain power measurement
	FDOMain	Overview measurement with defined setting in frequency

domain
of analyzer mode.

	TDOMain	Measurement of cdmaOne signal CREST factor in time domain
Example:	":CONF:IS95:MEAS MOD"	
Features:	*RST value:	POWer
	SCPI:	device-specific
Modes	CDP	

:CONFigure[:MS]:ARFCn   <numeric_value>

This command selects the number of the transmission channel of the mobile station.

Parameter:	<numeric_value>::=	1 to 124	(P-GSM phase I/II)
		0 to 124, 975 to 1023	(E-GSM)
		0 to 124, 955 to 1023	(R-GSM)
		512 to 885	(DCS1800 phase I/II/II+)
		512 to 810	(PCS1900)
		128 to 251	**(GSM850)**
Example:	":CONF:ARFC 67"		
Features:	*RST value:	1	(P-GSM phase I/II)
		0	(E-GSM; R-GSM)
		512	(DCS1800 phase I/II/II+)
		512	(PCS1900)
		128	**(GSM850)**
	SCPI:	device-specific	
Mode:	MSS		

:CONFigure[:MS]:POWer:CLASs   <numeric_value> | EG1 | EG2 | EG3

This command selects the power class of the mobile.

Parameter:	<numeric_value>	::= 1...5 (P-GSM Phase I)
		::= 2...5 (P-GSM Phase II, **GSM850**)
		::= 2...5 (E-GSM, R-GSM)
		::= 1...2 (DCS Phase I)
		::= 1...3 (DCS Phase II/II+)
		::= 1...3 (PCS1900)
	EG1, EG2, EG3	::= Power Classes for standard Edge
Example:	":CONF:MS:POW:CLAS 4"	
Features:	*RST value: 2	(P-GSM Phase I/II, E-GSM, R-GSM, **GSM850**)
	1	(DCS1800, PCS1900)
	SCPI:	device specific
Mode:	MS	

:CONFigure[:MS]:POWer:EXPected   <numeric_value>

This command enters directly the rated output level of the mobile.

Example:	":CONF:POW:EXP 43DBM"	
Features:	*RST value:	GMSK:
		39 dBm (P-GSM Phase I/II, E-GSM, R-GSM, **GSM850**)
		30 dBm (DCS1800, PCS1900)
		EDGE
		33 dBm (P-GSM Phase I/II, E-GSM, R-GSM, **GSM850**)
		30 dBm (DCS1800, PCS1900)
	SCPI:	device-specific
Mode:	MS	

:CONFigure[:MS]:POWer:LEVel   0 to 31

This command defines the power control level of the mobile.

Example:	":CONF:POW:LEV 5"	
Features:	*RST value:	2 (P-GSM Phase I/II, E-GSM, R-GSM, **GSM850**)
		0 (DCS1800, PCS1900)
	SCPI:	device-specific
Mode:	MS	

:CONFigure:SPECtrum:MODulation:RANGe   ARFCn | TXBand | RXBand |
COMBined | DCSRx1800 | G8Rxband | PCSRx1900

This command selects the frequency range for the measurement.

Example:	":CONF:SPEC:MOD:RANG TXB"	
Features:	*RST value:	ARFCn
	SCPI:	device-specific
Modes:	BTS, MS	

ARFCn	ARFCN $\pm$ 1.8 MHz
TXBand	TX-Band
RXBand	RX-Band
COMBined	ARFCN $\pm$ 1.8 MHz / TX-Band
DCSRx1800	RX band DCS 1800 (option FSE-K10 only)
G8Rxband	RX band GSM 850 (option FSE-K10 only)
PCSRx1900	RX band PCS 1900 (option FSE-K10 only)

CONFigure:WCDPower[:BTS]:CTABle:DATA
         2..9 , 0..511 , 0|1 , <numeric_value> | AUTO, 2|4|8|16 , 0|1|2|3|4|5 , <numeric_value>...

This command defines the values of the selected channel table.

Each line of the table consists of 8 values:
<code class>,<code number>,<use TFCI>,<timing offset | AUTO>,<pilot length>,<channel type>,<status>,<CDP relative [dB]>....

Code class:	2 to 9
Code number:	0 to 511

use TFCI:	0: not used, 1: used
Timing offset:	0 to 38400, for code class 9, the step width is 512, else 256, for AUTO, the timing offset is calculated by the instrument
Pilot length:	code class 9: 4
	code class 8: 2, 4, 8
	code class 7: 4, 8
	code class 5/6: 8
	code class 2/3/4 16
Channel Type:	0: DPCH Dedicated Physical Channel
	1: PICH Paging Indication Channel
	2: SCCPCH Secondary Common Control Physical Channel
	3: HS_SCCH HSDPA: High Speed Shared Control Channel
	4: HS_PDSCH HSDPA: High Speed Physical Downlink Shared Channel
	5: CHAN every other channel without pilot symbols
Status:	0: not active, 1:active
CDP relative:	for setting commands any value, for query CDP relative value

Channels CPICH and PCCPCH may only be defined once. They have the same channel type like data channels. However, they can be determined via their channel numbers. If channel CPICH or PCCPCH is missing in the command, it is automatically added at the end of the table.

Prior to this command, the name of the channel table has to be defined with command `CONF:WCDP:CTAB:NAME`.

Mode: WCDP (K72, K74)

Example: `":CONF:WCDP:CTAB:DATA 8,0,0,0,0,0,1,0.00,`
`8,1,0,0,0,0,1,0.00,7,1,0,256,8,0,1,0.00"`
2 channels are defined: CPICH, PCCPCH and a channel in code class 7

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

:CONFigure:WCDPower[:BTS]:CTABle:RESTore

This command restores the default channel tables preset upon instrument delivery or after firmware update.

Example: `":CONF:WCDP:CTAB:REST`

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

This command is an "event" which is why it is not assigned an *RST value and has no query.

DISPlay - Subsystem

:DISPlay[:WINDow<1|2>]:SELect

This command switches the active measurement window. The numeric suffix in WINDow selects the active window. As a result, a switch is possible from FULL SCREEN A to FULL SCREEN B (see example)

Example: `":DISP:FORM SPLit"`
`":DISP:WIND2:SEL"`
`":DISP:FORM SINGle"`

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

Modes: A, VA

This command is an event and has thus no query and no *RST value assigned.

FETCh - Subsytem

:FETCh:BURSt:POWer[:IMMediate]?

Carrier Power measurement (`:CONFigure:MS:POWer:SINGle:STATe OFF`):

This command reads out the result of the last step performed during the measurement of the output power of the base station or mobile.

Parameter: The result is output as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>, <Delta>,<Status>

with

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	Rated value for the current power control level acc. to standard dBm
<Act-Level>:	measured power in dBm
<Delta>:	Difference between the measured power and the power at the previous static/dynamic power control level.
<Status>:	Result of limit check in character data form: PASSED no limits exceeded FAILED limit exceeded

Example: `":FETC:BURS:POW?"`
                 Result: `0,0,43,44.1,0,PASSED`

Carrier Power Individual measurement (`:CONFigure:MS:POWer:SINGle:STATe ON`)

This command reads out the result of the last step performed during the measurement of the output power of the base station or mobile.

Parameter: The result is output as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,Rat-Level>,<Act-Level>,<RBW>,<ARFCN>,<CF>, <Attenuation>,<Number of bursts>,<Status>

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	Rated value for the current power control level acc. to standard dBm
<Act-Level>:	measured power in dBm
<RBW>:	resolution Bandwidth in kHz
<ARFCN>:	channel number
<CF>:	carrier frequency in Hz
<Att>:	external attenuation in dBm
<Number of burst>:	number of bursts
<Status>:	result of limit check in character data form: PASSED no limits exceeded FAILED limit exceeded

Example: `":READ:BURS:POW?"`
                 Result: `0,3,37,20.6915,1000,2,8.904E+008,20,1,FAILED`

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

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the phase/frequency error is selected (see `:CONFigure:BURSt:PFERror`).

:FETCh:BURSt:POWer:ALL?

Carrier Power measurement (:CONFigure:MS:POWer:SINGle:STATe OFF):

This command reads out the results of all individual steps during the measurement of the output power of the base station or mobile.

Parameter: The result is output as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>, <Delta>,<Status>

with

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	Rated value for the current power control level acc. to standard dBm
<Act-Level>:	measured power in dBm
<Delta>:	Difference between the measured power and the power at the previous static/dynamic power control level.
<Status>:	Result of limit check in character data form:
	PASSED no limits exceeded
	FAILED limit exceeded

Example: ":FETC:BURS:POW:ALL?"
                    Result: 0,0,43,44.1,0,PASSED,1,0,41,42.5,1.6,PASSED,
                                    1,1,35,32.5,5.6,FAILED

Carrier Power Individual measurement (:CONFigure:MS:POWer:SINGle:STATe ON)

This command reads out the results of all individual steps during the measurement of the output power of the base station or mobile.

Parameter: The result is output as an ASCII string in the following format:

<Static Power Ctrl>,<Dyn Power Ctrl>,Rat-Level>,<Act-Level>,<RBW>,<ARFCN>,<CF>, <Attenuation>,<Number of bursts>,<Status>

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	Rated value for the current power control level acc. to standard dBm
<Act-Level>:	measured power in dBm
<RBW>:	resolution Bandwidth in kHz
<ARFCN>:	channel number
<CF>:	carrier frequency in Hz
<Att>:	external attenuation in dBm
<Number of burst>:	number of bursts
<Status>:	result of limit check in character data form:
	PASSED no limits exceeded
	FAILED limit exceeded

Example: ":READ:BURS:POW:ALL?"
                    Result: 0,3,37,20.6915,1000,2,8.904E+008,20,1,FAILED,
                                    0,3,37,20.3597,1000,2,8.904E+008,20,1,FAILED

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

Modes: BTS, MS

If no measurement has been performed yet, a query error results.
This command is a query only and therefore has no *RST value assigned. It is available only if measurement of the phase/frequency error is selected (see :CONFigure:BURSt:PFERror).

FORMat - Subsytem

:FORMat:DEXPort:COMMent <string>

This command defines a comment for the output file.

Example: `":FORM:DEXP:COMM 'ASCII EXPORT TRACE 1'"`

Features: *RST value: „“
                        SCPI: conforming

Modes: A, VA, BTS, MS, CDP, WCDP

:MMEMory:SELect[:ITEM]:WTABle ON | OFF

This command includes the channel tables of the WCDMA measurement (FSIQK72, FSIQK73) in the list of data subsets of a device setting to be stored/loaded.

Examples: `":MMEM:SEL:WTAB ON"`

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

Modes: A, VA, BTS, MS, WCDP

READ - Subsytem

:READ:BURSt:POWer?

Carrier Power measurement: (`:CONFigure:MS:POWer:SINGle:STATe OFF`)

This command starts the measurement of the maximum output power of the base station or mobile and reads out the result.

Measurement of the maximum output power marks the beginning of a measurement cycle where subsequently the limits of the static and dynamic power control levels are checked step by step (`READ:BURSt:STATic?` or `READ:BURSt:DYNamic?`).

Parameter: The result is read out as an ASCII string in the following format:

                      <Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>, <Delta>,<Status>

<Static Power Ctrl>:	0
<Dyn Power Ctrl>:	0
<Rat-Level>:	rated value for the current power control level acc. to standard in dBm
<Act-Level>:	measured power in dBm
<Delta>:	0
<Status>:	result of limit check in character data form:
	PASSED no limits exceeded
	FAILED limit exceeded

Example: `":READ:BURS:POW?"`
                    Result: `0,0,43,44.1,0,PASSED`

Carrier Power Individual measurement: (`:CONFigure:MS:POWer:SINGle:STATe ON`)

This command starts the measurement of the maximum output power of the base station or mobile and reads out the result. The power control level is preset (command `:CONFigure<1|2>[:MS]: POWer:LEVel <num_value>`)

Parameter: The result is read out as an ASCII string in the following format: single measurements are retrieved:

<Static Power Ctrl>,<Dyn Power Ctrl>,<Rat-Level>,<Act-Level>,<RBW>,<Arfcn>,<CF>,<Attenuation>,<Number of bursts>,<Status>

<Static Power Ctrl>:	current static power control level
<Dyn Power Ctrl>:	current dynamic power control level
<Rat-Level>:	rated value for the current power control level acc. to standard in dBm
<Act-Level>:	measured power in dBm
<RBW>:	resolution bandwidth in kHz
<ARFCN>:	channel number
<CF>:	carrier frequency in Hz
<Att>:	external attenuation in dBm
<Number of burst>:	number of bursts
<Status>:	result of limit check in character data form:
	PASSED no limits exceeded
	FAILED limit exceeded

Example: ":READ:BURS:POW?"
Result:: 0,3,37,20.6915,1000,2,8.904E+008,20,1,FAILED,
              0,3,37,20.3597,1000,2,8.904E+008,20,1,FAILED

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

Modes: BTS, MS

When the measurement is started any ongoing measurement cycle is aborted.

An ongoing measurement can be aborted with the command ABORT. This command is a query only and has therefore no *RST value assigned. It is available only when measurement of the maximum carrier power is selected (see :CONFigure:BURSt:POWer).

SENSe - Subsytem

:[SENSe<1|2>:]AVERage:TYPE MAXimum | MINimum | SCALar | VIDeo | LINear

This command selects the trace averaging method.

VIDeo	Averaging of logarithmic level values.
LINear	Averaging of linear power values prior to their conversion into level values.

Example: ":AVER:TYPE LIN"

Features: *RST value: VIDeo
                   SCPI: device-specific

Mode: A, VA, BTS, MS ("VIDeo" and "LINear" are not available in VA mode)

Note: *It is also possible to select the evaluation mode (MAXimum, MINimum, SCALar) for the trace with this command. However, it is recommended to use command DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE for this purpose. The command AVERage:TYPE should be used only to select the trace averaging method. Also, the query reads out the trace averaging mode only.*

The following functions are defined but should not be used:

MAXimum (MAX HOLD): $AVG(n) = MAX(X_1...X_n)$

MINimum (MIN HOLD): $AVG(n) = MIN(X_1...X_n)$

$$AVG(n)= \frac{1}{n} \times \sum_{i=1}^{n} xi$$

SCALar (AVERAGE):

:[SENSe<1|2>:]CDPower:ANTenna   OFF | 1 | 2

This command switches the antenna diversity mode on or off and selects the antenna of the diversity path.

OFF   Antenna diversity mode switched off.

1 | 2   According to 3 GPP, the pilot symbols of the channels are different depending on the antenna used. The CPICH symbols are different and the synchronization channels are transmitted alternately in every second slot.

Example: ":CDP:ANT 1"

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

Mode: WCDP (FSIQK72)

:[SENSe<1|2>:]CDPower:PCONtrol   PILot | SLOT

This command sets the power control position. A distinction is made between a power control at the slot limit (SLOT) and a power control at the beginning of pilot symbols (PILot).

Example: ":CDP:PCON SLOT"

Features: *RST valuet: PILot
                            SCPI: device-specific

:[SENSe<1|2>:]CDPower:STYPe   CPICh | SCHannel

This command selects the type of synchronization.

CPICh   Synchronizaton to CPICH (default). The CPICH has to be contained in signal.

SCHannel   Synchronization without CHICH. This type of synchronization is provided for test model 4 which is defined with or without CPICH.

Example: ":CDP:STYP SCH"

Features: *RST value: CPICh
                            SCPI: device-specific

:[SENSe<1|2>:]DDEMod:PRESet   GSM | DCS1800 | PCS1900 | EDGe | TETRa | PHS | PDCup |
                                  PDCDown | APCO25CQPSK | APCO25C4FM | CDPD | DECT |
                                  CT2 | ERMes | MODacom | PWT | TFTS | F16 | F322 | F324 |
                                  F64 | FQCDma | F95Cdma | RQCDma | R95Cdma | FNADc |
                                  RNADc | FWCDma | FCDMa4096 | RWCDma | RCDMa4096 |
                                  FW3Gppcdma | RW3Gppcdma | CDMa2000 | **R1CDma2000 |
                                  F1CDma2000** | F3CDma2000

This command selects an automatic setting of all modulation parameters according to a standard transmission method.

Two cdma2000 standards were added in release 4.0:

> **F1CDma2000   Forward   CDMA   2000,   Spreading   Rate   1,**
> **R1CDma2000   Reverse   CDMA   2000,   Spreading   Rate   1**,
> CDMA2000, F3CDma2000 Forward CDMA 2000, Spreading Rate 3,

Example: ":DDEM:PRES TETRa"

Features: *RST value: FWCDma
                            SCPI: device-specific

Mode: VA

:[SENSe:]DETector:CDPower[:FUNCtion]:MODE   FAST | NORMal

This command enables speedier calculation. The timing error and phase error are not calculated in the fast mode.

For FW 4.20 and higher, this command has no effect on the measurements.

Example:	":DET:CDP:MODE FAST"	
Features:	*RST value:	NORMAL
	SCPI:	device-specific
Mode:	CDP, WCDP (FSIQK72)	

[SENSe<1|2>:]POWer:ACHannel:PRESet   ACPower | CPOWer | OBANdwidth|OBWidth | CN | CN0 | ADJust

This command selects the type of power measurement and resets the instrument depending on the selected standard.

Selection of parameter ADJust optimizes automatically the settings (span, RBW, VBW and detector) of the analyzer for the power measurement selected by command :CALCulate<1|2>:MARKer:FUNCtion:POWer:SELect (see Softkey ADJUST CP SETTINGS).

Example:	"POW:ACH:REF:PRES ACP"	
Features:	*RST value:	-
	SCPI:	device-specific
Mode:	A-F	

SYSTem - Subsytem

:SYSTem:FIRMware:UPDate <string>

This command starts a firmware update using the files in the set directory.

Example:	`":SYST:FIRM:UPD 'C:\V4.32'"`
Features:	*RST value: –
	SCPI : conforming
Mode:	A, VA, BTS, MS

This command is an event and has therefore no query and no *RST value assigned.

TRACe - Subsytem

:TRACe[:DATA] TRACE1 | TRACE2 | ABITstream| PWCDp, CTABle, <block> | <numeric value>

This command transfers trace data from the controller to the instrument, the query reads trace data out of the instrument.

Example:	`":TRAC TRACE1,"+A$   (A$: data list in current format)`
	`":TRAC? TRACE1"`
Features:	*RST value: -
	SCPI: conforming

The following description only refers to operating mode WCDP. TRACE3 and TRACE4 cannot be used in this operating mode. This command is available as query only.

W-Code Domain Power, base station (option FSIQK72)

TRACE1, TRACE2, ABITstream, CTABle or PWCDp can be queried depending on the display mode.

The following measured values are transferred depending on the display mode:

CODE PWR ABSOLUTE / RELATIVE (TRACE1) , CHANNEL TABLE (TRACE1)

Each channel is defined by the class, the channel number, the absolute level, the relative level and the timing offset. The class denotes the spreading factor of the channel.

Class 9 corresponds to the highest spreading factor (512, symbol rate 7.5 ksps). Class 2 corresponds to the lowest admissible spreading factor (4, symbol rate 960 ksps).

Five values are transmitted for each channel.
< class>,<cannel number>,<absolute level>,<relative level>,<timing offset>, ...

For CODE PWR ABSOLUTE / RELATIVE, the channels are output in ascending order sorted according to the code numbers, i.e. in the same sequence as they are displayed on the screen. For CHANNEL TABLE, the channels are sorted according to the code classes, i.e. the unassigned channels are transmitted last.

The units are:

Absolute level	dBm,
Relative level	dB referred to CPICH.
Timing offset	chips (FSIQK72)

The example shows the results of a query for three channels with the following configuration:

1st channel: spreading factor 512, channel number 7, timing offset 0

2nd channel: spreading factor 4, channel number 1, timing offset 256 chips

3rd channel: spreading factor 128, channel number 255, timing offset 2560 chips

This yields the following result: ...,9,7,-40,-20,0,...,2,1,-40,-20,256,...,7,255,-40,-20,2560,... (only the 3 active channels are shown in the example above, the inactive channels are replaced by "...". The channel status (active/inactive) can be queried with command TRAC? CTAB).

The channels come in the same order as in the CDP diagram, i.e. depending on their position in the code domain of spreading factor 512.

CODE PWR ABSOLUTE / RELATIVE (PWCDp) , CHANNEL TABLE (PWCDp), FSIQK72

PWCDp can be set for only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Screen A. The pilot length is transmitted in addition to the same five values as transmitted for TRACE1:
< class>,<cannel number>,<absolute level>,<relative level>,<timing offset> , <pilot length>,...

The pilot length is given in symbols.

CODE PWR ABSOLUTE / RELATIVE (CTABle) , CHANNEL TABLE (CTABle), FSIQK72

CTABle can be set for only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Screen A. The channel status (0 = inactive; 1 = active) is transmitted in addition to the same six values as transmitted for PWCDp:
< class>,<cannel number>,<absolute level>,<relative level>,<timing offset>, <pilot length>, <channel status>...

CODE PWR ABSOLUTE / RELATIVE (CWCDp) , CHANNEL TABLE (CWCDp)

`TRAC? CWCDp` can be set only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Screen A. The same data as for `TRAC? TRACE1` is transmitted, additionally pilot length, channel type, modulation type and a reserved value are given. For each channel therefore 10 values are transmitted.

< class>,<cannel number>,<absolute level>,<relative level>,<timing offset> or <I/Q-mapping>, <pilot length>,<channel type>,<modulation type>,<reserved>,...

Channel Type:
  0 - DPCH **D**edicated **P**hysical **Ch**annel
  1 - PICH **P**aging **I**ndication **Ch**annel
  2 - CPICH **C**ommon **Pi**lot **Ch**annel
  5 - PCCPCH **P**rimary **C**ommon **C**ontrol **P**hysical **Ch**annel
  6 - SCCPCH **S**econdary **C**ommon **C**ontrol **P**hysical **Ch**annel
  7 - HS_SCCH HSDPA: **H**igh **S**peed **S**hared **C**ontrol **Ch**annel
  8 - HS_PDSCH HSDPA: **H**igh **S**peed **P**hysical **D**ownlink **S**hared **C**hannel
  9 - CHAN channel without pilot symbols

Modulation Type:
  2 - QPSK
  4 - 16QAM
  15 – slot switched off

<reserved> {0} reserved for future extensions

RESULT SUMMARY (TRACE2), FSIQK72

The results of the RESULT SUMMARY are output in the following order:

<composite EVM>,<peak CDE>,<carr freq Error>,<chip rate error>, <total power>,<trg to frame>,<EVM peak channel>,<EVM mean channel>, <class>, <channel number>,<power abs. channel>,<power rel. channel>,<timing offset>, <IQ offset>,<IQ imbalance>

The units are:

EVM peak channel/mean channel, composite EVM, IQ offset/imbalance :   %,
Peak CDE, total power and power abs. channel   dB.
Power rel. Channel   dB referred to CPICH.
Carr freq error :   Hz
Chip Rate Error   ppm.
Timing offset   chips
Trg to Frame   µs.
I/Q mapping   1 = I mapping; 0 = Q mapping
pilot symbols   absolute number

POWER VS SLOT (TRACE2), FSIQK72

16 pairs of slot (slot number of CPICH) and level values (for 16slots) are always transferred.
<slot number>, <level value in dB>,<slot number>,<level value in dB>,.....

SYMBOL EVM (TRACE2), FSIQK72

The number of level values depends on the spreading factor:

Spreading factor 512   5 values
Spreading factor 256   10 values
Spreading factor 128   20 values
Spreading factor 64   40 values
Spreading factor 32   80 values
Spreading factor 16   160 values
Spreading factor 8   320 values
Spreading factor 4   640 values

PEAK CODE DOMAIN ERR and Composite EVM (TRACE2), FSIQK72

15 pairs of slot (slot number of CPICH) and level values are always transferred.
PEAK CODE DOMAIN ERR: <slot number>, <level value in dB>,.....
Composite EVM: <slot number>, <level value in %>, ...

SYMBOL CONST (TRACE2), FSIQK72

The real and the imaginary part are transferred as a pair:
<re 0>,<im 0>,<re 1>,<im 1>,.....<re n>, <im n>

The number of level values depends on the spreading factor:

Spreading factor 512   5 values
Spreading factor 256   10 values
Spreading factor 128   20 values
Spreading factor 64   40 values
Spreading factor 32   80 values
Spreading factor 16   160 values
Spreading factor 8   320 values
Spreading factor 4   640 values

BITSTREAM (TRACE2), FSIQK72

The bitstream of one slot is transferred. One value is transferred per bit (range 0,1). The
number of symbols is not constant and may vary for each sweep. Specific symbols in the
bitstream may be invalid depending on the channel type and the symbol rate (symbols without
power). The corresponding invalid bits are marked by "9". The number of Bits of an 16QAM
modulated channel is twice of that of an QPSK modulated channel.

Example for a bitstream trace
1,0,9,9,0,1,0,0,0,1 (used channels) and 9,9,9,9,9,9,9,9,9,9 (unused channels).

BITSTREAM (ABITstream), FSIQK72

ABITstream can be set only if `CALC2:FEED "XTIM:CDP:BSTReam"` is selected (in the lower bitstream window). This command returns the bitstreams of all 15 slots one after the other, the output format may be REAL, UINT or ASCII.

W-Code Domain Power, mobile station tests (option FSIQK73)

TRACE1, TRACE2, ABITstream or CTABle can be queried depending on the display mode.

The following measured values are transferred depending on the display mode:

CODE PWR ABSOLUTE / RELATIVE (TRACE1) , CHANNEL TABLE (TRACE2), FSIQK73

Each channel is defined by the class, the channel number, the absolute level, the relative level and the I/Q mapping (mobile station, FSIQK73). The class denotes the spreading factor of the channel.
Class 8 corresponds to the highest spreading factor (256, symbol rate 15 ksps). Class 2 corresponds to the lowest admissible spreading factor (4, symbol rate 960 ksps).
Five values are transmitted for each channel.
< class>,<cannel number>,<absolute level>,<relative level>, <I/Q mapping>, ...

The units are:
Absolute level   dBm,
Relative level   dB referred to CPICH.
I/Q mapped   1: I-mapped; 0: Q-mapped

The example shows the results of a query for three channels with the following configuration:

1st channel: spreading factor 256, channel number 0, Q-mapped

2nd channel: spreading factor 4, channel number 1, I-mapped

3rd channel: spreading factor 4, channel number 1, Q-mapped

This yields the following result: ..8,0,-40,-20,0,...,2,1,-40,-20,0,..,2,1,-40,-20,0,...
(only the 3 active channels are shown in the example above, the inactive channels are replaced by "...". The channel status (active/inactive) can be queried with command TRAC? CTAB).

The channels come in the same order as in the CDP diagram, i.e. depending on their position in the code domain of spreading factor 256.

CODE PWR ABSOLUTE / RELATIVE (CTABle) , CHANNEL TABLE (CTABle), FSIQK73

CTABle can be set for only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Screen A. The channel status (0 = inactive; 1 = active) is transmitted in addition to the same 5 values as transmitted for TRACE1 ot TRACE2:
< class>,<cannel number>,<absolute level>,<relative level>, <I/Q-mapping>, <channel status>...

RESULT SUMMARY (TRACE2), FSIQK73

The results of the RESULT SUMMARY are output in the following order:

<composite EVM>,<peak CDE>,<carr freq Error>,<chip rate error>,
<total power>,<trg to frame>,<EVM peak channel>,<EVM mean channel>, <class>, <channel number>,<power abs. channel>,<power rel. channel>, <I/Q mapping> , <number of pilot symbols>, <IQ offset>,<IQ imbalance>

The units are:

EVM peak channel/mean channel, composite EVM, IQ offset/imbalance :   %,
Peak CDE, total power and power abs. channel   dB.
Power rel. Channel   dB referred to total signal power.
Carr freq error :   Hz

Chip Rate Error   ppm.
Trg to Frame   µs.
I/Q mapping   1 = I mapping; 0 = Q mapping
pilot symbols   absolute number

POWER VS SLOT (TRACE2), FSIQK73

15 pairs of slot and level values (for 15 slots) are always transferred.
<slot number>, <level value in dB>,<slot number>,<level value in dB>,.....

SYMBOL EVM (TRACE2)

The number of level values depends on the spreading factor:

Spreading factor 256   10 values
Spreading factor 128   20 values
Spreading factor 64   40 values
Spreading factor 32   80 values
Spreading factor 16   160 values
Spreading factor 8   320 values
Spreading factor 4   640 values

PEAK CODE DOMAIN ERR and Composite EVM (TRACE2), FSIQK73

15 pairs of slot and level values are always transferred.
PEAK CODE DOMAIN ERR: <slot number>, <level value in dB>,.....
Composite EVM: <slot number>, <level value in %>, ...

SYMBOL CONST (TRACE2), FSIQK73

The real and the imaginary part are transferred as a pair. Either the real or the imaginary
component is always 0 depending on the selected I/Q mapping:
<re 0>,<im 0>,<re 1>,<im 1>,.....<re n>, <im n>

The number of level values depends on the spreading factor:

Spreading factor 256   10 values
Spreading factor 128   20 values
Spreading factor 64   40 values
Spreading factor 32   80 values
Spreading factor 16   160 values
Spreading factor 8   320 values
Spreading factor 4   640 values

BITSTREAM (TRACE2), FSIQK73

The bitstream of one slot is transferred. One value is transferred per bit (range 0,1). The
number of symbols is not constant and may vary for each sweep. Specific symbols in the
bitstream may be invalid for unused channels. The corresponding invalid bits are marked by
"9".

Example for a bitstream trace
0,1,0,0,1,1,0,0,0,1 (used channels) and 9,9,9,9,9,9,9,9,9,9 (unused channels).

BITSTREAM (ABITstream), FSIQK73

ABITstream can be set only if `CALC2:FEED "XTIM:CDP:BSTReam"` is selected (in the lower
bitstream window). This command returns the bitstreams of all 15 slots one after the other, the
output format may be REAL, UINT or ASCII.

TRACe:IQ Subsystem

The commands of this subsystem serve for recording and transmitting IQ data. They require option FSIQB70 and are only accessible via remote control.

Command	Parameter	Unit	Comment
TRACe			
:IQ			
:DATA?			Query only
:DMEanmax			Query only
:SET	RAW,	--,	
	8 MHz,	HZ,	
	<numeric_value>,	HZ,	
	IMMediate | EXTernal | VIDeo,	--,	
	POSitive | NEGative,	--,	
	<numeric_value>,	s,	
	<numeric_value>	s	
[:STATe]	<Boolean>		

Option FSIQB70 has a storage capacity of 512 K for the real and imaginary part. The data is stored to the memory with a sampling rate of 25.6 MHz which results in a maximum record length of approx. 20 ms. The 10 MHz IF filter is always active during recording. This filter is equalized with respect to magnitude and phase at a bandwidth of 8 MHz prior to data output.

A resampling of data at the user-defined sampling rate follows. No further band limiting is performed prior to resampling. The user has to take care that the sampling rate is high enough to satisfy the Nyquist criterion.

FREE RUN, EXTERN and VIDEO are available as the trigger sources. Like in vector analysis, the slope can also be determined for external trigger and video trigger and a time offset of the trigger time with respect to the output signal can be defined.

The output signal consists of a list of sampling values which are transmitted via the IEC/IEEE bus. The real parts are read first followed by the complete list of imaginary parts. The FORMAT command allows to select either binary output (32 bit IEEE 754 floating point) or ASCII output. The binary format is recommended for long data records because of the shorter transmission times.

:TRACe:IQ:DATA?

This command starts a measurement with the parameters specified with command `TRACe:IQ:SET` and directly outputs the results. The number of result samples depends on the parameters specified with `TRACe:IQ:SET`, the data format is determined in the `FORMat` – subsystem.

Example:

```
'Measurement configuration:   'Data type:       RAW
                              'BW:              8 MHz
                              'Sample Rate:     17.463 MHz
                              'Trigger Source:  External
                              'Trigger Slope:   Positive
                              'Trigger Offset:  0 s
                              'Record Length:   7.4 ms
":TRAC:IQ ON"                 'Switch on I/Q data acquisition
":TRAC:IQ:SET                 RAW,8MHz,17463KHz,EXT,POS,0s,7.4ms"
                              'Choose configuration
":FORMat REAL,32"            'Select format of response data
":TRAC:IQ:DATA?"             'Start measurement and read results
"(get result)"
":TRAC:IQ OFF"               'Switch off I/Q data acquisition
```

Results: The results are available in linear form. Their unit is mV.

ASCII format (FORMat ASCII):

A list of values separated by commas is returned in floating point format (comma-separated values = CSV). The number of results is twice as high as the number of recorded samples, with the first half showing the real parts and the second half the imaginary parts.

Binary format (FORMat REAL,32):

In this case, the command returns binary data (definite length block data according to IEEE 488.2), with the real parts and then the imaginary parts being transmitted in the 32-bit IEEE 754 floating point format.
Example:

#41024<I-value1><I-value2>...<I-value128><Q-value1><Q-value2>...<Q-value128>
where:

#4	digits of the data length (in this case: 4)
1024	length of following data in bytes (in this case: 1024)
<I-value x>	4-byte floating point real part
<Q-value y>	4-byte floating point imaginary part

The number of complex output values is calculated from the record length multiplied by the output data rate. The result has to be rounded down.
For long record times combined with a high sample rate the result is cut to a maximum of 524200 Samples.

Features: *RST value: -
             SCPI: device specific

Mode: A, VA, BTS, MS

:TRACe:IQ:DMEanmax?

This command reads out the I/Q data. It starts the same measurement as command
`TRACe<1|2>:IQ:DATA?` but adds the mean and peak signal power in µWatt at the end of the results list.

Example: `":TRAC:IQ:DME?"`

Features: *RST value: -
                 SCPI: device specific

Mode: A, VA, BTS, MS

The number of result samples depends on the parameters specified with `TRACe:IQ:SET`, the data format is determined in the `FORMat` – subsystem (ASCII or binary).

:TRACe:IQ:SET   \<data type \>,\<bw\>,\<sample rate\>,\<trigger mode\>,\<trigger slope\>, \<trigger offset\>,\<record length\>

The most important parameters for recording the IQ data are determined by means of this command.

Parameters:	\<data type\>:	RAW The data are neither RX-filtered nor is an internal phase or frequency correction performed. Only the frequency response of the internal analog filters is corrected in amplitude and phase. This is currently the sole type of data available.
	\<bw\>:	8MHz The bandwidth with which the IQ data are recorded. Currently, only the 8 MHz setting is possible. This corresponds to a baseband width of 4 MHz. If an output sample rate is selected that does not satisfy the Nyquist theorem, the user has to take care that the signal applied is band-limited appropriately.
	\<sample rate\>:	The output sample rate of IQ data.
		Freely selectable between 40 kHz and 32 MHz.
	\<trigger mode\>:	This parameter selects the trigger source for starting data recording.
		Possible values: IMMediate, EXTernal, VIDeo
		The parameter defined here can be changed any time by means of TRIGger:SOURce. If a change of the trigger threshold is required, the TRIGger:LEVel command can be used.
	\<trigger slope\>:	This parameter selects the slope of the trigger signal for external trigger and video trigger.
		Possible values: POSitive, NEGative
		The parameter defined here can be changed any time by means of TRIGger:SLOPe.
	\<trigger offset\>:	This parameter defines the length of the trigger delay. A negative value ensures that the first samples output are prior to the trigger event.
		Possible values: -590 µs to 2.5 ms
		The parameter defined here can be changed any time by means of TRIGger:HOLDoff.
	\<record length\>:	Length of data record to be recorded.
		Possible values: 1µs to 20.4 ms
		For long record times combined with a high sample rate the result is cut to a maximum of 524200 Samples without further warnings.
Example:	"`:TRAC:IQ:SET RAW,8MHz,4.096MHz,EXT,POS,-100us,20ms`"	
Features:	*RST value:	RAW, 8MHz, 16MHz, IMM, POS ,0us , 5ms
	SCPI:	device-specific
Mode:	A, VA, BTS, MS	

:TRACe:IQ[:STATe] ON|OFF

This command switches IQ data recording on or off.
Since IQ data recording is not compatible with other measurement functions, the latter are switched off as long as the IQ data recording function is active. As long as the function is active, no results will be output on the screen.

Example:	**"**:TRAC:IQ ON"	
Features:	*RST value:	OFF
	SCPI:	device-specific
Mode:	A, VA, BTS, MS	

As long as IQ data recording is active, only the following IEC/IEEE bus commands should be used:

TRACe:IQ:SET	to specify the most important settings
TRACe:IQ:DATA?	to trigger a measurement
FREQuency:CENTer	to change the center frequency
DISPlay:TRACe:Y:RLEVel	to change the reference level
[SENSe<1|2>]:CDPower:LEVel:ADJust	
	to set the reference level automatically ; to obtain a wide dynamic range for the subsequent reading of data.
FORMat	to change the format of output data
INPut subsystem	to change the settings of attenuator and input impedance

To change the trigger settings:

TRIGger:SOURce IMM|EXT|VID	
	trigger source
TRIGger:LEVel	trigger threshold
TRIGger:HOLDoff	trigger delay
TRIGger:SLOPe	trigger slope
SENSe:DDEMod:SBANd	to invert the sideband

The commands TRACe:IQ:STATe OFF and *RST deactivate IQ data recording.

STATus QUEStionable:SYNC Register

This register comprises information about sync and burst events as well as about the error situation in the code domain power measurement of options FSIQK71/FSIQK72/FSIQK73.
It can be queried with commands ":STATus:QUEStionable:SYNC:CONDition?" and ":STATus:QUEStionable:SYNC[:EVENt]?".

Bits 6 is new since firmware V4.20.

Meaning of bits in STATus:QUEStionable:SYNC register

Bit No.	Meaning
0	**BURSt not found** This bit is set if a burst was not found.
1	**SYNC not found** This bit is set if the sync sequence of midamble was not found.
2	**No carrier** This bit is set if the carrier power determined in thepre-measurement is 20 dB below of the expected signal power (options FSE-K10/ FSE-K11).
3	**Carrier overload** This bit is set if the carrier power determined in the premeasurement is 4 dB above of the expected signal power (options FSE-K10/ FSE-K11).
4 to 5	not used
6	**K72 Check Pilot Symbols** This bit is set if invalid sequences were found during the check of the pilot symbols of the data channels.
7	**K73 Invalid trigger offset** This bit is set within the FSIQK73 (WCDP - MS) application if a complete frame can not be processed due to the trigger settings.
8	**K71/K72/K73 Evaluation Error** This bit is set if an error that the subsequent bits do not describe in greater detail has occurred during the data evaluation for the code domain power analysis.
9	**K71 PN Correlation Error** This bit is set if evaluation errors occur within the FSIQK71(CDP) application because of insufficient S/N ratio, insufficient or excessive level, or non-detection of pilot signal. **K72 Bad long code number** This bit is set within the FSIQK72 (WCDP -BTS) application if an invalid scrambling code was entered.
10	**K71 Symbol Detection Error** This bit is set if more than 9 active channels are detected within the FSIQK71/CDP application (it might be necessary to check the active channel threshdd). **K72/73 Frame sync failed** This bit is set within the FSIQK72 (WCDP -BTS) and FSIQK73 (WCDP - MS) applications if the synchronization to a frame was not possible

Bit No.	Meaning
11	**K71 Pilot/Channel Timing Error** This bit is set if for application FSIQK71/CDP the pilottiming offset of the signal is to large (> $\pm$ ½ symbol). **K72 Slot format not supported** This bit is set within the FSIQK72 (WCDP-BTS) application if the channel table contains an invalid slot format.
12	**K71 Bad S/N Warning** This bit is set if for application FSIQK71/CDP the measurement accuracy is reduced because of poor S/N ratio. **K72 Channel type not supported** This bit is set within the FSIQK72 (WCDP-BTS) application if the channel table contains an invalid channel type. Supported channel types are DPCH and PICH.
13	**K72 No active channel** This bit is set within the FSIQK72 (WCDP-BTS) application if no active channel was found.
14	**K72 No waveQual symbols on** This bit is set within the FSIQK72 (WCDP-BTS) application if the EVM measurement is aborted because ON symbols are not available
15	This bit is always 0.

Using user-defined limit lines via the remote-control interface with GSM BTS ANALYZER and GSM MS ANALYZER, Options FSE-K10 and FSE-K11

If user-defined limit lines are to be remote-controlled in applications K10/K11, the following should be observed:

- Limit lines can be created with the commands of the basic unit (CALC:LIM subsystem). Lines created in such a way are available as limit line files in the unit and cannot be distinguished from the "normal" limit lines.

- A user-defined limit line should meet certain criteria (example: Frequency Domain should be selected for the transient spectrum measurement of K11) so that it can be used for a specific K10/K11 measurement. If an attempt is made to activate a non-compatible line, the unit returns the error message "-221, settings conflict".

- K10/K11 measurements require either no limit line or one (spurious, transient spectrum, modulation spectrum) or two limit lines (power vs time measurement). To ensure that measurements are performed as expected, select and activate at least the required number of limit lines (commands CALC1:LIM1:NAM and CALC1:LIM1:STATE) when using user-defined limit lines. It is not possible to activate a user-defined limit line, e.g. in the power vs time measurement, and then assume that the application will automatically select the second line to standard.

- Suffix 1 is always to be used for measurements with one line: CALC1:LIM*1* !

- For measurements with two lines, suffix 1 is to be used for lower limits and suffix 2 for upper limits.

- After selection and activation of the required number of limit lines, it is possible to activate the use of user-defined lines with command CONF:BTS:LIM:STAN OFF (K11) or CONF:MS:LIM:STAN OFF (K10).

- It is recommended not to use the names of lines for the limit line standard (e.g. `DC_BNL` and `DC_BNU`) as names of user-defined limit lines in order to make the query of limit line characteristics unambiguous.

Programming Example
Comment lines begin with <//>

```
// Start FSE-K11 (e.g. GSM1800, Phase 1).
CONF:BTS:NETW GSM1800
CONF:BTS:NETW:PHAS 1

//Select Power vs. Time (PVT) measurement and perform measurement
//with standard limit lines; query results
CONF:BURS:PTEM
INIT:CONT OFF

INIT
*OPC?
CALC:LIM:BURS:PTEM?

//Create two limit lines and use them for measurement.

// Upper Limit for PVT

CALC1:LIM1:NAM 'K1PVTU'
CALC1:LIM1:DEL
CALC1:LIM1:UNIT DBM
CALC1:LIM1:CONT:DOM TIME
CALC1:LIM1:CONT:MODE REL
CALC1:LIM1:CONT -400e-6,-300e-6,-200e-6,-100e-6,100e-6,200e-6,300e-6,400e-6
CALC1:LIM1:UPPER -50,-40,-30,-20,-20,-30,-40,-50
CALC1:LIM1:UPPER:MODE ABS
```

```
// Lower Limit for PVT

CALC1:LIM1:NAM 'K1PVTL'
CALC1:LIM1:DEL
CALC1:LIM1:UNIT DBM
CALC1:LIM1:CONT:DOM TIME
CALC1:LIM1:CONT:MODE REL
CALC1:LIM1:CONT -400e-6,-300e-6,-200e-6,-100e-6,100e-6,200e-6,300e-6,400e-6
CALC1:LIM1:LOWER  -60,-50,-40,-30,-30,-40,-50,-60
CALC1:LIM1:LOWER:MODE ABS

// Switch on and activate user defined limit lines
// The command for switching off the standard limit line is only available
// after the user defined limit lines are switched on

// Index 1 for Lower Limit !
CALC1:LIM1:NAM 'K1PVTL'
// Index 2 for Upper Limit !
CALC1:LIM2:NAM 'K1PVTU'
CALC1:LIM1:STATE ON
CALC1:LIM2:STATE ON
CONF:BTS:LIM:STAN OFF

// Start new measurement and query results
INIT
*OPC?
CALC:LIM:BURS:PTEM?
```

3 New Features, Improvements and Modifications

This section describes the new features and modifications of firmware version 4.40.

- Probe ON/OFF softkey in transducer menu

- Modified Channel Power measurement for standards W-CDMA 3GPP (FWD and REV) due to a new release of the standard (analyzer mode)

- Modified Channel Power measurement due to a new release of the standard (options FSIQK72 and FSIQK73)

- Modified Video Bandwidth for CCDF and Time Domain (options FSIQK72 and FSIQK73)

- Channels without Pilot Bits can be detected (option FSIQK72)

- Limit Lines for Power vs Time measurement in 1900 MHz band (PCS) changed

Probe ON/OFF softkey in transducer menu

The probe ON/OFF softkey from the UNIT menu has been copied to the transducer menu.

Modified Channel Power measurement for standards W-CDMA 3GPP

The 3gPP documents 25.141 and 34.121 have changed from 3V8 (2001-12) to 3V9 (2002-03) concerning the measurement of power ("mean power", see sections 3.1, 6.2 and 6.5). These changes have been introduced into the firmware for standards W-CDMA 3GPP FWD and. W-CDMA 3GPP REV. Other standards are unchanged.
Please note, that the Adjacent Channel Leakage Power Ratio (ACLR) now uses a different definition of power ("RRC filtered mean power") than the Power measurement itself ("mean power"). For users who want to measure the channel power "the old way", it is possible to switch the RRC filter ON.

FSIQ-K72, FSIQ-K73: Modified Channel Power and SEM measurements

The 3gPP documents 25.141 and 34.121 have changed from 3V8 (2001-12) to 3V9 (2002-03) concerning the measurement of power ("mean power", see sections 3.1, 6.2 and 6.5). These changes have been introduced into the application firmware FSIQ-K72 and FSIQ-K73.
Please note, that the Adjacent Channel Leakage Power Ratio (ACLR) now uses a different definition of power ("RRC filtered mean power") than the Power measurement itself ("mean power"). For users who want to measure the channel power "the old way", it is possible to use the channel power function of the spectrum analyzer (see not above). For the SEM measurement the channel power measurment works like for the channel power.

FSIQ-K72, FSIQ-K73: Modified Video Bandwidth for CCDF and Time Domain

The video bandwidth has been changed from 5 MHz to 3 MHz. The new bandwidth leads to more accurate results for clipped signals.

FSIQ-K72: Channels without Pilot Bits can be detected

Up to firmware 4.30 channels without pilot bits (e.g. the PICH channel) could only be detected using mode "code channel predefined". Now they are detected also with mode "code channel autosearch".

FSE-K10: New Limit Lines for PvT Measurement

Only for GSM 1900 (PCS): The limit lines for GSM 1900 are different in the documents 45.005 and 51010. From FW 4.40 on, the FSE/FSIQ uses the slightly weaker lines from norm 51010.

4 Faults Remedied in Version V4.40

Note: Several of the listed faults were already fixed in service packs 4.30.x.

General errors

Selftest Failed, but Instrument Okay
Sometimes it could happen, that the selftest reportet "FAILED", but the instrument was OK.

Recall Data Set Lists on Floppy Disks
When looking which save sets are stored on a floppy disk, the firmware did not recognize if a new disk was inserted.

GSM/EDGE MS/BTS ANALYZER, FSE-K10/11/20/21/30/31

Selected Spurious Steps not in Save Sets
Within the spurious measurement it is possible to select/deselect some steps. This information was not stored in save sets, and so could not be restored after a recall.

Modulation Accuracy Status did not take into account all items (EDGE only)
The modulation accuracy status was PASSED even if the origin offset or 95% percentile was FAILED.

New method for power measurement of EDGE signals
The measurement of the signal power for EDGE signals is improved in 4.40. The new method leads to up to 0.5 dB higher values. This especially means, that the upper limit line within the `Power Vs Time` measurement now is about 0.5 dB higher. The measurement of GSM signals shows no difference.

Operating Mode 3GPP BTS ANALYZER (Option FSIQK72)

Marker To Peak in Peak Code Domain Error (CDP)
The marker was placed on the first instead of the last slot.

SYNC TYPE SCH
Synchronisation with "SYNC TYPE SCH" did not work.

SCPI: S-CCPCH Channel with out Pilot Bits (CDP, Code Channel Predefined)
With the command `CONF:WCDP:BTS:CTAB:DATA` it was not possible to define a S-CCPCH channel without pilot bits.

Operating Mode 3GPP MS ANALYZER (Option FSIQK73)

No Negative Frequency Error (CDP)
A frequency error less than zero was shown as "0.0".

Tracking Generator

Wrong Level for Small Frequencies in Zero Span
For a zero span measurement at a frequency less than about 1 MHz and a resolution bandwidth of 30 kHz the measured level could be to high (only if the frequency was the last changed instrument setting).

5 Faults Remedied in Service Pack 2

Note: Service Pack 1 does not exist. This number is skipped due to internal reasons.

General

Hardcopy on Floppy Disk
In rare cases a hardcopy to the floppy disk produced a corrupted file.

Mode Analyzer

Spurious at 3.809 and 3.914GHz
The specification for inherent spurious response is now also valid at 3.809 and 3.914 GHz receiving frequency.

FSE 26, FSE 40: Drop in Level with Spans > 16 GHz and RBW 50 kHz or smaller
Drops in level could occur with spans >16 GHz and small resolution bandwidth (<= 50 kHz).

Sweep pausing several seconds
When switching the RF Attenuation while using a FFT filter the sweep could stop for several seconds.

Mode Vector Analyzer

Trigger to Sync result dependents on points per symbol setting
Measuring the "Trigger to Sync Start Time" (Error Summary, external trigger, find sync on) is erroneously influenced by changing points per symbol from 4 to 16, when symbol rates below 64kHz are used.

Mode WCDMA BS Analyzer (FSIQ-K72 and FSIQ-K74)

SEM Limit Lines x-axis point 7.5 MHz corrected to 8.0 MHz
Three predefined limit lines were corrected.

Channel Table TM5_8 with wrong timing offset
Channel table TM5_8 showed a wrong timing offset for the DPCH channel with code 3 (4608 instead of 32768 chips).

6 Faults Remedied in Service Pack 3

Mode WCDMA BS Analyzer (FSIQ-K72/73/74)

CCDF Measurement
The % marker did not stop at the point of the sample with the highest level. Instead for small percentage values it was placed in the middle between this point and the right hand end of the x-axis.

7 Known Problems

Error with IEEE-Bus file transfer using repeat addressing

If "repeat addressing" is selected for the controller of the IEEE Bus, some bytes may be corrupted when transfering files by low level commands via the IEEE bus from the FSIQ to the controller computer. This error happens only if the following conditions hold:

- repeat addressing

- block size less than 4096 bytes

- large files (approximately more than 400 kB)

-
Workaround: The problem can be avoided by either disable repeat addressing or by setting the block size to at least 4096 bytes

Operating Mode 3GPP BTS ANALYZER (Option FSIQK72, FSIQK74)

TRACE:DATA? ABIT
When querying the bitstream values of all slots ("TRACE:DATA? ABIT") in the case of free running trigger, the bits of slot 0 and 1 may belong to the frame following the frame to which all other bits belong.
Workaround: Perform measurement with external trigger (TRIGGER EXTERN).

Operating Modes FSE-K10 and FSE-K11 (GSM measurements)

Within the FSE-K10/K11 measurement "PHASE/FREQUENCY ERROR" the value "trigger to sync start" is displayed (only if trigger mode "external" is selected). The value is approximately 4.3 us too high. The value is not used in the PASS/FAIL decision of the measurement and is displayed for information purpose only.
The same applies for the "trigger adjusted" value in the trigger adjust function.

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