

Measurement functions to characterize TD-SCDMA (3GPP TDD LCR) signals in accordance with the requirements of 3GPP TS 34.122.

- Total Average Power plus Midamble / Data Power
- Transmit On/Off Time Mask
- Transmit Closed Loop Power Control (CLPC)
- Spectrum analysis:
 - Occupied bandwidth
 - Spectrum Emissions Mask (SEM)
 - Adjacent Channel Leakage power Ratio (ACLR)
- Modulation Accuracy:
 - Composite Constellation
 - Data and Midamble Modulation Accuracy
 - RHO
 - EVM
 - IQ Skew, Gain Imbalance
 - IQ Origin Offset (Carrier Leakage)
 - Magnitude Error
 - Phase Error
 - Frequency Error
 - Detected mid shifts (Midamble only)
 - Timing Error
 - Peak Code Domain Error
 - Peak Active Code Domain Error

- Detected Code Channel Results
- CCDF
- Receiver Sensitivity (BER)
- Fast Sequence Tuning (FST)⁽¹⁾

The TD-SCDMA measurement suite provides analysis capabilities for all major 3GPP TDD LCR mobile transmitter RF parameters such as power, spectrum, and modulation accuracy and receiver sensitivity (BER).

The TD-SCDMA PXI Studio plug-in provides a manual user interface providing trace displays for code domain power and code domain error as well as constellation diagrams and spectrum masks.

(1) not exposed in PXI Studio

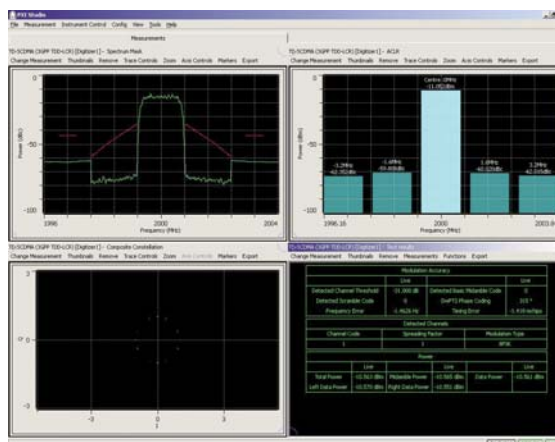


Figure 1. Typical TD-SCDMA (3GPP TDD LCR) screenshot

TD-SCDMA (3GPP TDD-LCR)

All specifications are defined when used in conjunction with the 3030 Series PXI RF digitizer with option 109 operating in TD-SCDMA band classes 0-12.

Measurements performed are in accordance with 3GPP 34.122 section 5 and 6 as applicable for low chip rate 1.28 Mcps operation only.

Specifications are defined with the input signal at the RF digitizer tuned frequency and at the reference level unless otherwise stated.

Measurement of power control and BER require a 3020 Series signal generator.

Frequency

Uplink (Hz)

User defined frequency or preset bands, as shown in the table below

UARFCN	MHz
9254-13096	1850.8-2619.2

Level

Uplink (DUT output level) (dBm)

Downlink (DUT input level) (dBm)

Power Control Mode

Drive to level, Drive to Max / Min

Path Loss Correction

Uplink / Downlink (dB)

CONTROL PARAMETERS

Midamble Code Detection

Auto / Manual

Channel Configuration Detection

Auto / Manual

Sync Mode

Pilot / Midamble

Slot Threshold

Manual (dBr)

Channel Threshold

Auto / Manual (dBr)

Slots to Analyze

TS0 to TS6, DwPTS and UpPTS

System Code Configuration

Sync downlink code

Sync uplink code

Scramble code

Basic Midamble code

Code Channel Configuration

Channel Status

Channel Code

Channel Spreading Factor

Channel Modulation Type

Slot Timing Reference

DwPTS or UpPTS

Slot Frequency Reference

Pilot or Midamble

MEASUREMENTS

POWER

Total Power (dBm)

Sum of the midamble and data average power for the analyzed period of time.

Midamble Power (dBm)

Average power (dBm) in the midamble for the analyzed timeslot.

Data Power (dBm)

Average power in the data segments pre and post midamble for the analyzed time slot.

Data Power (data segments outside midamble)

Left Data Power (before midamble)

Right Data Power (post midamble)

Traces

Captured Power (dBm) vs. Time (s) Trace

Accuracy

See 3030 Series module level accuracy spec.

Closed Loop Power Control (CLPC)

To test the ability of the UE transmitter to adjust its output power in accordance with one or more TPC commands received in the downlink.

Test Segment

Step BC, DE, FG

Auto-determine Max Power Threshold

On / Off

Maximum Power Threshold

0 to 50 dBm

Minimum Power Threshold

0 to -100 dBm

Transient Period

0 to 1 seconds

Measurements

Overall (Pass/Fail)

Max Power (dBm)

Min Power (dBm)

Absolute Power vs. Slot Table

Slot No

Slot Power (dBm)

Step (Pass / Fail)

Ten Step (Pass / Fail)

Relative Power vs. Slot Table

Slot No

Step Power (dB)

Step (Pass / Fail)

Ten Step Power (dB)

Ten Step (Pass / Fail)

Trace

CLPC Absolute Power vs. Slot

CLPC Relative Power vs. Slot

CLPC Relative Power vs. Slot (10 steps)

TX OFF POWER & ON / OFF TIME MASK

Indication

Status (Pass / Fail)

Fail level (dBm)

Time (chips)

On power (dBm)

Off power (dBm)

Avg leading Off Power (dBm)

Avg trailing Off Power (dBm)

Traces

Transmit On / Off Mask

Accuracy

Typically ± 0.1 dB / 10 dB⁽²⁾ (relative to peak power)

OUTPUT RF SPECTRAL EMISSIONS

OCCUPIED BANDWIDTH

Bandwidth containing 99% of the total power.

Indication

Hz

Accuracy

<100 kHz

SPECTRAL EMISSION MASK

The burst power spectrum of the transmitted signal is measured between 0.8 MHz and 4.0 MHz offset relative to the RRC filtered mean burst power and compared against a mask.

Indication

Pass / fail

Reference power dBm, Frequency and dBm mask value for measured value with closest proximity to mask.

Traces

Spectral trace + mask trace

Accuracy

< ± 0.05 dB error per 10 dBc⁽²⁾

ADJACENT CHANNEL LEAKAGE POWER RATIO (ACLR)

The power measured at frequency offsets relative to the reference channel power.

Offsets

4 fixed offsets: ± 1.6 MHz, ± 3.2 MHz

4 user defined offsets: Up to ± 10 MHz

Dynamic Range

-80 dBc (for 303x input levels > -10 dBm)

Indication

Ref Channel Power (RRC filtered) dBm

Offset power (RRC filtered) dBc

Traces

Adjacent Channel Leakage power Ratio (dBm) vs. frequency (Hz) Trace

Accuracy

< ± 0.05 dB error / 10 dBc⁽²⁾

FREQUENCY ERROR

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

Frequency Error Range

± 5 kHz

Frequency Error Accuracy

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

TRANSMIT MODULATION

Modulation Accuracy

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

Modulation Accuracy measurement results are available globally and for Data and Midamble indendently.

Trace

Composite constellation trace

Modulation Accuracy Results

Detected Channel Threshold (Data only): (dB)

Detected Basic Midamble Code:: (0-127)

Detected Scramble Code: (0-127)

DwPTS Phase Coding (degrees)

Timing Error: (mChips)

Rho: (0.9 to 1)

EVM

Peak / RMS (%)

Magnitude Error

Peak / RMS (%)

Phase Error

Peak / RMS (degrees)

IQ Gain Imbalance (dB)

IQ Skew (degrees)

EVM Residual Error

<1%

IQ ORIGIN OFFSET (CARRIER LEAK)

Range

0 to 20%

Residual Error

Typically 1%

CODE DOMAIN POWER (DATA ONLY)

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

Trace

Power (dBm) vs. code channel

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 (dB)

Peak Active Code Domain Error (dB)

Trace

Code domain error (dB) vs. code channel

MIDAMBLE MID SHIFTS MEASUREMENTS

Midamble Number of Mid Shifts

Midamble Mid Shifts

CCDF

Complimentary cumulative distribution function.

Trace

Peak to average power (dB) vs. probability (%)

BER

Number of Bits to Analyze

Up to 50,000

Measurements

Bit Error Rate (%)

Number of Bits in Error
Number of Bits Tested
Block Error Rate (%)
Number of Blocks Tested
Number of Blocks in Error

(2) Excluding the effects of noise

GENERAL

Operating System

Windows® XP (service pack 2) and 32-bit Vista.

Required Memory

512 Mbytes minimum, 1024 Mbytes recommended

Display Resolution

Minimum 1024 x 768

Other

Aeroflex 3000 Series modules require NI VISA version 3.1 or later (NI Visa 4.2 or later under Windows® Vista).

Aeroflex 3000 Series module drivers version 5.4.0 or later

ORDERING

PXI Studio is supplied as standard with plug-ins for RF Digitizer, Signal Generator, RF Combiner and Spectrum Analyzer.

Optional measurement plug-ins may be purchased with the 303x at time of order or purchased as an upgrade to the 303x.

Note: To be able to use measurement plug-ins within PXI Studio, associated options must be enabled in the 303x digitizer.

TD-SCDMA

When purchased with a 303x order as: 3030 option 109

When purchased as an upgrade, then order as: RTROPT109/3030

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