The most important thing we build is trust

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

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.
**SPECIFICATION**

**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

<table>
<thead>
<tr>
<th>UARFCN</th>
<th>MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>9254-13096</td>
<td>1850.8-2619.2</td>
</tr>
</tbody>
</table>

**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 (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 dBr mask value for measured value with closest proximity to mask.

Traces
Spectral trace + mask trace

Accuracy
<±0.05 dB error per 10 dBC

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

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
±(10 Hz + (Freq standard error x 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 individually.

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%

(2) Excluding the effects of noise
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

GENERAL

Operating System
Windows® 7/32 bit or 7/64 bit

Required Memory
512 Mbytes minimum, 1024 Mbytes recommended

Display Resolution
Minimum 1024 x 768

Other
PXI 3000 Series modules require NI VISA version 4.6 or later
PXI 3000 Series module drivers version 7.0.0 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