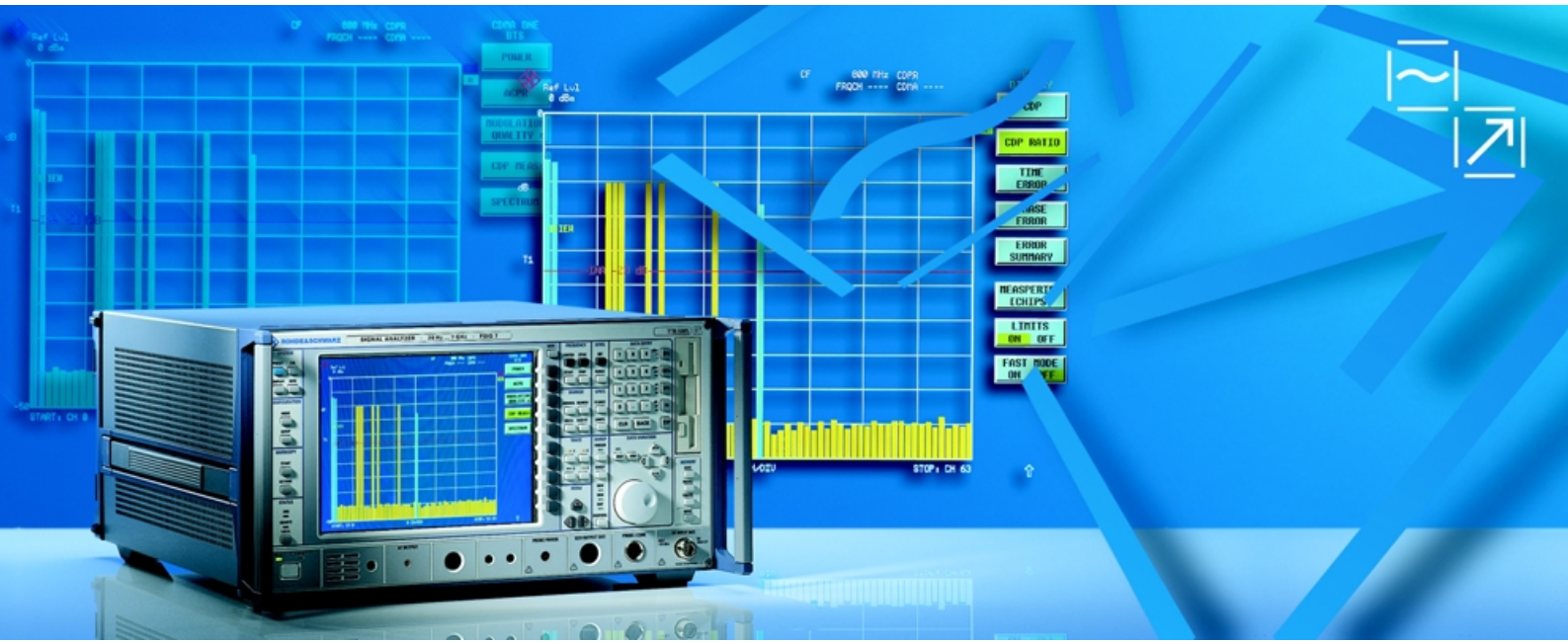


Application Firmware FSIQ-K71

for cdmaOne code-domain power measurement on base stations with Signal Analyzer FSIQ

Application Firmware FSIQ-K71 for Signal Analyzers FSIQ allows to characterize the Walsh code channels of a CDMA base station to US standards TIA/EIA-97-B/C.

- Simultaneous measurement of code-domain power of 64 channels and bargraph result display
- Measurement of time and phase offset error relative to pilot signal (nominal test case with 9 Walsh code channels)
- Measurement of pilot time alignment
- Easy operation thanks to common menu structure for cdmaOne measurements available in FSIQ

ROHDE&SCHWARZ

Comprehensive cdmaOne signal analysis in one unit

Application Firmware FSIQ-K71 further extends the wide range of applications offered by the FSIQ models and now even allows code-domain power measurements on cdmaOne signals. Complex tests as those stipulated for CDMA base stations by the TIA/EIA-97-B/C standard can be performed by using FSIQ and FSIQ-K71.

Application Firmware FSIQ-K71 also offers a common selection menu for all available cdmaOne measurements, which makes operation a great deal easier. An additional menu provides the functions already implemented in the basic unit for the determination of the channel and adjacent-channel power, and the waveform quality (RHO factor) besides the code-domain power (Table 1).

Code-domain power measurements

An important application of FSIQ-K71 is the measurement of the code-domain power which serves to determine the power of the different transmission channels in the CDMA signal as an absolute value or relative to the total power. This measurement is an indispensable tool for the development and production of base stations since it allows the comparison of the transmitted power, for example, with standard specifications. Moreover impairments and disturbances such as crosstalk between the code channels can be detected.

The powers of the individual code channels are displayed either as a bargraph (64 channels) or in tables (9 channels). The test interval can be selected from 1k chips to 24k chips and is adapted to the S/N ratio of the CDMA signal in the auto mode.

The built-in PASS/FAIL function allows convenient checking for compliance with values specified in the TIA/EIA-97-B/C test model (Table 2).

High measurement accuracy due to wide dynamic range

The slight time and phase offset errors between the code and pilot channels are crucial for the transmission quality and network capacity of a CDMA system. The unrivalled wide dynamic range of FSIQ keeps measurement errors to a minimum, which means low operating costs and high reliability for the mobile-radio network.

Measurements in the fast mode

To increase the speed during code-domain power measurement, the time-consuming calculation of time and phase offset errors can be switched off in the fast mode. For a test interval of 4096 chips, the measurement time of 1.1 s for the code-domain power can be reduced by up to 40%.

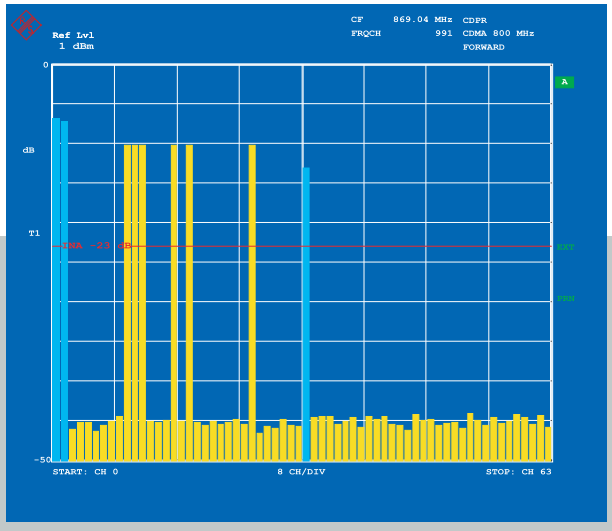
Simple synchronization to test signal

Synchronization to the pilot channel is performed automatically after applying the CDMA signal to the RF input of FSIQ. There is no need for an external trigger or reference signal. The measurement thus becomes very easy and operator's errors are reduced to a minimum.

Table 1: Measurement functions with and without Application Firmware FSIQ-K71

Measurements	Without FSIQ-K71	With FSIQ-K71 (FSIQ-B70 prerequisite)
Total power	Y	Y
ACPR	Y	Y
Pilot channel power	N	Y
Waveform quality (RHO factor)	Y	Y
Forward link frequency tolerance	N	Y
Pilot time tolerance	N	Y
Pilot channel to code channel time tolerance	N	Y
Pilot channel to code channel phase tolerance	N	Y
Code-domain power	N	Y

1



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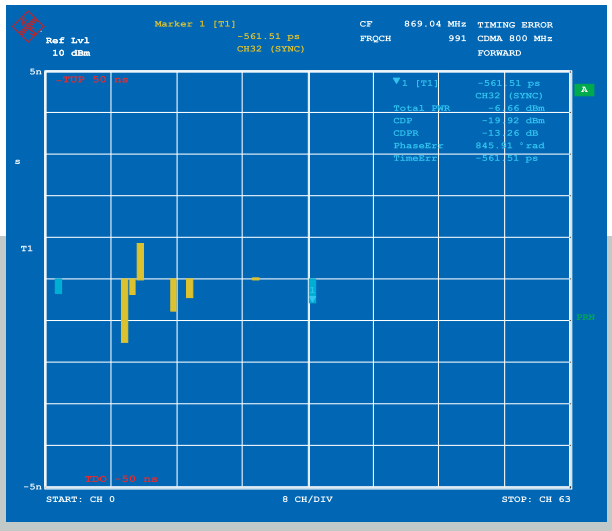


(1) Code-domain power: 64 Walsh code channels are displayed simultaneously

(2) Measurement of time errors relative to pilot signal. User-definable threshold lines indicate the maximum tolerable values

Table 2: TIA/EIA-97-B/C base station test model, nominal

Type	Number of channels	Fraction of power (linear)	Fraction of power (dB)	Comments
Pilot	1	0.2000	–7.0	Code channel 0
Sync	1	0.0471	–13.3	Code channel 32; always 1/8 rate
Paging	1	0.1882	–7.3	Code channel 1; full rate
Traffic	6	0.09412	–10.3	Variable code-channel assignments; full rate only

Automatic measurement

All measurements can of course be remote-controlled via the GPIB interface. No time-consuming programming is required since the analyzer is automatically set via Application Software FSIQ-K71. Results or PASS/FAIL information can be transferred via the bus to a computer for further processing.

Applications

Code-domain power measurement (1)

FSIQ and Application Firmware FSIQ-K71 allow the measurement of power in the 64 Walsh code channels of a CDMA signal in a settable test interval. Result display is either as an absolute value in dBm (CDP) or with reference to the total signal power (CDPR). The height of the displayed bars represents the power in the corresponding channel and affords fast channel comparison.

In the code-domain power display (CDP), the pilot, sync and paging system channels are shown in different colours to distinguish them from the traffic channels. The power as well as the time and phase offset errors of the individual channels can be easily measured by means of a marker.

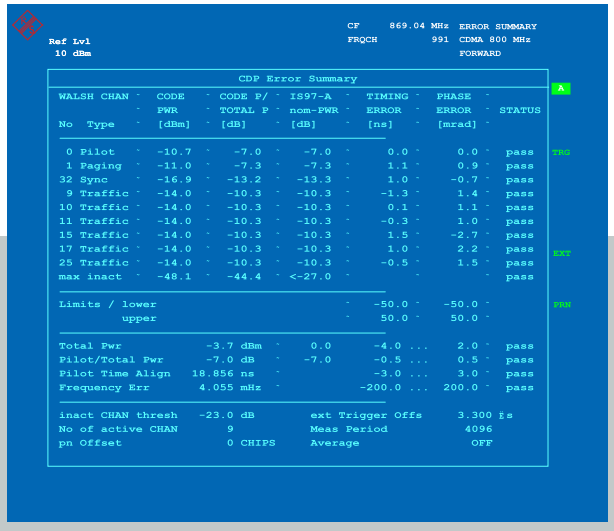
Time and phase offset errors (2)

Time and phase offset errors in a certain code channel cause crosstalk in other channels which in turn leads to a change in the distribution of code-domain powers. Uncertainties of this kind are calculated relative to the pilot channel and are specified in the TIA/EIA-97-B/C standard with tolerances.

Measuring time and phase offset errors with Application Firmware FSIQ-K71 entails up to nine active code channels including the pilot channel. The threshold at which a channel becomes active and for which the calculation of the time and phase offset error is required is freely settable.

Like the code-domain power, the time and phase offset errors are displayed either as bargraphs or in tables.

3



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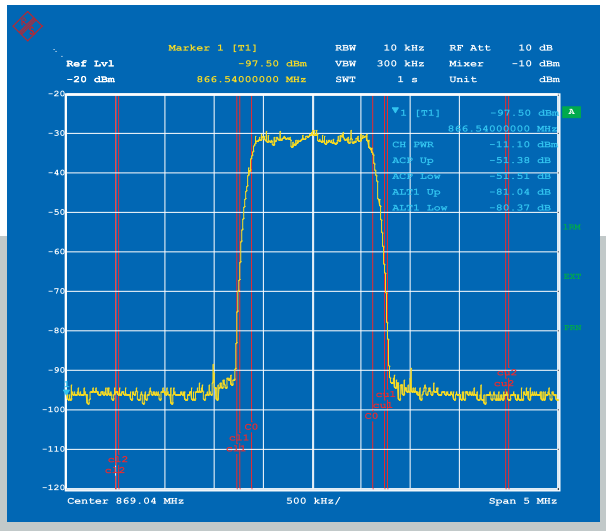

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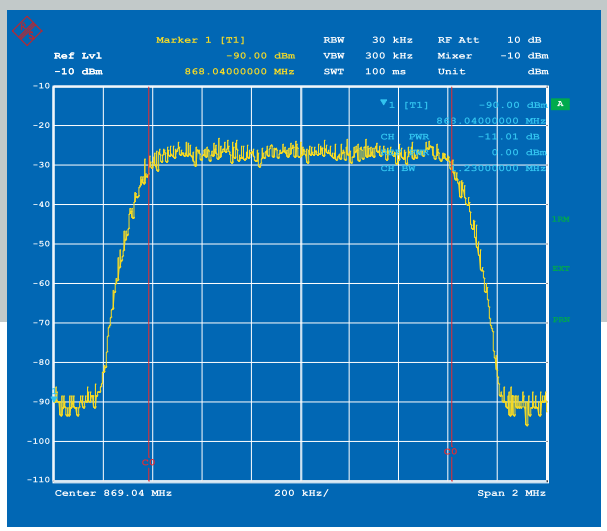

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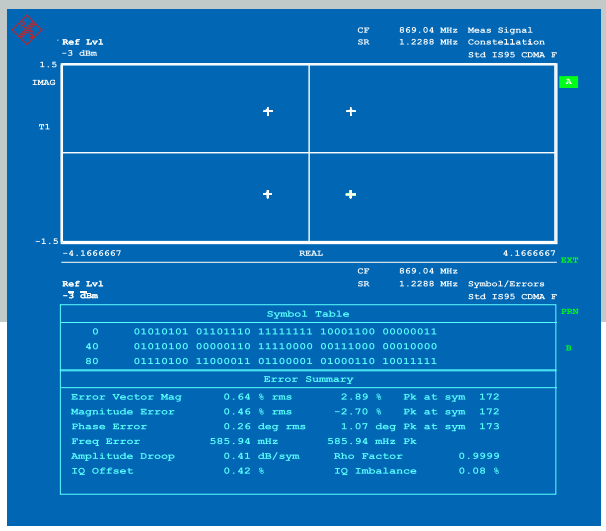

(3) The ERROR SUMMARY display gives a clear overview of all results
4) Integrated channel power over 1.23 MHz bandwidth

(5) Adjacent-channel power ratio measurement
(6) RHO factor measurement with integrated vector signal analyzer

Automatic test to TIA/EIA-97-B/C (3)

The ERROR SUMMARY display gives a clear overview of all results. According to the nominal test model the relative channel powers and time and phase offset errors of up to nine channels are listed. A PASS/FAIL function provides automatic checking for compliance with limit values to TIA/EIA-97-B/C. The limit values are user-definable and can be adapted to the measurement.

The pilot time alignment and the absolute frequency error are also indicated in this display and the compliance with limit values is monitored.

Power and adjacent-channel power measurement (4)(5)

The excellent dynamic range and phase noise values make FSIQ an ideal tool for ACPR (adjacent-channel power ratio) measurements on cdmaOne base stations. Irrespective of the waveform and signal statistics, power can accurately be measured and displayed with the integrated RMS detector.

RMS detection avoids measurement repeatability problems typically associated with digitally modulated signals and sample detection.

Waveform quality measurements (6)

The integrated vector signal analyzer in FSIQ provides waveform quality, forward link frequency tolerance and pilot time tolerance measurements as specified in the TIA/EIA-97-B/C standard.

Specifications

The specifications below are valid for measurements on cdmaOne signals carried out with FSIQ. With the exception of the code-domain power, all indicated measurements can be carried out with the basic unit.
Option FSIQ-B70 and Application Firmware FSIQ-K71 are required for code-domain power measurements.
Data given as nominal are design parameters and are not checked.

Measurements	FSIQ3, FSIQ7, FSIQ26, FSIQ40	Test specifications and permissible measurement uncertainty for measuring equipment to TIA/EIA-97-B/C
Channel power measurement		
Channel bandwidth		
Default	1.23 MHz	
Range	1 kHz to 1000 MHz	
Power range (1.23 MHz bandwidth)	–90 dBm to +30 dBm (S/N ≥10 dB)	–70 dBm to +47 dBm
Absolute error (95% confidence level)		
0 dB to –50 dB from ref. Level	<0.5 dB	±1 dB
Relative error (same channel, input attenuator fixed)		
Input level (ref. level = 0 dB)		
0 dB to –50 dB	<0.3 dB	±1.5 dB
–50 dB to –70 dB	<0.5 dB	
Adjacent-channel power measurement		
Power range at RF input	–50 dBm to +30 dBm	
Dynamic range (nominal, referred to channel power in 1.23 MHz bandwidth)		
Offset frequency / Channel bandwidth		
±750 kHz / 30 kHz	84 dB (–23 dBm mixer level [1])	
±885 kHz / 30 kHz	84 dB (–23 dBm mixer level [1])	
±1.25MHz / 12.5 kHz	87 dB (–24 dBm mixer level [1])	
±1.98MHz / 30 kHz	85 dB (–23 dBm mixer level [1])	
±2.25MHz / 1 MHz	74 dB (–18 dBm mixer level [1])	
Relative ACPR error		
0 dB to –50 dB	<0.3 dB	±1.5 dB
–50 dB to –70 dB	<0.5 dB	
Waveform quality measurement		
RHO factor	≥0.9995	

[1] Mixer level = mean power in 1.23 MHz bandwidth at RF input – RF attenuation

Measurements	FSIQ3, FSIQ7, FSIQ26, FSIQ40	Test specifications and permissible measurement uncertainty for measuring equipment to TIA/EIA-97-B/C
Code-domain power measurement		
Range at RF input (total power)	+30 dBm to –50 dBm	
Test interval range	1024, 2048 to 24k chips	Nx64 chips, N≥20
Code-domain power (test interval 2048 chips/ 1.25 ms)		12.4.2.2
Display dynamic range	10 dB to 100 dB, settable, default 50 dB	
Accuracy (Walsh channel power within 20 dB of total power	±0.3 dB	
Resolution	0.01 dB	
Frequency error	±10 Hz (excludes frequency reference of analyzer)	±10 Hz
Pilot time alignment (from even second trigger to start of PN sequence)		
Range	–13.33 ms to 13.33 ms	
Accuracy	±135 ns	±135 ns
Resolution	10 ns	
Code-domain timing offset (pilot to code-channel time tolerance)		
Range	±50 ns	
Accuracy	±10 ns	±10 ns
Code-domain phase offset (pilot to code-channel time tolerance)		
Range	±150 mrad	
Accuracy	±10 mrad	±10 mrad

Ordering information

Application Firmware FSIQ-K71 can be integrated into any member of the FSIQ family. Option FSIQ-B70, which provides additional memory capacity and a higher computing power, is the precondition to operate the application firmware.

Order designations

Application Firmware to test cdmaOne base stations	FSIQK71	1126.4498.02
Extensions required to operate Application Firmware FSIQK71	FSIQB70	1119.6747.02

For further options and recommended extensions see FSIQ data sheet (PD 757.4160)

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