Supplement to
Operating Manual
Signal Analyzer FSIQ 3 / FSIQ 7 / FSIQ 26 / FSIQ40
(Firmware V4.40 and higher)

Dear Customer,

your signal analyzer is equipped with a new firmware version. The new firmware offers a number of extensions and improvements which are not yet described in the operating manual. They are explained on the following pages. The new functions concern:

- Additional standards for the adjacent channel power measurement.
- Selection of trace averaging method
- Input of comment for trace export possible
- Trace export in vector analyzer mode
- Two additional digital cdma2000 standards in vector analyzer mode (cdma2000 SR1/DS FWD and cdma2000 SR1/DS REV)
- Recording and transmitting IQ data via remote control (option FSIQB70)
- %THD measurement (vector analysis)
- Extended functionality for operating modes GSM BTS ANALYZER (FSE-K11) and GSM MS ANALYZER (FSE-K10).
- New operating mode 3GPP Base Station Test, (application firmware FSIQK72 and FSIQK74).
- New operating mode 3GPP Mobile Test, (application firmware FSIQK73).
- New operating mode EDGE Mobile Tests (application firmware FSE-K20).
- New operating mode EDGE Base Station Tests (application firmware FSE-K21).
- New application firmware extension FSE-K30 (850 MHz band for base station test).
- New application firmware extension FSE-K31 (850 MHz band for mobile test).
- Setting the input attenuation to 0 dB via roll-key no longer possible
- Frequency and level offset is maintained at measurement switchover (application firmware FSIQK71)
- Changed settings for time domain measurement (application firmware FSIQK71/FSIQK72/FSIQK73)
- Modified default sweeptime for Spectrum Emission measurements (application firmware FSIQK72/FSIQK73)
- Extended range for scrambling code (application firmware FSIQK73)
- Extension of the IEEE-bus commands.

Caution:

Instruments FSIQ26/40 equipped with a RF module of model index 20 and higher should not be operated by a firmware version below 4.01.

Correction of Operating Manual, Chapter 1, Section "Unpacking the Instrument"

The list of deliverable item includes a Windows NT manual. This supplement, however, is no longer delivered, because the Windows NT controller is now described in the operating manual of the FSIQ.

Correction of Operating Manual, Chapter 1, 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.

Correction of Service Manual Instrument, Chapter 1, Section "Performance Test Report"

The testing of the RHO factor for W-CDMA, 4.96 FWD CH (Item No. 32) is omitted.

Additional adjacent channel power standards

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

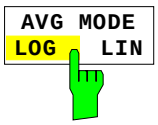
The following standards can be selected:

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

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.

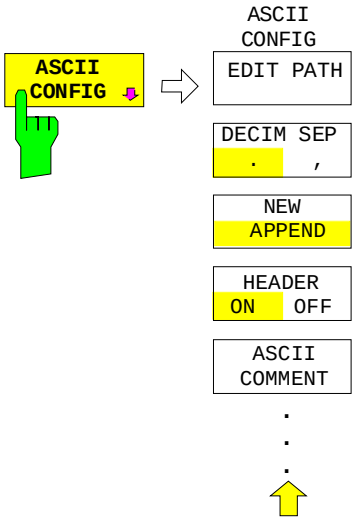
Logarithmic averaging is recommended if sinewave signals are to clearly stand out against the noise since, with this averaging, noise suppression is greater while the sinewave signals remain unchanged.

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.

ASCII Trace Export

The *ASCII CONFIG* menu was extended by softkey 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

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.Aug 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 or product 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
	0.00;44.919303894;	Measured values: <x value>,, <y1>, <y2>
	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.Aug 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.Aug 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.Aug 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:
	0.0;-28.4;	<x value>; <y value>;
	0.008e-003;-28.4;	
	0.016e-003;-28.5;	
	0.024e-003;-28.5;	
	0.032e-003;-28.4;	
	...;...;	

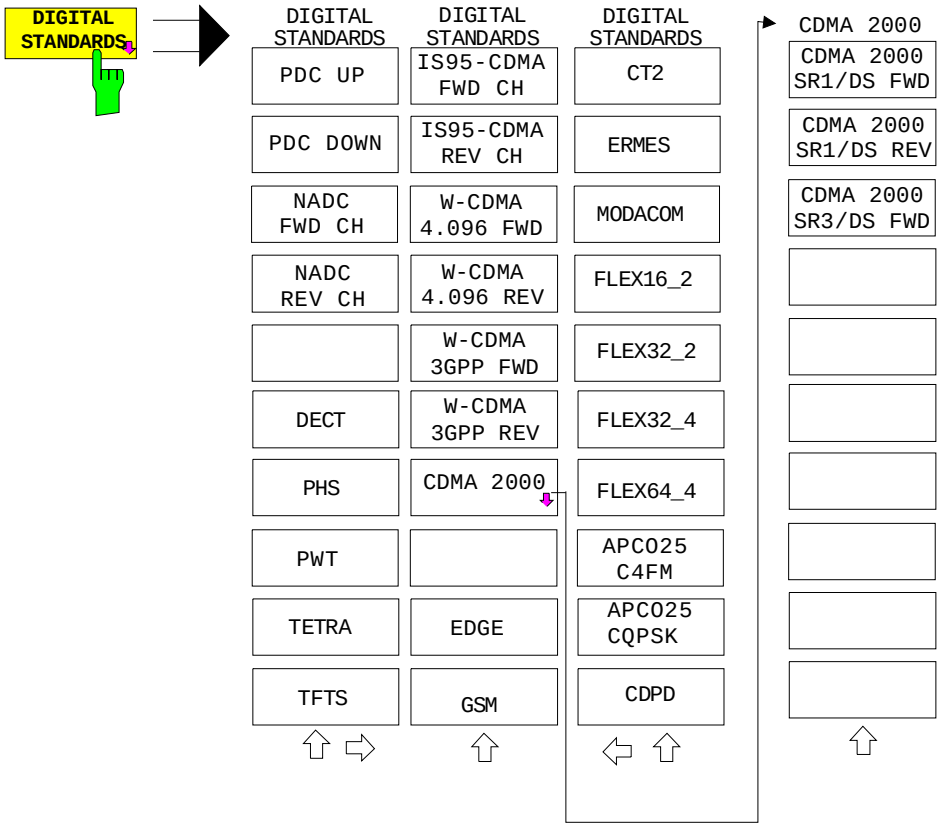
Example 2: Analog Demodulation

```
Type;FSIQ7;
Version;4.20;
Date;13.Aug 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;
```

New Digital cdma2000 Standards for Vector Analyzer Mode

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.

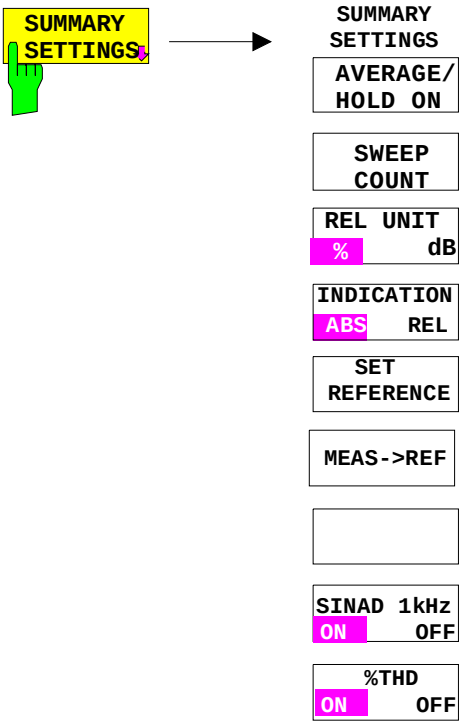
Extended DIGITAL STANDARDS menu:

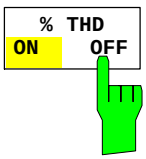


Extension of table "Standard Settings"

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)





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?`

Notes for Vector Analyzer Operating Mode

Adaptations for EDGE - Measurement with receiver filter

The EDGE measurement with a receiver filter and the EVM calculation are performed according to ETSI-TDOC **SMG2 829/99** / ANNEX H. This specified filter is effective in all display and measurement modes. Since it is a lowpass filter intersymbol-interference-free (ISI-free) points no longer occur in the display modes such as constellation diagram and vector diagram. In addition, the sync sequences provided in the unit were adapted by inverting the bits.

Note: *If measurements are to be performed without a receiver filter, deactivate digital standard EDGE (e.g. by switching from modulation parameter, meas filter from edge_mes to egde_ref and back to edge_mes).*

Extended Functionality for GSM BTS ANALYZER and GSM MS ANALYZER Operating Modes

Functions for the GSM BTS ANALYZER and GSM MS ANALYZER modes have been extended:

- Additional power class P1 for GSM BTS Analyzer. The new power class P1 for Pico BTS is supported.
- Extended settings range of output power for GSM BTS Analyzer.
  The settings range of output power now includes the gap between the power classes 8 and M1. Settings in this range are indicated by a question mark "?" in the table of power classes.
- Selection of trace averaging method

Note for Option FSE-K10:

The measurement MODULATION SPECTRUM - RX BAND as specified in GSM-11.10, chapter 13.4.4, section d)

> *d) The resolution and video bandwidth on the spectrum analyzer are adjusted to 100 kHz and the measurements are made at the following frequencies:*
> *on every ARFCN from 1 800 kHz offset from the carrier to the edge of the relevant transmit band for each measurement over 50 bursts.*
> *at 200 kHz intervals over the 2 MHz either side of the relevant transmit band for each measurement over 50 bursts.*
> ***at 200 kHz intervals over the band 925 - 960 MHz for each measurement over 50 bursts.***
> *at 200 kHz intervals over the band 1805 - 1880 MHz for each measurement over 50 bursts.*
>
> covers also for the P-GSM the E-GSM RX band.

As from firmware 4.10 the measurement covers the following bands:

Selected standard	Modulation RX bands
P-GSM	925 – 960 MHz (instead of 935 to 960 MHz as before)
E-GSM	925 – 960 MHz
For RGSM the extended range from 921 MHz is used.	
R-GSM	921 – 960 MHz

Recording and Transmission of IQ Data in Remote Control with Option FSIQB70

In remote control, IQ data can be recorded when the instrument is equipped with option FSIQB70. See description of IEC/IEE-bus commands of TRACe:IQ subsystem.

New Operating Mode 3GPP Base Station Test (Application Firmware FSIQK72)

Signal Analyzer FSIQ equipped with Application Firmware FSIQK72 performs code domain power measurements on downlink signals according to standard 3GPP (FDD mode). The application firmware is in line with standard 3GPP (Third Generation Partnership Project) with version release 99. In addition to the code domain measurements prescribed by the standard 3GPP, the application offers measurements with predefined settings in the frequency domain, e.g. power, ACLR and CCDF measurement.

The following hardware is required for using FSIQ in combination with option FSIQK72 (order no.: 1126.4746.02):

- Option FSIQB70 – Extended I/Q memory and DSP module
- Module I/Q Demodulator: model index 05 (order no.: 1066.2520.05)

Operating mode 3GPP base station test is described in a separate software manual.
Please note, that the timing offset of the S-CCPCH-Channels of some of the testmodels in chapter 4 is wrong. It has to be 0 instead of 150. The correct value 0 is used in the predefined channel tables in the firmware.

New Extension for Operating Mode 3GPP Base Station Test: HSDPA (Application Firmware FSIQK74)

FSIQK74 is an add-on to FSIQK72 to support HSDPA channels (see FSIQK72).
The option is described in the FSIQK72 manual.

New Operating Mode 3GPP Mobile Station Test (Application Firmware FSIQK73)

Signal Analyzer FSIQ equipped with Application Firmware FSIQK73 perfoms code domain power measurements on uplink signals according to standard 3GPP (FDD mode). The application firmware is in line with standard 3GPP (Third Generation Partnership Project) with version release 99. In addition to the code domain measurements prescribed by the standard 3GPP, the application offers measurements with predefined settings in the frequency domain, e.g. power, ACLR and CCDF measurement.

The following hardware is required for using FSIQ in combination with option FSIQK73 (order no.: 1153.1009.02):

- Option FSIQB70 – Extended I/Q memory and DSP module
- Module I/Q Demodulator: model index 05 (order no.: 1066.2520.05)

Operating mode 3GPP mobile station test is described in a separate software manual.

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).

New Operating Modes EDGE Mobile Tests and EDGE Base Station Tests (Application Firmware FSE-K20/21).

Firmware application FSE-K20 (order no. 1106.4086.02) extends option FSE-K10 and firmware application FSE-K21 (order no.1106.4186.02) extends option FSE-K11 by the analysis of 8-PSK modulated EDGE signals according to the standard.
In this way, the functions of firmware applications FSE-K10 and FSE-K11 is also available for EDGE signals.

The functions of the options are described in the following manuals:

Operating Manual EDGE Mobile Tests FSE-K20, Order No. 1106.4105.xx-01

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

Operating Manual EDGE Base Station Tests FSE-K21, Order No. 1106.4205.xx-01

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

New Application Firmware Extensions FSE-K30 and FSE-K31 for Operating Modes GSM and EDGE Mobile and Base Station Tests

FW extension FSE-K30/FSE-K31 provides measurements in the new 850 MHz GSM band for options FSE-K10/FSE-K20 or FSE-K11/FSE-K21.

Operating Mode FSIQK71: Frequency Offset and Level Offset are maintained

When switching between the different measurements of application FSIQK71, not only the center frequency and reference level are maintained as stated in the operating manual, but also the center frequency offset and reference level offset.

Operating Modes FSIQK71, FSIQK72 and FSIQK73: Changed Settings for Time Domain Measurements

In Time Domain measurement, the RMS detector is selected for trace1, not the SAMPLE detector as stated in the operating manual.

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.

New and Extended IEEE-Bus Commands

Modification of Commands for GSM/EDGE Applications:

: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

Correction of the Operating Manual:

For the following commands, the correct *RST value is given below:

:CONFigure[:BTS]:NETWork:PHASe
:CONFigure[:MS]:NETWork:PHASe

These commands select the phase of the standard according to which the base/mobile station will work.

Example: ":CONF:NETW:PHAS 2"

Features: *RST value: 2 for PGSM, EGSM, GSM1800
2,PLUS for RGSM
for GSM850 and GSM1900, no phases are available
SCPI: device-specific

Mode: BTS/MS

Extended Functionality:

The new firmware was extended by the following IEEE-bus commands or command parameters:

- Additional standards for ACP.
- Additional command for active limit lines.
- Indication of limit lines without evaluation
- Additional commands for option FSE-K10,/K11, FSIQK71, FSIQK72/74.
- Additional commands for trace export.
- Trace:IQ subsystem, recording and transmitting of IQ data (option FSIQB70).
- Extension of commands for selection of power class in operating modes GSM BTS ANALYZER (FSE-K11) and GSM MS ANALYZER (FSE-K10).
- Extenuation of FETCh and READ commands for Carrier Power Individual measurement (FSE-K10/FSE-K11/FSE-K20/FSE-K21).
- Additional command parameters for application firmware extensions FSE-K30 and FSE-K31 (850 MHz band).
- Additional command for firmware update via IEC/IEEE bus interface.
- Additional bits in the STATus:QUEStionable:SYNC register for operating modes FSIQK71/K72/K73
- Additional command for selection of trace averaging method
- Additional command for switching the active measurement windows
- Additional command for the THD measurement

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	cdma One Base Station Tests (option FSIQK72/FSIQK73)

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<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 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 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...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: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.

Extended command for FW 4.40:
: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[: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]: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[:MS]:ARFCn <numeric_value>

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

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: MS

: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

Mode: CDP

: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 ± 1.8 MHz
TXBand	TX-Band
RXBand	RX-Band
COMBined	ARFCN ± 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)

Extended command for FW 4.40:

: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

: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

: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.

Command extended for „Carrier Power Individual“ measurement:
: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).

Command extended for „Carrier Power Individual“ measurement:
: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).

Command extended for „Carrier Power Individual“ measurement:
: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<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): $AVG(n) = MIN(X_1...X_n)$

SCALar (AVERAGE):

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

:[SENSe<1|2>:]CDPower:LEVel:ADJust

This command is used for setting automatically the RF attenuation and IF gain to the level of the applied signal. The instrument is to be switched to the *ATTEN MANUAL* mode so as to set the RF attenuation and IF gain separately to optimum values. This mode is maintained after changing from code-domain power measurements to the analyzer or vector analyzer modes.

Example: ":CDP:LEV:ADJ"

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

Mode: CDP, WCDP and TRACE:IQ:STAT ON

This command is an <Event> and has therefore neither *RST value nor query.

:[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<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: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.

Extended command for FW 4.40:

TRACe Subsystem

:TRACe[:DATA] TRACE1 |TRACE2 | ABITstream | PWCDp | CTABle | CWCDp

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

New keyword CWCDp:

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

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, <numeric_value>, IMMediate | EXTernal | VIDeo, POSitive | NEGative, <numeric_value>, <numeric_value>	--, HZ, HZ, --, --, s, 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
`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/K72/K73.
It can be queried with commands `STATus:QUEStionable:SYNC:CONDition?` and "`STATus:QUEStionable:SYNC[:EVENt]?`.

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 the premeasurement 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 pre-measurement 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 faulty sequences were found during the check of the pilot symbols
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 threshold). **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 pilot timing offset of the signal is to large (> ± 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 reducedbecause 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.

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

A Comment line starts 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?
```