

PXI Modules

cdma2000 Reverse Link Measurement Suite



A complete library of measurement functions to analyze cdma2000 mobile transmitter performance in conjunction with the 3030 series of PXI RF Digitizer modules.

- cdma2000 RC1 to 4 and 1xEV-DO rev A reverse link analysis
- Channel power
- Total power
- DTx power, burst width and rise/fall time
- ACPR
- Spurious emissions (spectral emission mask)
- Composite modulation accuracy (RHO and EVM)
- QPSK EVM (cdma2k RC3 and RC4, 1xEVDO)
- QPSK origin offset
- Code domain powers and PCDE
- Frequency error

Introduction

The cdma2000 and 1xEV-DO reverse link measurement suite comprises two measurement libraries with .dll application programming interfaces (API) for use in various application development environments (ADE) such as LabVIEW, LabWindows/CVI, Visual Basic, and Visual C/C++. Together with a 3030 series digitizer they enable precision characterization of both cdma2000 rev C and 1xEV-DO rev A reverse link transmissions.

Applications

The cdma2000 and 1xEV-DO reverse link measurement suite is designed for PXI based RF test systems used in the development and manufacturing of mobile radio transmitters, sub-modules and radio frequency integrated circuits (RFIC).

Highlights

The measurement suite provides analysis of all major signal characteristics in accordance with the requirements of 3GPP2 C.S0011-A release C and C.S0024-A version 2.0 for cdma2000 and 1xEV-DO Rev A reverse link transmissions. This includes channel and code domain powers, adjacent channel power ratio (ACPR), modulation accuracy (RHO and EVM), frequency error, and spurious emissions. Measurements can be processed in parallel on the acquired IQ data set for either continuous modulation or bursted transmissions. For bursted transmission, additional functions enable measurement of burst width and burst rise and fall times. For 1xEV-DO signals, analysis may be performed for a specified timeslot or any random timeslot in the frame.

Measurements are based upon a general assumption that the device under test is commanded to generate a traffic channel. For cdma2000 RC3/4 and 1xEV-DO this further requires knowledge of the scramble code used.

Various trace arrays are available, including de-scrambled code domain powers for both cdma2000 RC3/4 and 1xEV-DO channels. In addition, composite and QPSK I and Q constellation diagrams may be reconstructed within the application environment.

Measurement Speed

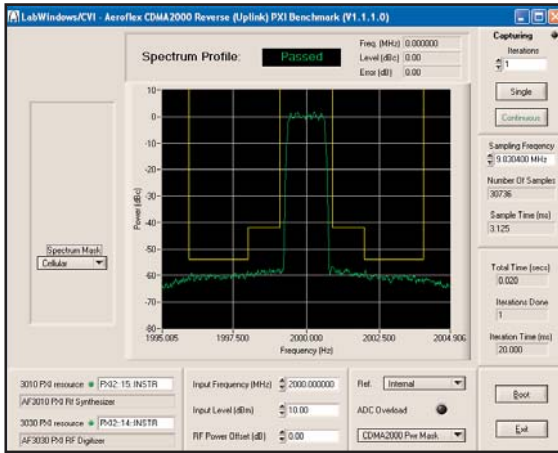
Acquisition and measurement times in ms			
	cdma2000 rev		1xEV-DO
Parameter	RC1 & 2	RC 3 & 4	Rev A
Power	6	6	6
ACLR	12	12	-
	-	-	40
EVM	10	60	55
Power,ACLR&EVM	15	65	
Mask	20	20	20
All	35	85	100

Times are based on using an embedded 2.2 GHz Pentium 4 CPU with sample time of 3.75 ms and sample rates of either 4.91 MHz or 9.83 MHz as appropriate.

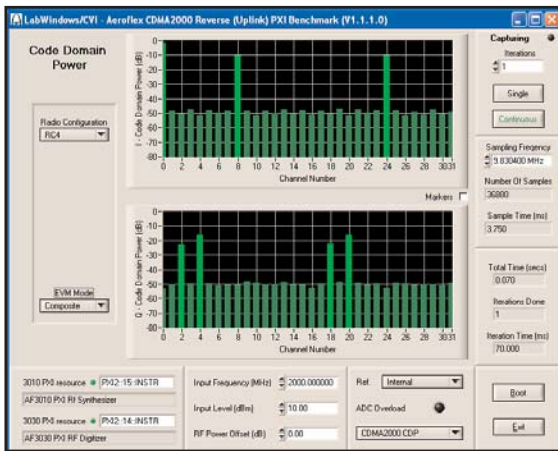
For the very latest specifications visit www.aeroflex.com

Example Code

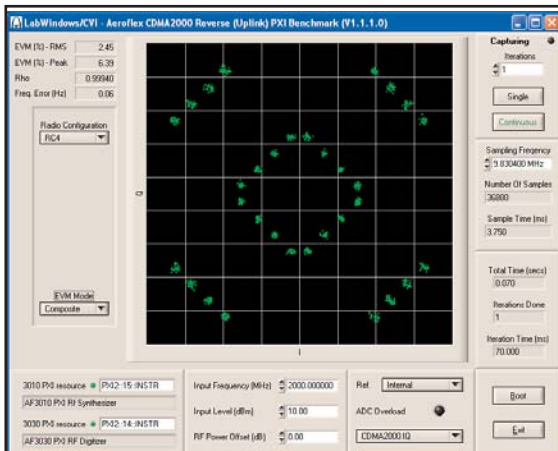
The measurement library is supplied with help including source code examples to aid the user in the development of measurement applications. Examples are supplied for a variety of applications development environments including Visual Basic (VB6), LabWindows CVI, and Visual C/C++.



Trace Display Data For Spectral Mask⁽¹⁾



Trace Display Data For Code Domain Power⁽¹⁾



Trace Display Data For Symbol Constellation⁽¹⁾

SPECIFICATION

All specifications are defined when used in conjunction with the 3030 series PXI RF digitizer operating in cdmaOne, cdma2000 and 1xEVDO band classes BCO to BC12.

CONTROL PARAMETERS

Minimum recommended sampling frequency

Modulation analysis 4 * chip rate

Spectral emission mask 2 * maximum frequency offset

Long Code Mask

long code mask range: 0 to 4,398,046,511,103

Radio Configuration Mode (cdma2000 only)

RC1/RC2 or RC3/RC4

Slot number (1xEVDO only)

0 to 15

POWER MEASUREMENT

Channel Power

The channel power is the power measured in the 1.23 MHz bandwidth. Channel power is measured concurrent with ACPR measurement

Average Power

The broadband average power is computed for a user defined segment within the IQ sample array

Burst Power

For burst signals, the peak power is computed together with burst duration, burst position, power on and power off times.

Indication

Channel power, average power, burst power in dBm

Burst duration and burst position samples

Power on time and power off time in seconds

Power Accuracy

S/N >40 dB in the temperature range 23°C ±5°C

3030 <0.6 dB, Typ 0.3 dB

3030A/3035 <0.45 dB, Typ 0.3 dB

ADJACENT CHANNEL POWER RATIO MEASUREMENT

ACPR is the ratio of the channel power to the power measured at frequency offsets outside the assigned cdma channel. Reference channel measured in 1.23 MHz, offset measured in 30 kHz.

Offsets

4 fixed or 4 user defined

Fixed offsets

±885 kHz, ±1980 kHz

User offsets

To ±4 MHz

Dynamic Range

-82 dBc

Indication

Ref Channel Power in dBm (1.23 MHz channel bandwidth)

Offset power in dBc (30 kHz RBW)

Accuracy

Typ 0.05 dB/10 dB⁽¹⁾

SPECTRAL EMISSION MASK

The power spectrum of the transmitted signal is compared to a mask.

Mask Type

Cellular, PCS, user defined

Indication

Pass/fail

Frequency + dBr mask value with closest proximity to mask

Spectral trace + mask trace

No of failed points

Accuracy

Typ 0.05 dB/10 dB⁽¹⁾

TRANSMIT MODULATION

Modulation Accuracy

The modulation accuracy can be measured for either composite RHO, EVM as per 3GPP2 C.50011_A or 3GPP2 C.S0033-A or QPSK EVM (RC3 & 4, 1xEV-DO only).

1xEV-DO composite RHO is computed for default or user channel settings. When set to user channel settings, RHO is measured only on the selected channel subset.

The modulation accuracy is a measure of the difference between the measured waveform and the theoretical modulated waveform (the error vector).

The minimum measurement interval for composite rho / EVM is 500 μ s (cdma200 RC1/2), 3.2 ms (cdma200 RC3/4), 1xEV-DO or user defined.

For QPSK EVM the measured interval can be user defined in chips from 256.

COMPOSITE RHO

Mode(1xEVDO only)

Random / Specific slot 0 to 15

rho Range

0.9 to 1

Indication

32 bit floating point

Accuracy

Better than ± 0.003 for rho values between 0.9 and 1.0

EVM & QPSK EVM

Composite EVM range

0 to 20% RMS

0 to 40% Peak

QPSK EVM range

0 to 10% RMS

0 to 20% Peak

Residual Error

Typically 1%

QPSK ORIGIN OFFSET (CARRIER LEAK)

Range

0 to 20%

Residual Error

Typically 1%

FREQUENCY ERROR

The frequency error is derived from modulation quality measurement and is the frequency relative to the 3030 tuned frequency.

Frequency Error Range

RC1-2: ± 5 kHz

RC3-4: ± 2 kHz

1xEV-DO: ± 2 kHz

QPSK: ± 10 kHz

Frequency Error Accuracy

Typ $\pm(10 \text{ Hz} + (\text{Freq standard error} \times \text{transmitter freq}))$

CODE DOMAIN POWER (RC3/RC4, 1XEVD0)

Code domain power is a measure of the power in each code channel of a CDMA channel. Code domain power gives the distribution of signal energy among the code channels, normalized by the total signal energy.

Indication

Two 32 element arrays of code domain powers (dB)

Pilot channel power (dB)

Data channel power (dB)

Ack channel power (dB), (1xEVDO only)

DRC channel power (dB), (1xEVDO only)

Peak Code Domain Error

Code domain error is a measure of the code domain distribution of error power, provided by a code domain power measurement of the error signal. Peak code domain error is the largest power in the error.

Indication

Peak Code Domain Error I (dB)

Peak Code Domain Error Q (dB)

Two 16 element arrays of the code domain errors

ORDERING

This application is designed for use in conjunction with the 3030 series PXI RF Digitizer.

It may be either purchased with any of the 3030 series at time of order or purchased as an upgrade.

When purchased with the 3030 series RF Digitizer, order as: 3030 option 102

When purchased as an upgrade, then order as: RTROPT102/3030

Notes

(1) Representation of trace data is shown using example application software which is not supplied

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.