

## Spectrum Analyzers FSP/FSU

## GSM and EDGE measurements with Application Firmware FS-K5



Photo 43615/1

**FIG 1** With its high measurement speed and accuracy, Spectrum Analyzer FSP is not only the right tool for general-purpose applications but also an ideal choice for production needs

**GSM, EDGE, HSCSD, GPRS,  $3\pi/8$  shifted PSK – GSM evolution calls for new or modified measurements on the RF signal. Application Firmware FS-K5 for measurements on transmitted GSM/EDGE signals keeps you firmly in touch with all the new developments. Plus FS-K5 combines flexibility for development with very high measurement speed in production.**

### Keeping pace with development

The increasing demand worldwide for bandwidth and attractively priced mobile communication means that there will be further expansion of GSM mobile radio networks over the next few years. Besides increased capacity through denser networking of base stations, developments point to higher data rates by expanding GSM to HSCSD (high-speed circuit-switched data) and GPRS (general packet radio services) and subsequently EDGE, which increases the bit rate by a better grade of modulation at the same bandwidth.

HSCSD and GPRS provide the user with several timeslots and so optimize data throughput. Instead of GMSK modulation, EDGE (enhanced data rate for GSM evolution) is based on an 8PSK

method with the same symbol rate as GSM, but with three transmitted bits per symbol instead of one as in GSM.

Application Firmware FS-K5 for measurements on transmitted GSM/EDGE signals updates to match these developments. Plus, it combines plenty of flexibility for design needs with the very high measurement speed you need in production.

### What the user expects

Both development and production are confronted with the need to design, manufacture and test more products faster and more cheaply. Measuring instruments for development purposes should feature intuitive operation, be preset for GSM standards, user-configurable and good value for money.

Production requires precise measuring instruments that are fast and flexible to remotely-control, and provide test routines at optimum speed. And these instruments must remain compatible in their remote-control command sets and operating philosophy over several generations.

This is exactly where Application Firmware FS-K5 comes in with its advantages for efficient GSM and EDGE measurements on modules and complete terminals.

### Application Firmware FS-K5 “GSM mobile station test”

The newly developed Application Firmware FS-K5 is suitable for all spectrum analyzers of the FSP [\*] and FSU\* families. Thanks to their high measurement accuracy and reproducibility of results, these instruments ensure higher throughput in production and, last but not least, also in the laboratory.

\* The new Spectrum Analyzer FSU will feature in the next issue.

Measurement	Explanation
Phase/Frequency error	With synchronization to midamble
Modulation accuracy	EVM, 95:th-percentile value, origin offset suppression and frequency error with synchronization to midamble
Carrier power	Without midamble reference
Power versus time	Carrier power versus time and carrier power itself with synchronization to midamble
Spectrum due to modulation	
Spectrum due to transients	
Spurious emissions	

**These measurements are possible with FS-K5**

FSP (FIG 1) is thus an excellent basis to perform ETSI-specific measurements on mobiles together with FS-K5. If you run the software on FSU, the outstanding features of this high-end analyzer, such as an extremely wide dynamic range, excellent noise figure and higher display resolution, go into the measurement.

Despite the variety of measurement functions, the user interface can be operated intuitively, the menu depth is very low (maximally one submenu), making familiarization fast and easy (example in FIG 2).

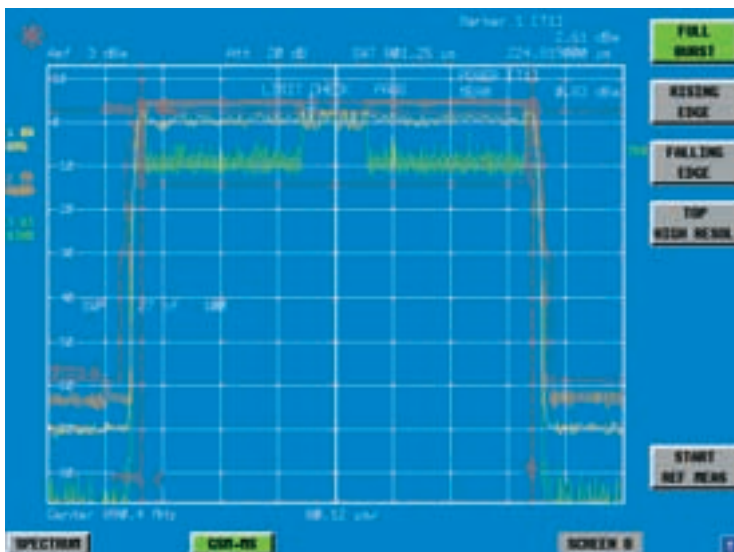
All measurements relevant to ETSI standards can be carried out on the physical layer at a keystroke, manually or via the IEC/IEEE bus. There is a softkey for each measurement that, when first activated, presents the parameters for each measurement ready set according to GSM standards (FIG 3).

The usual parameters available on spectrum analyzers are, as in the basic unit, user-configurable by hardkeys and softkeys. Manual setting of optimum level and trigger reference, which is time-consuming and requires lots of experience, is no more – the software sets them automatically and optimally at a keystroke.

FS-K5 comprises the most important limit lines of the ETSI standards. You can modify them or add those you define yourself.

### Multislot, speed and external trigger

Both single- and multislot measurements are supported (see table for overview). So it is possible to measure the phase/frequency error in one of four active slots of a mobile phone. Determining the spectrum due to modulation



**FIG 2**  
Power versus time measurement of EDGE burst

- ▶ (ARFCN  $\pm 1.8$  MHz, four active slots), which used to be a time-consuming procedure, is very much accelerated thanks to this feature (ARFCN: absolute radio frequency channel number).

Measurement speed in remote control is enhanced yet again compared to the already excellent high speed under manual control. The previously mentioned measurement of the spectrum due to modulation takes less than eight seconds by averaging over 200 bursts, which signifies a considerable increase in production throughput. The testpoints of measurement of the spectrum due

to modulation can, of course, also be expanded beyond ARFCN  $\pm 1.8$  MHz at 200 kHz spacings.

Mobiles do not usually provide any external triggers. But ETSI specifications say that measuring the spectrum due to modulation in the whole band has to be gated, i. e. triggered so that only a specific burst section is considered. Option FS-B6 (a broadband and sensitive RF power trigger) solves this problem: you no longer need an external trigger, even when measuring in the whole band and beyond. This applies both to GSM and EDGE.

The user can choose whether to display the results as a curve or in tabular form showing ETSI or user-specific limit values. Some measurements even allow both types of display. The software automatically compares measured results with the set limit values, displays PASS, MARGIN or FAIL and marks the associated values in a result table (FIG 4).

All this, plus the possibility to run the software fully compatible on several instrument series exploiting their individual characteristics, makes Application Firmware FS-K5 the ideal choice for every development lab and production line.

And FS-K5 is future-oriented – the evolution from GSM to 2.5G is already in there.

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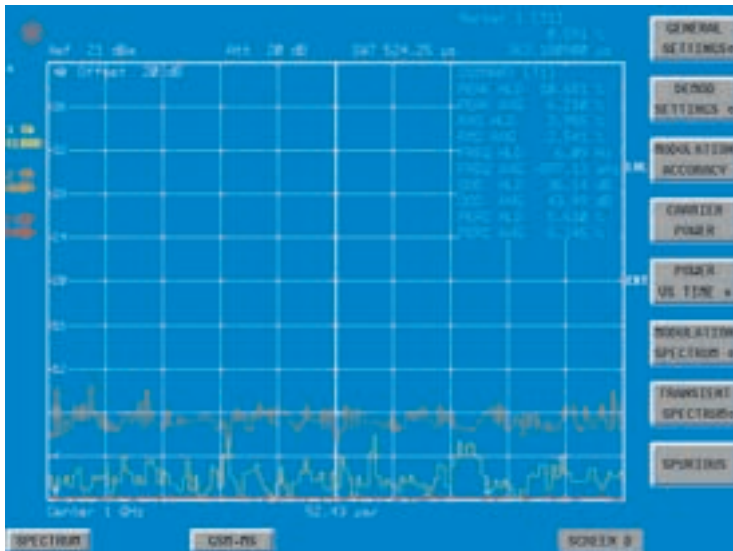


FIG 3  
Measuring modulation accuracy



FIG 4  
Display of results measured for spectrum due to modulation

More information and data sheet at [www.rohde-schwarz.com](http://www.rohde-schwarz.com) or enter 170/05 on reader service card

REFERENCES  
[\*] Spectrum Analyzer FSP: Medium class aspiring to high end. News from Rohde & Schwarz (2000) No. 166, pp 4–7