

## Analyzers R&amp;S®FSP/FSU/FSQ

## Test of TD-SCDMA base stations

**The new R&S®FS-K76 application firmware enhances the functionality of the Spectrum Analyzers R&S®FSP and R&S®FSU and the Signal Analyzer R&S®FSQ. For the first time worldwide, R&S®FS-K76 now makes it possible to perform TD-SCDMA code domain measurements with a spectrum analyzer. TD-SCDMA (time division synchronized code division multiple access) is a new standard mainly endorsed by China. R&S®FS-K76 enables the peak code domain power and modulation accuracy of TD-SCDMA signals to be measured in the same manner as for WCDMA and cdma2000 signals.**

## TD-SCDMA – a new standard in two versions

TD-SCDMA has been specified by two different standardization organizations: 3GPP<sup>1)</sup> and the China Wireless Telecommunication Standard group (CWTS). The 3GPP TD-SCDMA standard is also known as the low chip rate (LCR) option of TDD, and the CWTS standard is also referred to as TD-SCDMA system for mobile communication (TSM). The main difference between the two standards is that TSM is intended for use with GSM core networks and LCR with UTRAN<sup>2)</sup>. The signals and measurements for physical layer tests are identical, with minor differences existing with respect to requirements.

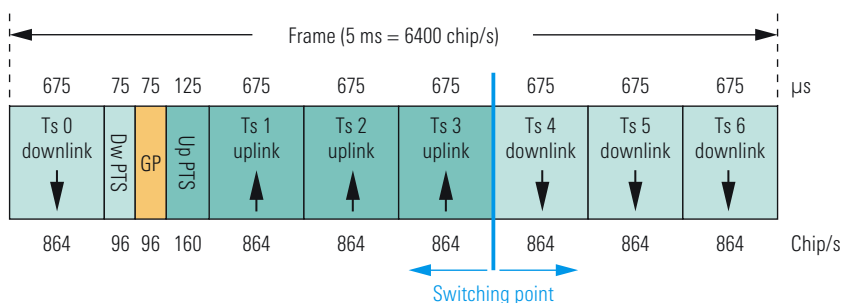
CDMA systems differentiate between users by codes and not by frequencies. TD-SCDMA employs a chip rate of 1.28 Mchip/s and a bandwidth of 1.6 MHz. TDD systems operate on the same frequency in the uplink and the downlink, and differentiate between users by time division duplex (TDD). To avoid interference in the network, it is mandatory that the base station and the mobile phone do not transmit at the same time. To synchronize transmission of the mobile phones, the signal from the base station contains a downlink pilot timeslot (DwPTS).

FIG 1 shows the timeslot structure of a TD-SCDMA frame. The first timeslot (Ts0) of the frame is always used for transmission in the downlink, the second one (Ts1) in the uplink. The remaining timeslots can be configured by the network for either uplink or downlink transmission by moving the switching point. Either QPSK or – if very high data rates are to be achieved – 8PSK modulation is used for the different codes.

For a detailed analysis of the performance of a CDMA transmitter, looking at the spectrum alone is not sufficient, since CDMA systems differentiate between users by codes. It is therefore necessary for the analyzer to despread the signal and measure the power and quality of each individual code.

## Code domain analysis

The main application of the new R&S®FS-K76 firmware is to determine the code domain power of the individual physical channels and to check each one for compliance with specified nominal values. Moreover, this measurement is ideally suited for detecting impairments in the transmitter.



- 1) Third Generation Partnership Project
- 2) UTRAN – UMTS Terrestrial Radio Access Network  
UMTS – Universal Mobile Telecommunications System

**FIG 1**  
Time domain structure of TD-SCDMA signal.

The firmware automatically detects data rates and modulation formats, freeing the user from having to do so. All important modulation accuracy parameters, e.g. error vector magnitude (EVM), peak code domain error (PCDE) and frequency error, are available at a glance (FIG 2). Detailed analysis of all parameters can be performed very conveniently. An example of this is shown in FIG 3, where the EVM across all captured timeslots is displayed and can be checked for compliance with standard requirements.

## Spectrum measurements

R&S®FS-K76 offers ready-to-run functions for the most common spectrum measurements, such as code domain power versus time, transmit power, adjacent channel power, as well as spectrum emission mask. The integrated RMS detector allows accurate transmitter power measurements irrespective of the modulation mode.

## Multistandard platforms for 3G

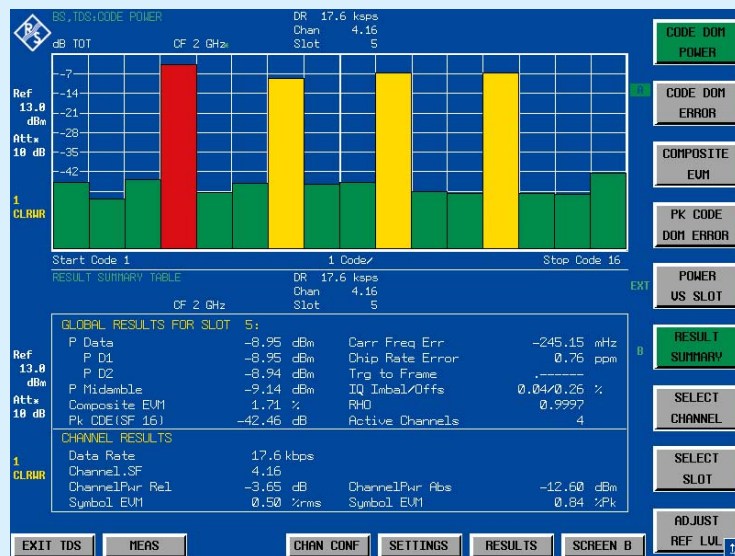
With the new application firmware options described in this issue, the Analyzers R&S®FSP, FSU and FSQ support numerous 2G, 2.5G and 3G standards (FIG 4). All applications can be installed together, making the analyzers versatile multistandard platforms.

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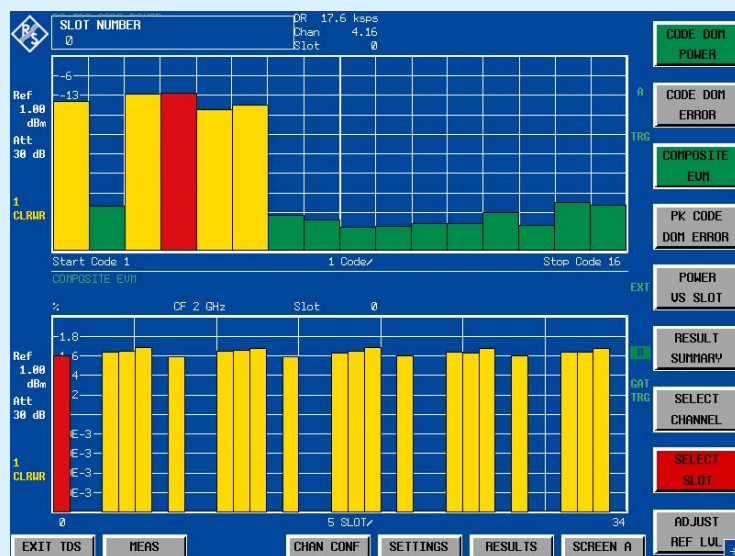
**Additional articles on the R&S®FSP/FSU/FSQ are found on pages 16, 27, 30 and 36.**

**More information and data sheets for the analyzers and options at [www.rohde-schwarz.com](http://www.rohde-schwarz.com)**

**FIG 2**  
Code domain spectrum and overview of main modulation parameters.



**FIG 3**  
Composite EVM versus timeslots.



**FIG 4**  
The analyzers support measurements to a variety of standards.

Option	Standard
R&S®FS-K5	GSM/EDGE
R&S®FS-K72	3GPP FDD base stations
R&S®FS-K73	3GPP FDD user equipment
R&S®FS-K74	3GPP HSDPA base stations
R&S®FS-K76	TD-SCDMA base stations
R&S®FS-K82	cdma2000 base stations
R&S®FS-K83	cdma2000 and 1xEV-DV mobile stations
R&S®FS-K84	cdma2000 and 1xEV-DO base stations