



cdma2000 Base Station Test Application Firmware R&S FS-K82

Transmitter measurements on cdma2000 base stations and modules with Signal Analyzer R&S FSQ and Spectrum Analyzers R&S FSU and R&S FSP

- ◆ Adds measurement functions in line with 3GPP2 specifications to the R&S FSU, R&S FSQ and R&S FSP analyzer families
- ◆ Provides the functionality needed for base station testing as well as the related parameters
 - Code domain power (code domain analyzer)
 - Code domain power versus time
 - Rho
 - Error vector magnitude (EVM)
 - Peak code domain error
 - Power versus symbol
 - Symbol constellation
 - Channel table
 - Code domain error power

Application Firmware R&S FS-K82 can be installed on all models of the Signal Analyzers R&S FSQ and Spectrum Analyzers R&S FSU and R&S FSP. It enhances the range of applications to include code domain power and modulation measurements on cdma2000 signals for radio configurations 1 to 5.

Featuring wide dynamic range for adjacent channel power, the R&S FSQ and the R&S FSU are ideal tools for cdma2000 base station transmitter measurements in development and production.

The R&S FSP is the ideal development tool with easy-to-use measurement functions integrated into a cost-effective analyzer – the workhorse for every engineer.

Measurement	R&S FSU/ FSP/FSQ	R&S FSU/ FSP/FSQ with R&S FS-K82
Maximum output power	x	x
Frequency error		x
Power control dynamic range		x
Total power dynamic range		x
Occupied bandwidth	x	x
Spectrum emission mask		x
ACLR	x	x
Spurious emissions	x	
Rho		x
Error vector magnitude		x
Peak code domain error		x

Code domain power measurements

The main application of R&S FS-K82 is the determination of the power in the individual code channels referred to as code domain power measurement. The power ratios between the individual channels, for instance, can be checked for compliance with the nominal values. Moreover, this measurement is a very efficient tool for detecting transmitter impairments such as clipping or intermodulation that are not obvious from the spectrum alone.

R&S FS-K82 also supports the analysis of orthogonal transmit diversity signals. Not only the signals for the separate antennas can be studied, but also the combined signal as it is seen by a mobile receiver.

The power of the different codes can be shown versus the code number. This is called Hadamard order. The code powers can also be displayed in bit reversed order which intuitively provides information about how much of the code domain is occupied by each single user.

To investigate power control, the power characteristic in a code channel can be displayed versus a number of power control groups (PCG). The number of PCGs to be analyzed can be changed. For the R&S FSQ and the R&S FSU this number ranges between 2 and 50 and for the R&S FSP between 2 and 12.

To look even further into the behaviour of a single code, the power versus symbol feature is a very useful tool.

Measurement of modulation quality: rho, peak code domain error and EVM

Three different measurements are commonly used in cdma2000 systems for determining the modulation quality:

- ◆ EVM (error vector magnitude)
- ◆ Rho
- ◆ Peak code domain error

The composite EVM measurement returns a modulation error value for the total signal, whereas the symbol EVM function yields the individual vector errors of the active channels.

Rho is the correlation between the measured signal and the ideal reference signal and is a measure of the overall modulation quality.

To obtain the peak code domain error (PCDE), the vector error between the measured signal and the ideal reference signal is determined with a selectable base spreading factor of 64 or 128.

Automatic detection of active channels and their data rate

The data rates of the user channels are automatically detected by R&S FS-K82 and need not be known beforehand. With the channel configuration tool the user can define the active channels, which improves the capabilities to measure under difficult signal conditions.

Band class settings

The frequency band classes 0 to 9 as specified by the standard are user-selectable, so that the correct limits are set in the ACLR and spectrum emission mask measurements.

Spectrum emission mask

To perform the spectrum emission mask measurement in line with the 3GPP2 specifications, the FS-K82 provides an automatic function that gives a pass/fail result. If requested by the band class setting, the limits depend on the channel power.

Spectrum measurements over wide dynamic range

The RMS detector integrated as standard allows accurate transmitter power measurements irrespective of the waveform. Due to their extremely wide dynamic range, the R&S FSU and R&S FSQ are the ideal analyzers for out-of-band emissions that have to be detected for instance by means of adjacent-channel power measurements.

Measurements cannot only be performed on systems but also on individual components such as amplifiers which have to meet more stringent requirements.

Remote control

All measurements can be remote-controlled. The results and demodulated data bits can be transferred via the IEEE bus. This makes R&S FS-K82 ideal for use in production.

Applications and examples

Code domain power measurement on a signal with 9 active channels (1)

Active and inactive channels are displayed in bit-reversed order. Inactive channels (noise, interference) are displayed with the base spreading factor. The table also shows the main parameters of the total signal at a glance, e.g. total power, pilot power, rho, frequency error and error of chip rate, as well as the parameters of the marked code channel such as code power and EVM.

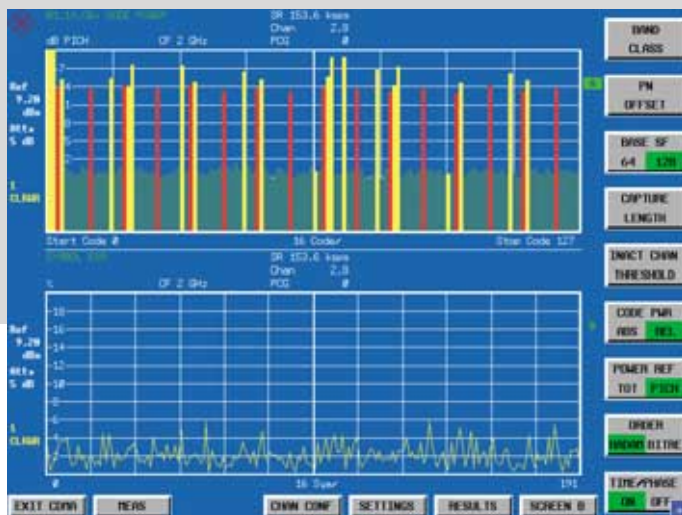
Measurement of error vector magnitude versus symbol (2)

The upper half of the screen displays the code domain overview with the codes sorted in Hadamard order. The EVM for each symbol in a power control group is shown in the lower half of the screen.

1



2

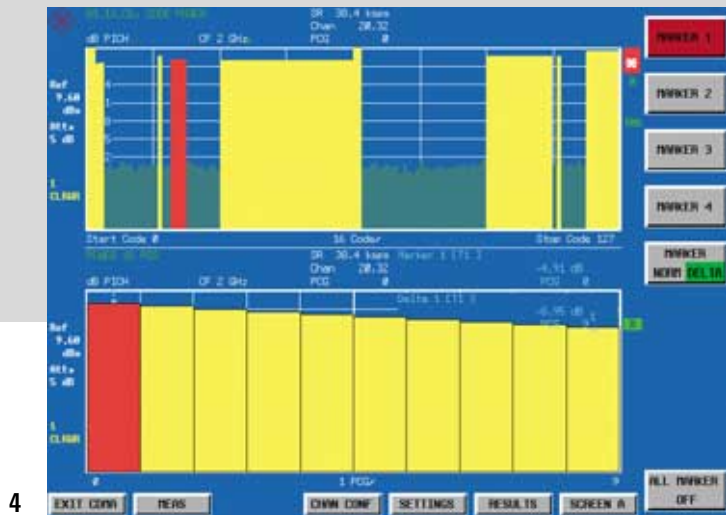
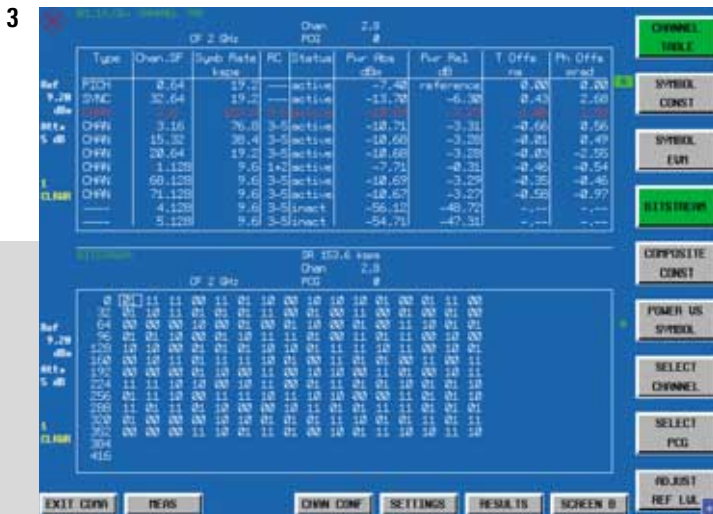


Automatic detection of channels and decoding of information (3)

Information about the active channels is presented in a list. In addition, the user data transmitted on each physical channel can be analyzed.

Measurement of code domain power versus time (4)

The code domain power can additionally be displayed versus the selected 10 PCGs to determine the accuracy of power control.



Specifications

The specifications below apply to the R&S FSUx (R&S FSU 3/8/26), R&S FSQx (R&S FSQ 3/8/26) and R&S FSPx (R&S FSP 3/7/13/30/40). They are based on the data sheet specifications of the Spectrum Analyzer R&S FSQ, R&S FSU and R&S FSP and have not been checked separately. Specifications apply under the following conditions: 15 minutes warmup time at ambient temperature, specified environmental conditions met, calibration cycle adhered to and internal calibration performed. Data with tolerances are measurement uncertainties with a confidence level of 95%. The specified level measurement errors do not take into account systematic errors due to reduced S/N ratio.

Measurement	R&S FSP	R&S FSU/R&S FSQ
Code domain power (applies to code domain power and code domain power versus slot)		
Total signal power, measurement uncertainty	<0.5 dB	<0.3 dB
Pilot power, measurement uncertainty	<0.6 dB	<0.4 dB
Code power, measurement uncertainty Absolute Relative	<0.6 dB <0.1 dB	<0.4 dB <0.1 dB
Frequency error		
Measurement range Measurement uncertainty (S/N >40 dB)	<1 kHz <1.5 Hz + error of reference frequency	<1 kHz <1.5 Hz + error of reference frequency
Composite EVM		
Measurement range	1.5 % to 25%	1% to 25%
Inherent EVM	<1.5%	<1%
Measurement uncertainty	<0.5% of reading	<0.25% of reading
Peak code domain error		
Measurement range	0 dB to -55 dB	0 dB to -60 dB
Inherent PCDE	-55 dB	-60 dB
Measurement uncertainty	<1 dB (0 dB to -40 dB)	<1 dB (0 dB to -40 dB)
Output power		
Measurement uncertainty Absolute Relative	<0.5 dB <0.2 dB	<0.3 dB <0.1 dB
Occupied bandwidth (99%)		
Measurement uncertainty	<85 kHz	<85 kHz
Spurious emissions		
Level uncertainty <3.6 GHz 3.6 GHz to 13 GHz	<0.5 dB <2.5 dB	<0.5 dB <2.5 dB

Ordering information

Application Firmware R&S FS-K82 can be integrated into any member of the R&S FSU, R&S FSQ or R&S FSP families.

Designation	Type	Order No.
cdma2000 Base Station Test Application Firmware	R&S FS-K82	1157.2316.02

Recommended extras

Designation	Type	Order No.
High-Power Attenuator 20 dB, 50 W, 0 GHz to 6 GHz	R&S RDL50	1035.1770.52

