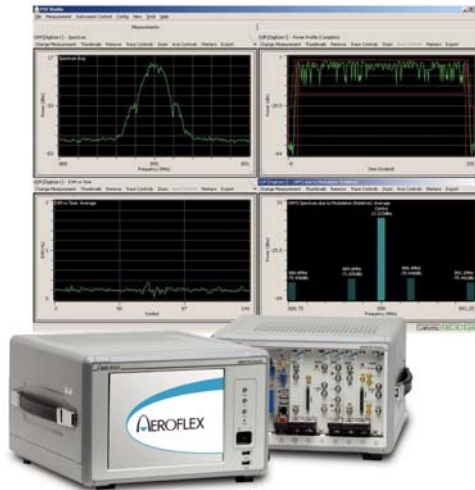


PXI

GSM/EDGE Measurement Suite



Measurement functions to characterize GSM and EDGE mobile transceiver RF performance in accordance with the methods specified in 3GPP 51-010-1.

- TX average power and single/multi slot burst power profile
- GSM phase error
- EGDE EVM and origin offset suppression
- Frequency error
- Output radio frequency spectrum
- Rx sensitivity (BER/BLER) measurement
- Fast Sequence Tuning (FST)⁽¹⁾

The GSM/EDGE measurement suite supports analysis of GSM/HSCSD/GPRS and EGPRS transmit and receiver parameters including receiver BER/BLER (using loopback methods as defined in ETSI TS 100 293-GSM 04.14).

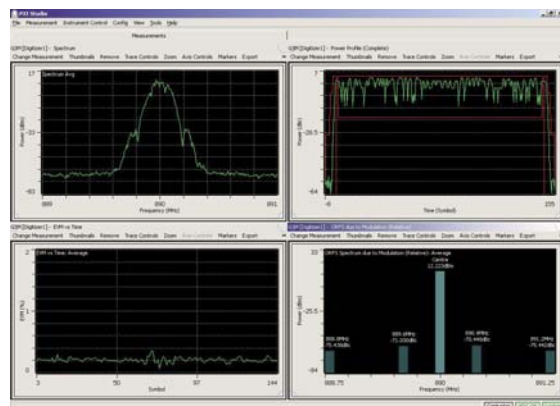


Figure 1. GSM/EDGE plug-in screenshot

The GSM/EDGE PXI Studio plug-in provide manual analysis of either Normal or Access burst types with automatic detection of modulation type and training sequence (TSC). Results are provided as both numerical tabular or graphical trace displays. Measurements can be made for single or multiple contiguous active-slot frames.

(1) Not exposed in PXI Studio

GSM/EDGE

All specifications are defined when used in conjunction with the 3030 Series PXI RF digitizer with option 100 operating in any GSM band between 400 MHz and 2000 MHz..

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

Measurements performed are in accordance with 3GPP TS 151 010-1 section 13 and 14 as applicable.

BER/BLER measurements, Burst Timing Error measurements, specific timeslot analysis and multi-DUT operation additionally require a 3020 Series PXI digital RF signal generator to be assigned.

CONFIGURATION

Frequency

Uplink (Hz)

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

Band	PCL	dBm	ARFCN	MHz
GSM400	2-19	39-5	259-293 306-340	450.6-457.4 479.0-485.8
GSM700			438-511	747.2-761.8
GSM850			128-251	824.2-848.8
GSM900			0-124, 975-1023	890-914.8 880.2-889.8
DCS1800	0-15	30-0	512-885	1710.2-1784.8
PCS1900			512-810	1850.2-1909.8

Burst Type

GMSK: Auto or Manual (Normal / Access)

8PSK: Normal

TSC (training sequence)

Uplink: Auto or Manual (0 to 7)

Path Loss Correction

Tx and Rx (dB)

Acquisition Trigger Source

Immediate (free run), Burst (video), Ext (PXI trigger bus, local bus, star trigger, LVDS, TTL)

Synchronization (Auto Burst Detection)

Burst Detection threshold (dB)

Search length (ms)

Burst Timing Latency Compensation

0 to ± 78.125 symbols

BER/BLER Loopback

GSM (Mode A/B)

Number of Speech Frames: 1 to 250

GSM (Mode C)

Number of Burst Frames: 1 to 1000

GPRS / EGPRS

Number of Radio Blocks: 1 to 100,000

Downlink Signal Mode

GSM, GPRS, EDGE

EGPRS Modulation and Coding Scheme

MCS1 to 9

GPRS Coding Scheme

CS1 to 4

Measurement Display Types

Spectrum (RBW 10 kHz, 30 kHz, 100 kHz)

Captured power vs. time

Power Profile (complete, useful, rising, falling, guard)

Phase error vs. time

EVM vs. time

ORFS Relative/Absolute (Spectrum due to Modulation)

ORFS Relative/Absolute (Spectrum due to Switching)

MEASUREMENTS:

GSM/EDGE AVERAGE BURST POWER

The transmitter output power is the average value of the power over the time that the useful information bits of one burst are transmitted.

Fast Burst Power is measured without midamble synchronization.

Indication

GMSK Average burst power (dBm)

EDGE, Current Avg power, long term average power or estimated long term average power (dBm)

Detected burst type and TSC

Burst Timing Error (symbols)

Accuracy

Refer to 3030 Series specification

GSM/EDGE POWER PROFILE

Measurement can be performed for up to 7 contiguous active slots, of same modulation type.

Complete Frame

Power vs. time traces

Rising/falling edge

Complete

Measurement Results

Complete Profile (Pass / Fail)

Rising/Falling part (Pass / Fail)

Complete Profile Fail time (symbols)

Rising/Falling Fail time (μ s)

Burst (each active slot)

Power vs. time traces

Useful part

Guard

Measurement Results

Useful Part/Guard (Pass / Fail)

Useful Part/Guard Fail time (symbols)

Useful Part/Guard Fail level (dB)

Values with closest proximity to mask or worst case failure for the complete, rising edge, falling edge, guard and useful parts of the burst.

Dynamic Range

Typically -80 dBc (for 3030 Series RF input levels > 0 dBm)

Accuracy (rising falling edges)

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

Time accuracy <0.5 μ s

Accuracy (useful part)

Level: Typically ± 0.02 dB (relative to peak power)

Time accuracy <0.25 symbol

Accuracy (Guard)

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

Time Accuracy <0.25 symbol

GMSK MODULATION

GMSK phase error measurements performed for a single slot

Phase Error Range

0 to 100 RMS
0 to 400 peak

Indication

Results are expressed as numerical values for RMS + Peak phase error

Traces

Peak phase error vs. time

Accuracy

Better than $\pm 0.5^\circ$ rms phase error $\pm 1.0^\circ$ peak phase error

8PSK MODULATION

The minimum RMS magnitude of the error vector is calculated for a single slot.

Burst Type

Normal only

EVM Range

0 to 20% EVM RMS
0 to 40% EVM peak

Indication

EVM % (rms and peak), phase error degrees (rms and peak), 95th percentile EVM %, origin offset suppression (dB), and droop (dB)

Accuracy

$\pm 0.4\%$ RMS $\pm 1\%$ peak

Offset Origin Suppression Range

>20 dB to 60 dB (floor)

Offset Origin Suppression Accuracy

± 0.5 dB at 33 dB

FREQUENCY ERROR

Measurements can be performed for single or multiple active slots.

The frequency error measured is the difference between the input signal and the nominal 3030 tuned frequency.

Frequency Error Range

Typically ± 300 kHz GMSK (GSM)
Typically ± 100 kHz 8PSK (EDGE)

Frequency Error Accuracy

$< \pm 5$ Hz + (Tx freq x freq standard error)

SPECTRUM DUE TO MODULATION & SWITCHING

This measurement determines the peak power and the time gated average power at up to 20 specified frequency offsets.

Burst Type

Normal

Range Offset

Up to ± 10 MHz

Measurement Range (typical)

Spectrum Due to Modulation

	GMSK		8PSK	
	1 GHz	2 GHz	1 GHz	2 GHz
Carrier Frequency	1 GHz	2 GHz	1 GHz	2 GHz
Frequency Offset	dBc	dBc	dBc	dBc
100 kHz	-76	-70	-73	-67
200 kHz	-81	-75	-78	-72
250 kHz	-82	-76	-79	-73
400 kHz	-83	-77	-80	-74
1.8 MHz	-84	-79	-81	-76
6 MHz	-85	-79	-82	-76

Spectrum Due to Switching

	GMSK		8PSK	
	1 GHz	2 GHz	1 GHz	2 GHz
Carrier Frequency	1 GHz	2 GHz	1 GHz	2 GHz
Frequency Offset	dBc	dBc	dBc	dBc
400 kHz	-73	-67	-70	-64
1.8 MHz	-74	-69	-71	-66

Indication

Table of values

Reference power (dBm), frequency offset (Hz) and level (dBc) relative to reference power

Accuracy

$< \pm 0.05$ dB error / 10 dBc⁽²⁾

BLER

Measurement Results

Block Error Rate (%)

Number of Radio Blocks Tested

Number of Radio Blocks in Error

Number of Active Slots Analyzed per frame

BER, BER II, RBER II, FER

Measurement Results

Mode C burst loopback

Number of bits examined

Number of error bits found

Bit Error Rate (%)

Mode A/B Speech loopback

Number of frames examined

Erased Speech Frames

Speech Frame Erasure Rate (%)

Notes

(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.

GSM/EDGE

When purchased with a 303x, order as: 3030 option 100

When purchased as an upgrade, then order as: RTROPT100/3030

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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.