Data sheet

Version 01.00

September 2003

cdma2000/1xEV-DV Mobile Station Test Application Firmware R&S®FS-K83

Transmitter measurements on cdma2000 and 1xEV-DV reverse link with the Signal Analyzer R&S®FSQ and the 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 mobile station testing as well as the related parameters
  - Code domain power
  - 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

ROHDE&SCHWARZ

Application Firmware R&S®FS-K83 can be installed on all models of the Signal Analyzers R&S®FSQ and Spectrum Analyzers R&S®FSU and R&S®FSP.

Application Firmware R&S®FS-K83 enhances the range of applications to include code domain power and modulation measurements on cdma2000 signals for radio configurations 3 and 4 and 1xEV-DV revision C signals.

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

The R&S®FSP is the ideal partner in development and production, featuring low uncertainty in level measurement, high measurement speed as well as excellent RF characteristics.

Code domain power measurements

The main application 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.

The power values of the active and unassigned codes are displayed in different colours. Codes with alias power and codes that contain power components that result from a higher spreading factor than the base spreading factor are also implied by a change of colour. Furthermore, quasi-inactive codes, where the code on the analyzed branch is inactive but the code with the same code number on the other branch belongs to an active channel, are also indicated on the screen.

Measurement	R&S®FSU/FSP/FSQ	R&S®FSU/FSP/FSQ with R&S®FS-K83
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
Time and phase offset	–	X

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, i.e. the data rate used for transmission.

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.

For an even closer look into the behaviour of a single code, the power versus symbol feature can be used.

1xEV-DV

To facilitate higher data rates, revision C of the 1xEV-DV standard has added two new channels for fast acknowledgment and quality indication of the radio channel. These new channels are automatically detected by the firmware.

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

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

- Rho
  Rho is the correlation between the measured signal and the ideal reference signal and is a measure of overall modulation quality.
- EVM (error vector magnitude)
  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.

- Peak code domain error
  To obtain the peak code domain error (PCDE), the vector error between the measured signal and the ideal reference signal is determined. In option R&S®FS-K83, a base spreading factor of 16, 32 or 64 can be selected for the mobile.

Automatic detection of active channels and their data rates
The data rates of the user channels are automatically detected by R&S®FS-K83 and need not be known beforehand. Signals with a gated pilot are also automatically detected as long as at least one of the captured power control groups contains a pilot signal.

The channel configuration tool enables the user to define the active channels, which improves the capabilities for measuring under difficult signal conditions.

Band class settings (1)
The frequency band classes 0 to 12 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, R&S®FS-K83 provides an automatic function that yields a pass/fail result. If specified in 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 by means of adjacent-channel power measurements, for instance.

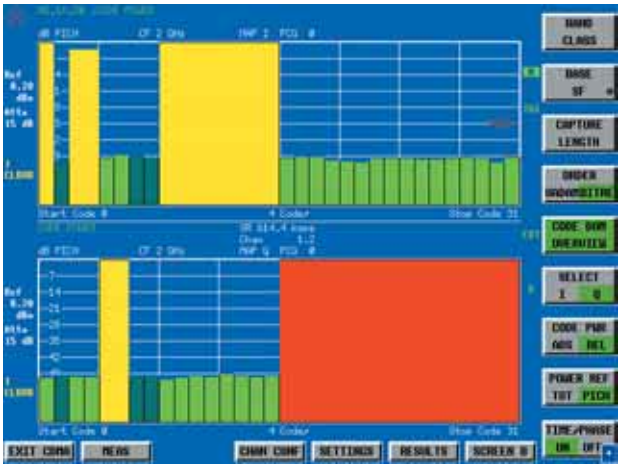
Measurements can be performed not only on systems but also on individual components such as amplifiers that have to meet more stringent requirements.

1

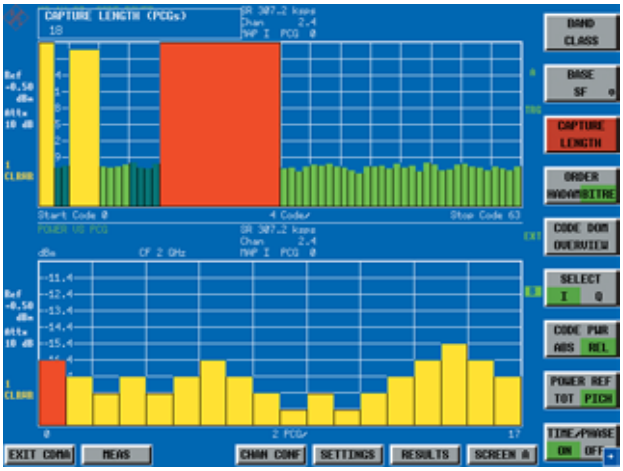
BAND CLASS SELECTION

√Band Class 0 (800 MHz Band)
Band Class 1 (1900 MHz Band)
Band Class 2 (TACS Band)
Band Class 3 (JTACS Band)
Band Class 4 (Korean PCS Band)
Band Class 5 (450 MHz Band)
Band Class 6 (2 GHz Band)
Band Class 7 (700 MHz Band)
Band Class 8 (1800 MHz Band)
Band Class 9 (900 MHz Band)
Band Class 10 (secondary 800 MHz Band)
Band Class 11 (400 MHz European PAMR Band)
Band Class 12 (800 MHz PAMR Band)

2



3



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-K83 ideal for use in production.

cdma2000 applications and examples

Code domain power measurement on a signal with high data rate transmission (2)
Active and inactive channels are displayed in bit-reversed order. Inactive channels (noise, interference) are displayed with the base spreading factor. The upper half shows the inphase part of the signal, the lower half the quadrature part.

Measurement of code domain power versus time (3)
The code domain power can additionally be displayed versus the selected number of PCGs to determine the accuracy of power control.

1xEV-DV applications and examples

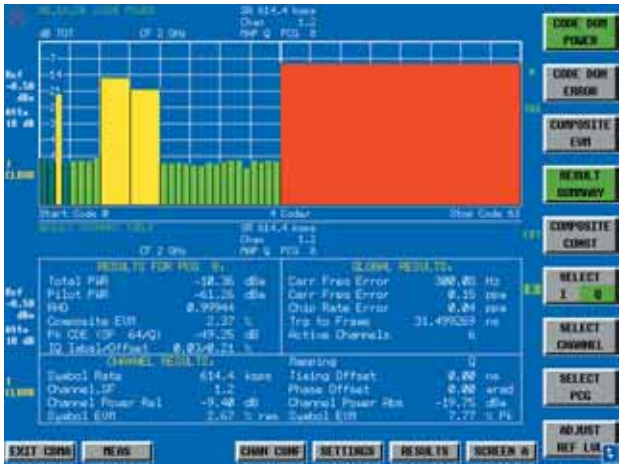
Channel table and data on the selected signal (4)
The upper part of the screen shows an overview of the detected channels and a number of parameters such as symbol rate, power and timing offset.

Code domain power measurement on a signal with high data rate transmission (5)
Active and inactive channels of the quadrature part are displayed in bit-reversed order with a base spreading factor of 64.

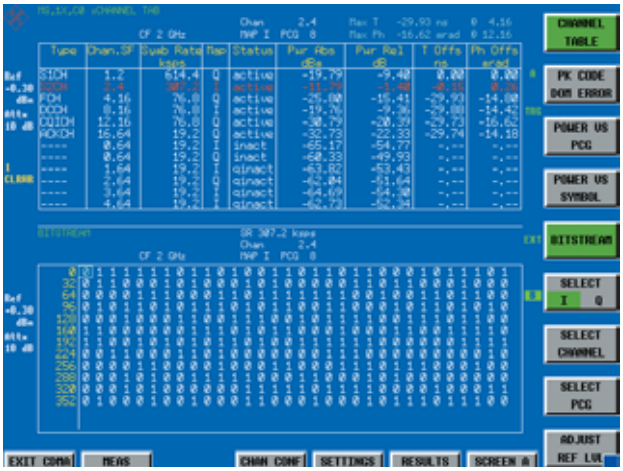
The table below shows the main parameters of the total signal at a glance, e.g. total power, pilot power, rho, frequency error and error of chip rate, as well as the parameters of the marked code channel such as code power and EVM.

Error power and composite constellation (6)
The distribution of the error power of the signal is displayed in the upper part of the display. The lower part shows the composite constellation of the signal.

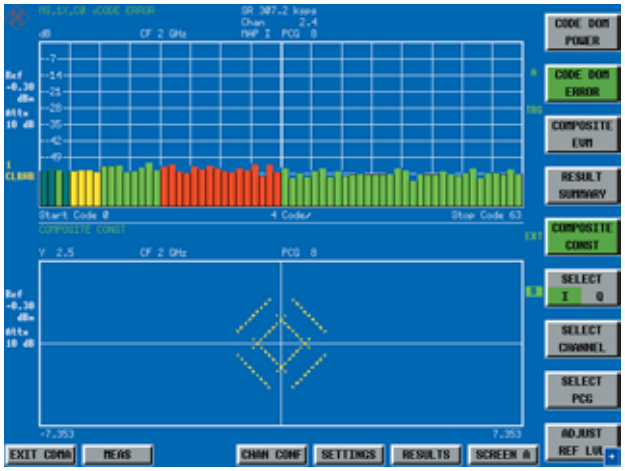
4



5



6



Specifications

The specifications below apply to the R&S®FSQ3/8/26, R&S®FSU3/8/26/46 and R&S®FSP3/7/13/30/40.
They are based on the data sheet specifications of the R&S®FSU, R&S®FSQ and R&S®FSP analyzers and have not been checked separately.
Specifications apply under the following conditions: 15 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to and internal calibration performed. Data with tolerances: measurement uncertainties with a confidence level of 95%. Data without tolerances: typical values. 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/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	<0.6 dB	<0.4 dB
Code power; measurement uncertainty, relative	<0.1 dB	<0.1 dB
Frequency error		
Measurement range uncertainty (S/N >40 dB)	<2 kHz <1.5 Hz + error of reference frequency	<2 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%	<0.25%
Peak code domain error		
Measurement range	0 dB to –55 dB	0 dB to –60 dB
Inherent PCDE		
SF = 16	–49 dB	–54 dB
SF = 32	–52 dB	–57 dB
SF = 64	–55 dB	–60 dB
Measurement uncertainty	<1 dB	<1 dB
	(0 dB to –40 dB)	(0 dB to –40 dB)
Output power		
Measurement uncertainty, absolute	<0.5 dB	<0.3 dB
Measurement uncertainty, relative	<0.3 dB	<0.1 dB
Occupied bandwidth (99%)		
Measurement uncertainty	<85 kHz	<85 kHz
Spectrum emission mask		
Level uncertainty		
<3.6 GHz	<0.5 dB	<0.5 dB
3.6 GHz to 13 GHz	<2.5 dB	<2.5 dB
Trigger to frame		
Accuracy	<210 ns	<210 ns

Ordering information

Application Firmware R&S®FS-K83 can be integrated into any member of the R&S®FSQ, R&S®FSU or R&S®FSP families.

Designation	Type	Order No.
cdma2000/1×EV-DV Mobile Station Test Application Firmware	R&S®FS-K83	1157.2416.02

Recommended extras

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

ROHDE&SCHWARZ

Rohde & Schwarz GmbH & Co. KG · Mühldorfstraße 15 · 81671 München · Germany · P.O.B. 801469 · 81614 München · Germany · Telephone +49 89 4129-0
www.rohde-schwarz.com · Customer Support: Telephone +49 1805124242, Fax +49 89 4129-13777, E-mail: CustomerSupport@rohde-schwarz.com

Printed in Germany (Bi as/bb)

PD 0758.0697.32 · Mobile Station Test Application Firmware R&S®FS-K83 · Version 01.00 · September 2003