

# Agilent GS-8210 Wireless Handset Test System

## Technical Overview



### **Automated testing simplifies mobile phone service and repair**

The Agilent GS-8210 wireless handset test system is a cost effective, automated mobile handset test solution for cellular phone inspection and repair. The system consists of an N9360A mobile station tester, test software and RF shield box (with built-in antenna coupler). The GS8210 system tests all the major 2G, 3G, 3.5G cellular phones including multi-format testing for GSM/GPRS/EGPRS, W-CDMA, HSDPA, cdma2000, and 1xEV-DO mobile stations.



**Agilent Technologies**

## N9360A mobile station test set

Designed with "just-enough" test performance, the N9360A go/no go test set platform is tailored to meet the needs of the low cost mobile station test market. The N9360A includes a built-in PC to simplify testing for operators with little or no technical expertise. N9360A features include:

- Quad-band GSM/GPRS/EGPRS and SMS test capabilities
- W-CDMA Band I to VI test capability
- Twelve traffic-channel test in automatic mode
- ACLR and SEM measurement capability<sup>1</sup>
- FM (frequency modulation) capability<sup>1</sup>
- Receiver sensitivity support in GPRS ETSI A and ETSI B mode
- Support for EGPRS SRB loopback BLER

## GS-8210 Test Software

GS-8210 test software provides simple and complete parametric tests for mobile phone inspection and repair. The user-friendly GUI includes pre-configured test plans for easy setup and use, configurable test executive for test and test report flexibility; and engineer, operator and administrator test modes to ensure standardized testing.

### Pre-configured test plans

Pre-configured test plans reduce time and engineering effort required for automated mobile test setup while also providing flexibility to tailor testing as needed.

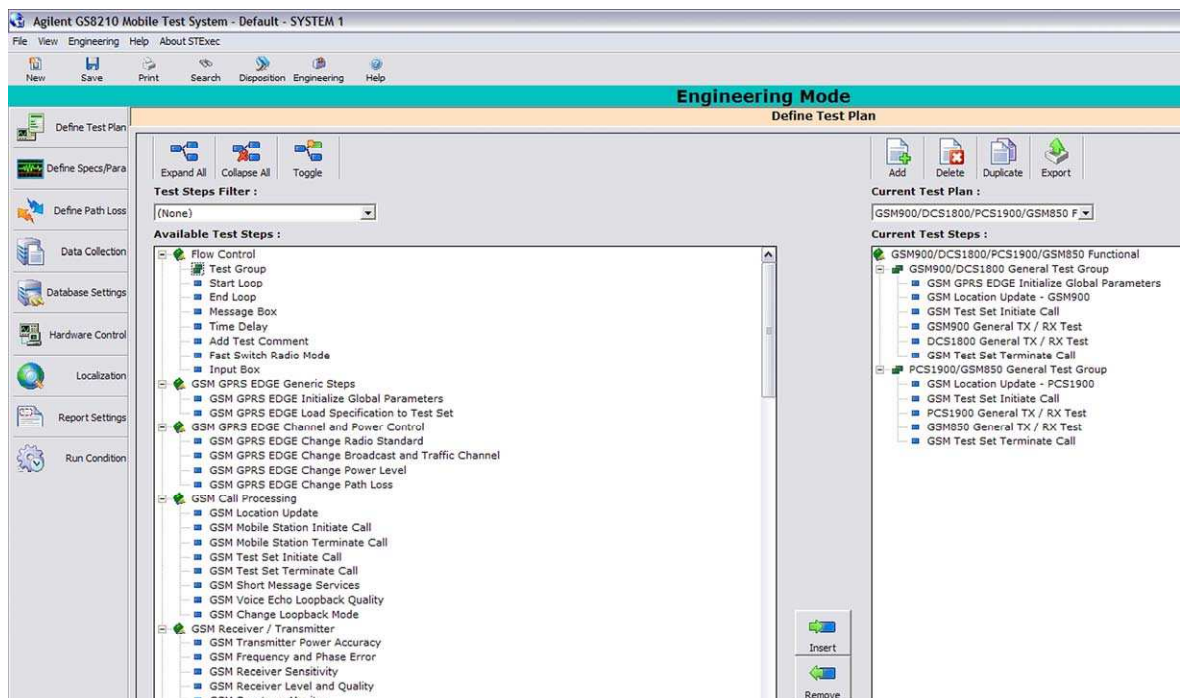


Figure 1. Example of GS-8210 test software pre-configured test plans.

<sup>1</sup> Requires N9360AU-100 hardware upgrade

## Engineer, operator and administrator test modes

Engineer, operator, and administrator operation modes provide control over access to test parameters to ensure testing standards are maintained.

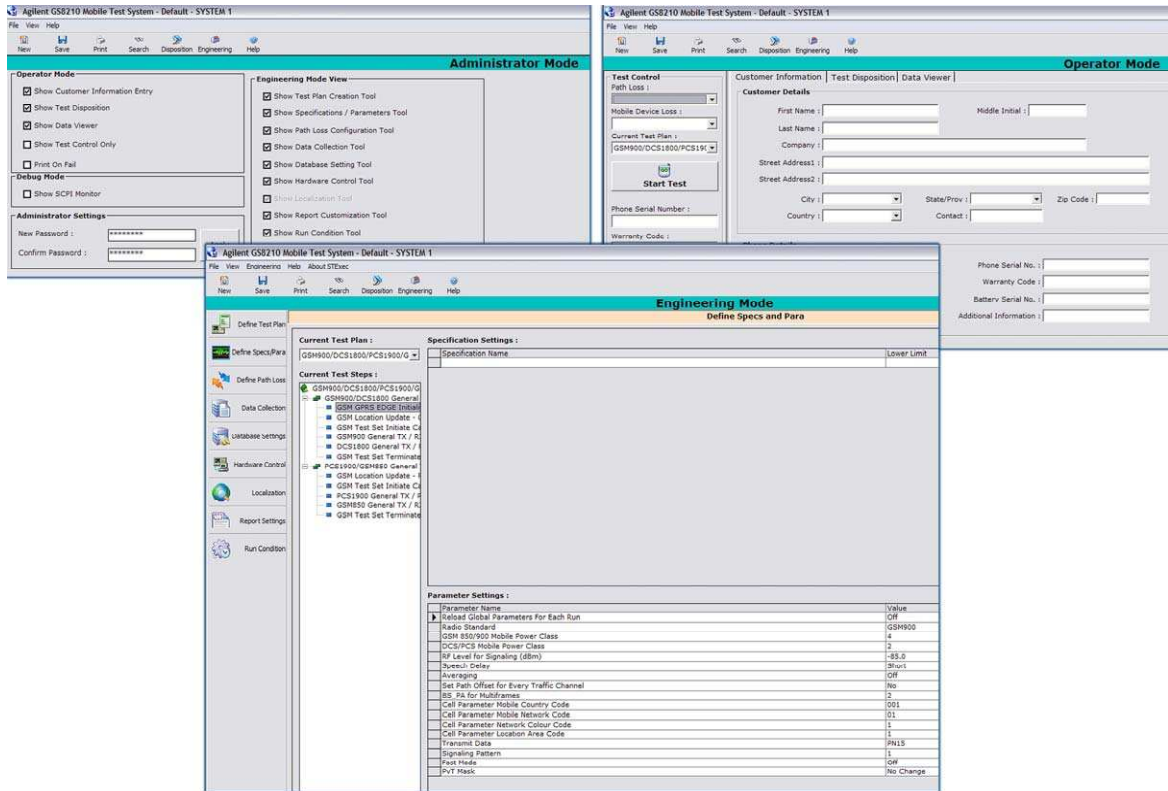


Figure 2. Example of GS-8210 test software modes of operation.

## Configurable test executive

A configurable test executive allows storing data and running software using either local or external databases, test report generation in HTML, PDF, and CSV formats – and external printer options – for test configurations that meet your needs.

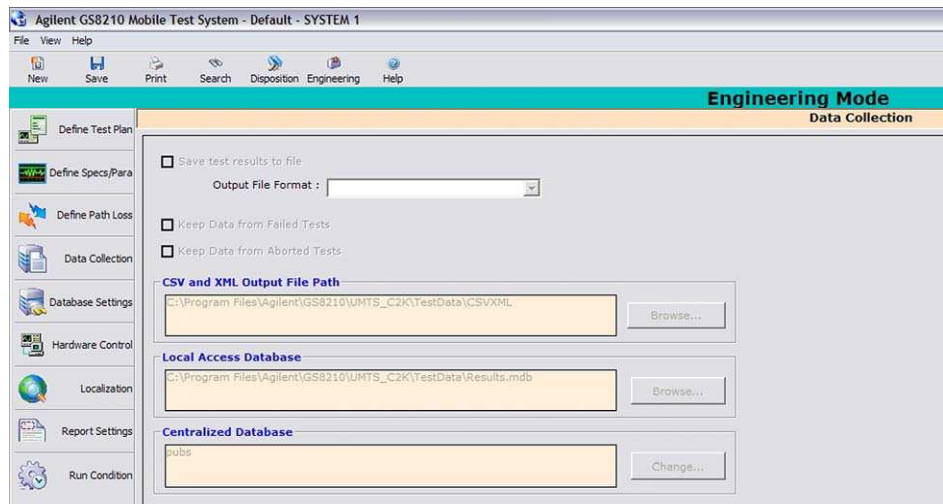


Figure 3. Example of GS-8210 test software's configurable test executive .

# RF Shielded Test Chamber Overview

The shield box included with the GS-8210 system offers good isolation for handsets. It allows you to simulate over-the-air calls without interference from live networks and other sources

## Technical Specifications

Specifications describe the test set's warranted performance and are valid over the entire operation and environmental ranges unless otherwise noted.

Supplemental characteristics are intended to provide additional information useful in applying the instrument by giving typical, but non-warranted performance parameters. These characteristics are shown in *italics* and labeled as *typical*, or *supplemental*.

GSM/GPRS/EGPRS		
Band	Frequency (MHz)	
	Uplink	Downlink
GSM850	824 ~ 849	869 ~ 894 (867 ~ 896) <sup>1</sup>
GSM900	876 ~ 915	921 ~ 960 (921 ~ 962) <sup>1</sup>
DCS1800	1710 ~ 1785	1805 ~ 1880 (1802 ~ 1884) <sup>1</sup>
PCS1900	1850 ~ 1910	1930 ~ 1990 (1927 ~ 1994) <sup>1</sup>

W-CDMA/HSDPA		
Band	Frequency (MHz)	
	Uplink	Downlink
Band I	1920 ~ 1980	2110 ~ 2170
Band II	1850 ~ 1910	1930 ~ 1990
Band III	1710 ~ 1785	1805 ~ 1880
Band IV	1710 ~ 1770	2110 ~ 2170
Band V	824 ~ 849	869 ~ 894
Band VI	830 ~ 840	875 ~ 885
Band VIII	880 ~ 915	925 ~ 960
Band IX (Japan)	1749.9 ~ 1784.9	1844.9 ~ 1879.9

cdma2000/1xEV-DO		
Band	Frequency (MHz)	
	Reverse	Forward
Band 0 (Cell US)	815 ~ 849	869 ~ 894
AWS-1	1710 ~ 1755	2110 ~ 2155
Band 1 (PCS US)	1850 ~ 1910	1930 ~ 1990
Band 3 (Cell Japan)	887 ~ 889	832 ~ 834
	893 ~ 901	838 ~ 846
	915 ~ 925	860 ~ 870
Band 4 (PCS Korea)	1750 ~ 1780	1840 ~ 1870
Band 6 (IMT-2000)	1920 ~ 1980	2110 ~ 2170

<sup>1</sup>Requires N9360AU-100 hardware installed in unit

# GSM/GPRS/EGPRS

## Peak Tx Power Measurement

Range	-20 to +39 dBm
Resolution	0.1 dB
Accuracy	$\leq \pm 1.0$ dB (25 $\pm 5$ °C), <i>typical</i> = $\pm 0.5$ $\leq \pm 1.5$ dB (0 to 50 °C)

## Power Ramp

Range	-20 to +39 dBm
Resolution	0.1 dB
Accuracy	$\leq \pm 1.0$ dB (25 $\pm 5$ °C), $\leq \pm 1.5$ dB (0 to 50 °C)
Range for display:	
Vertical	80 dB
Horizontal	zoom off -9.25 to +156.25 bits, zoom on -8.00 to +2.00 bits, +145.00 to +155.00 bits

## Frequency Error Measurement

Range	0 to $\pm 60$ kHz
Resolution	1 Hz
Accuracy	$\leq \pm (10 + \text{reference signal})$ Hz
Input level	-5 to +39 dBm

## Burst Timing

Range	-20 to +20 deg
Resolution	0.1 deg
Accuracy	
GSM850, GSM900	$\leq \pm 1.0$ deg rms
DCS1800, PCS1900	$\leq \pm 1.5$ deg rms
GSM850, GSM900	$\leq \pm 4.0$ deg peak
DCS1800, PCS1900	$\leq \pm 6.0$ deg peak
Input level	-5 to +39 dBm

## Rx Quality

Range	0 to +7
Resolution	1

## Actual Timing Advance

Range	0 to +63 bits
Resolution	1 bit

# GSM/GPRS/EGPRS

(continued)

## EVM Measurement (EGPRS 8PSK)

Range	0 to 10%
Resolution	0.01%
Residual EVM	≤ 3.8%
Input level	-5 to +39 dBm

## Origin Offset Measurement (EGPRS 8PSK)

Range	≥ 20 dB
Resolution	0.01 dB
Residual EVM	≥ 40 dB
Input level	-5 to +39 dBm

## Spectrum Monitor

Range	-11 to +39 dBm
Span	fc to fc+400 kHz, fc±100 kHz
RBW	10 kHz, 30 kHz
Range for display	Span fc to fc+400 kHz ,level 80; fc±100 kHz, level 80
Accuracy	≤ ±2 dB
Resolution	0.1 dB
Noise level	≤ -35 dB (Pin = ±29 dBm)

# W-CDMA/HSDPA

## Modulated Power Measurement

Range	0 to +36 dBm; (-30 to +36 dBm) <sup>1</sup>
Resolution	0.1 dB
Accuracy	$\leq \pm 0.7$ dB (25 $\pm$ 5 °C), <i>typical</i> = $\pm 0.4$ $\leq \pm 1.0$ dB (0 to 50 °C)

Range	-53 to -0.01 dBm; (-60 to -30.01dBm) <sup>1</sup>
Resolution	0.1 dB
Accuracy	$\leq \pm 1.0$ dB (25 $\pm$ 5 °C), <i>typical</i> = $\pm 0.5$ $\leq \pm 1.5$ dB (0 to 50 °C)

Range	-60 to -53.01 dBm; (-70 to -60.01dBm) <sup>1</sup>
Resolution	0.1 dB
Accuracy	$\leq \pm 1.5$ dB (25 $\pm$ 5 °C), <i>typical</i> = $\pm 0.8$ $\leq \pm 2.0$ dB (0 to 50 °C)

## Frequency Error Measurement

Range	0 to $\pm 500$ Hz
Resolution	0.1 Hz
Accuracy	$\leq \pm (10 + \text{reference signal})$ Hz
Input level	-20 to +36 dBm (-30 to +36 dBm) <sup>1</sup>

## EVM Measurement

Range	0 to 20%
Resolution	0.01%
Residual EVM	$\leq 3.8\%$
Input level	-20 to +36 dBm; (-30 to +36 dBm) <sup>1</sup>

## ACLR Measurement

Input level	-5 to +36 dBm
Range	0 to -40 dB (at $\pm 5$ MHz), 0 to -48 dB (at $\pm 10$ MHz) ( $\leq -43$ dB (at $\pm 5$ MHz) and $\leq -53$ dB (at $\pm 10$ MHz)) <sup>1</sup>
Resolution	0.01 dB

## SEM Measurement<sup>1</sup>

Range	-5 to +36 dBm
Margin	> 7.7 dB

<sup>1</sup> Requires N9360AU-100 hardware installed in unit

## W-CDMA/HSDPA (continued)

### OBW Measurement

Input level	-5 to +36 dBm
Accuracy	< ±100 kHz
Range	0.00 to 9.99 MHz
Resolution	0.01 MHz

### Sensitivity/BER

Input level	-20 to +36 dBm
Range	
PN9	0.00 to 25.00%
PN15	0.00 to 33.33%

### Origin Offset Measurement

Range	≤ -10%
Resolution	0.01 %
Residual EVM	≤ -50%
Input level	-20 to +36 dBm

**Modulated Power Measurement**

Range	-53 to +36 dBm; (-60 to +36 dBm) <sup>1</sup>
Resolution	0.1 dB
Accuracy	≤ ±1.0 dB (25 ±5 °C), ≤ ±1.5 dB (0 to 50 °C)
Range	-60 to -53.01 dBm; (-70 to -60.01 dBm) <sup>1</sup>
Resolution	0.1 dB
Accuracy	≤ ±1.5 dB (25 ±5 °C), ≤ ±2.0 dB (0 to 50 °C)

**Frequency Error Measurement**

Range	-10 to +10 kHz
Resolution	0.1 Hz
Accuracy	≤ ± (30 + reference signal) Hz
Input level	-20 to +36 dBm; (-30 to +36 dBm) <sup>1</sup>

**Origin Offset Measurement**

Range	≤ -20%
Resolution	0.01 %
Input level	-20 to +36 dBm

**Time Offset Measurement**

Range	-10 to +10 μSec
Resolution	1/8 chip
Input level	-20 to +36 dBm

**Access Probe Power Measurement**

Resolution	0.01 %
Input level	-40 to +36 dBm

**Code Power Measurement**

Accuracy	≤ ±2.0 (0 to 36 dBm), ≤ ±4.0 (-20 to -0.01 dBm)
Resolution	0.1 dB
Input level	-20 to +36 dBm

<sup>1</sup> Requires N9360AU-100 hardware installed in unit

## RF Signal Generator for GSM/GPRS/EGPRS

RF Signal Generator for GSM/GPRS/EGPRS	
Frequency step (MODEM)	0.1 kHz (Range: carrier < ±200 kHz)
Modulation	GMSK (B.T=0.3), 8PSK, OFF (CW)
Output power accuracy	
≤ ±1	-110.0 to -50.0 dBm (25 ±5 °C)
≤ ±1.5 dB	-50.0 to -20.0 dBm (25 ±5 °C)
≤ ±1.5	-110.0 to -50.0 dBm (0 to 50 °C)
≤ ±2.0 dB	-50.0 to -20.0 dBm (0 to 50 °C)
Output power accuracy <sup>1</sup>	
≤ ±1	-120.0 to -50.0 (25 ±5 °C)
≤ ±1.5 dB	-50.0 to -10.0 dBm (25 ±5 °C)
≤ ±1.5	-120.0 to -50.0 dBm (0 to 50 °C)
≤ ±2.0 dB	-50.0 to -10.0 dBm (0 to 50 °C)
Phase error (GMSK)	≤ 5 deg. RMS, ≤ 15 deg. Peak (≤ 3 deg. RMS, ≤ 9 deg. Peak) <sup>1</sup>
Modulation accuracy (8PSK)	≤ 12.5 % RMS; (≤ 7.0 % RMS) <sup>1</sup>
Power level step	0.1 dB

Power level range	
Auto/Man	-110.0 to -50.0 dBm in 0.1 dB steps (-120.0 to -50.0 dBm in 0.1 dB steps) <sup>1</sup>
Tx analyzer	-110.0 to -50.0 dBm in 0.1 dB steps (-120.0 to -50.0 dBm in 0.1 dB steps) <sup>1</sup>
SG	-110.0 to -20.0 dBm in 0.1 dB steps (-120.0 to -10.0 dBm in 0.1 dB steps) <sup>1</sup>
Off	< -120 dBm; (-130 dBm) <sup>1</sup>

<sup>1</sup> Requires N9360AU-100 hardware installed in unit

# RF Signal Generator for W-CDMA/HSDPA

Modulation	W-CDMA: QPSK, Off: CW, FM <sup>1</sup>
FM modulation <sup>1</sup>	Rate = 50kHz, Deviation = 500kHz
Modulation accuracy	QPSK $\leq 12.5\%$ rms; (QPSK $\leq 10.0\%$ RMS) <sup>1</sup>
Output power accuracy	
$\leq \pm 1$	-115.0 to -50.0 dBm (25 $\pm 5$ °C)
$\leq \pm 1.5$	-50.0 to -18.0 dBm (25 $\pm 5$ °C)
$\leq \pm 1.5$	-115.0 to -50 dBm (0 to 50 °C)
$\leq \pm 2.0$	-50.0 to -18.0 dBm(0 to 50 °C)
Output power accuracy <sup>1</sup>	
$\leq \pm 1$	-120.0 to -50.0 dBm (25 $\pm 5$ °C)
$\leq \pm 1.5$	-50.0 to -15.0 dBm (25 $\pm 5$ °C)
$\leq \pm 2.0$	-15.0 to -10.0 dBm (25 $\pm 5$ °C)
$\leq \pm 1.5$	-120.0 to -50 dBm (0 to 50 °C)
$\leq \pm 2.0$	-50.0 to -15.0 dBm (0 to 50 °C)
$\leq \pm 2.5$	-15.0 to -10.0 dBm (0 to 50 °C)
Frequency	
Band I	2110 to 2170 MHz
Band II	1930 to 1990 MHz (1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5)
Band III	1805 to 1880 MHz
Band IV	2110 to 2170 MHz
Band V	869 to 894 MHz (871.5, 872.5, 876.5, 877.5, 882.5, 887.5)
Band VI	875 to 885 MHz, (877.5, 882.5)
Power level step	0.1 dB
Power level range	
Mod	-115.0 to -18.0 dBm in 0.1 dB steps (-120.0 to -15.0 dBm in 0.1 dB steps) <sup>1</sup>
CW	-115.0 to -18.0 dBm in 0.1 dB steps (-115.0 to -15.0 dBm in 0.1 dB steps) <sup>1</sup>
Off	$\leq -120.0$ dBm; (-130.0 dBm) <sup>1</sup>

<sup>1</sup> Requires N9360AU-100 hardware installed in unit

## RF Signal Generator for cdma2000

Modulation	CDMA, Off: CW
Modulation accuracy	> 0.990
Output power accuracy	
$\leq \pm 1$	-115.0 to -53.0 dBm (25 $\pm$ 5 °C)
$\leq \pm 1.5$	-52.9 to -18.0 dBm (25 $\pm$ 5 °C)
$\leq \pm 1.5$	-115.0 to -53 dBm (0 to 50 °C)
$\leq \pm 2.0$	-52.9 to -18.0 dBm(0 to 50 °C)
Output power accuracy <sup>1</sup>	
$\leq \pm 1$	-120.0 to -50.0 dBm (25 $\pm$ 5 °C)
$\leq \pm 1.5$	-49.9 to -15.0 dBm (25 $\pm$ 5 °C)
$\leq \pm 1.5$	-120.0 to -50 dBm (0 to 50 °C)
$\leq \pm 2.0$	-49.9 to -15.0 dBm (0 to 50 °C)
$\leq \pm 2.5$	-14.9 to -10.0 dBm (0 to 50 °C)
Frequency	
Band 0	860 to 894 MHz
Band 1	1930 to 1990 MHz
Band 3	832 to 834 MHz, 838 to 846 MHz, 860 to 870 MHz
Band 4	1840 to 1870 MHz
Band 6	2110 to 2170 MHz
Power level step	0.1 dB
Power level range	
Mod	-115.0 to -18.0 dBm in 0.1 dB steps (-120.0 to -10.0 dBm in 0.1 dB steps) <sup>1</sup>
CW	-115.0 to -18.0 dBm in 0.1 dB steps (-115.0 to -10.0 dBm in 0.1 dB steps) <sup>1</sup>
Off	$\leq -120.0$ dBm; (-130.0 dBm) <sup>1</sup>

<sup>1</sup> Requires N9360AU-100 hardware installed in unit

# GSM/GPRS/EGPRS

## Test Coverage

### **GSM Transmitter Tests**

- Phase and frequency error
- Tx output power (normal burst)
- Monotonic power sequence
- Power vs time (burst timing) (normal burst)
- ORFS (output RF spectrum) due to modulation
- ORFS due to switching

### **GPRS Transmitter Tests**

- Phase and frequency error in GPRS multislot configuration
- Tx output power in GPRS multislot configuration (normal burst)
- Monotonic power sequence in GPRS configuration
- Power vs time (burst timing) in GPRS configuration (normal burst)
- ORFS (output RF spectrum) due to modulation in GPRS multislot configuration
- ORFS due to switching in GPRS multislot configuration

### **EGPRS Transmitter Tests**

- Frequency error in EGPRS configuration
- Modulation accuracy in EGPRS configuration
- EGPRS transmitter output power
- ORFS (output RF spectrum) due to modulation in EGPRS configuration
- ORFS due to switching in EGPRS configuration

### **GSM Receiver Tests**

- Reference sensitivity, TCH/FS
- Signal strength

### **GPRS Receiver Tests**

- Minimum input level for reference performance for GPRS operation

### **EGPRS Receiver Tests**

- Minimum input level for reference performance for EGPRS operation

### **Receiver Signal Reporting**

- Signal strength
- Signal quality under static conditions TCH/FS no DTX

### **Short Message Service (SMS)**

- SMS mobile terminated
- SMS mobile originated
- SMS cell broadcast

## HSDPA Test Coverage

### HSDPA

- Through R
- Median CQI
- CQI variance
- BLER

## W-CDMA FDD Test Coverage

### W-CDMA Transmitter Characteristics

- Maximum output power (Tx power)
- Frequency error
- Open loop power control in the uplink
- Inner loop power control in the uplink
- Minimum output power
- Occupied bandwidth (OBW)<sup>1</sup>
- Adjacent channel leakage power ratio DSB (ACLR)<sup>1</sup>
- Adjacent channel leakage power ratio (ACLR)<sup>1, 2</sup>
- Spectrum emission mask<sup>2</sup>
- Error vector magnitude

### W-CDMA Receiver Characteristics

- Reference sensitivity level
- Maximum input level

### Short Message Service (SMS)

- SMS mobile terminated
- SMS mobile originated

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<sup>1</sup> Manual mode only

<sup>2</sup> Requires N9360AU-100 hardware installed in unit

# GSM/GPRS/EGPRS/ W-CDMA Test Features

## **GSM**

- Location update
- MS call
- BS call
- MS release
- BS release
- TCH loop
- Voice loopback
- Emergency call
- Handover
- Short message service

## **GPRS**

- Attach
- Detach
- Handover

## **EGPRS**

- Attach
- Detach
- Handover

## **W-CDMA**

- Registration
- UE origination call
- UE termination call
- BS call (RMC)
- BS call (AMR)
- BS release
- Voice (AMR) loopback
- RMC test loopback
- Handover

## cdma2000 Test Features

### **Protocol Test**

- Location update
- MS call
- MS release
- BS call (talk)
- BS call (RF test)
- BS release
- Talk (loopback voice)
- Softer handoff
- Hard handoff
- Band handoff

### **RF Test (Automatic Test)**

- Access probe power
- ILP
- Max Tx power
- Min Tx power
- Frequency error
- Multi code rho
- Time offset
- Sensitivity/FER

### **RF Test (Manual Test)**

- Tx power
- Frequency error
- Rho/multi code rho
- Origin offset
- Time offset
- FER
- Max Tx power
- Min Tx power
- Code power pilot
- Code power traffic (fundamental)
- Pilot strength
- Access probe power

## 1xEV-DO Test Features

### **Protocol Test**

- UATI assignment
- Session opened
- BS call
- RF test
- Softer handoff
- Connection close
- Session close

### **RF Test (Automatic Test)**

- Access probe power
- ILP
- Max Tx power
- Min Tx power
- Frequency error
- Multi code rho
- Time offset
- Sensitivity/PER1
- Sensitivity/PER2
- Sensitivity/PER3

### **RF Test (Manual Test)**

- Tx power
- Frequency error
- Multi code rho
- Origin offset
- Time offset
- PER
- Max Tx power
- Min Tx power
- Code power

## Physical Specifications

Physical Specifications	
Dimension	145 x 330 x 373 mm (H x W x D)
Weight	9 kg
Voltage	80 to 240 Vac, 1 $\Phi$
Power line frequency	50/60 Hz
Power	160 W

Internal Timebase	
Output frequency	10 MHz
Output impedance	50 ohm (typically)
Reference accuracy	0.06 ppm/2 year

## Ordering Information

### N9360A Mobile Station Tester

N9360A Options	
Option 010	Support GSM/GPRS
Option 011	Support GSM/GPRS/EGPRS
Option 020	Support cdma2000
Option 022	Support cdma2000/1xEV-DO
Option 023	Support GSM/GPRS/cdma2000
Option 030	Support W-CDMA
Option 032	Support W-CDMA/cdma2000
Option 033	Support W-CDMA/cdma2000/1xEV-DO
Option 034 <sup>1</sup>	Support GSM/GPRS/EGPRS/W-CDMA
Option 035	Support GSM/GPRS/EGPRS/W-CDMA/ cdma2000/1xEV-DO
Option 036	Support GSM/GPRS/EGPRS/W-CDMA/cdma2000
Option 051	Support GSM/GPRS/W-CDMA/HSDPA
Option 052	Support GSM/GPRS/EGPRS/W-CDMA/HSDPA
Option 053	Support GSM/GPRS/EGPRS/W-CDMA/HSDPA/ cdma2000/1xEV-DO
Option W36	Test software to support GSM/GPRS/EGPRS/W-CDMA/HSDPA/ cdma2000/1xEV-DO
Option S01	RF shielded test chamber with 2 x N-type connector
Option S02	RF shielded test chamber with 2 x N-type connector and USB connector
Option S03	RF shielded test chamber with 2 x N-type connector and D-SUB 25 connector
Option S04	RF shielded test chamber with 2 x N-type, USB and D-SUB 25 connector
Option C01 <sup>2</sup>	RF cable option (1 meter)
Option C02	GPIB cable option (1 meter)
Option C03	USB/GPIB interface to control GPIB instruments over USB
Option C04	RS232 serial cable
Option C05	LAN crossover cable
Option C06 <sup>2</sup>	EF400 RF cable (1 meter)
Option A01	Additional test USIM
Option A02	Additional antenna coupler
Option U010 <sup>3</sup>	GSM/GPRS upgrade kit
Option U020 <sup>4</sup>	cdma2000 upgrade kit
Option U021 <sup>3</sup>	1xEV-DO upgrade kit
Option U023 <sup>4</sup>	cdma2000/1xEV-DO upgrade kit
Option U030 <sup>3</sup>	W-CDMA upgrade kit (for N9360A-02x)
Option U031 <sup>3</sup>	W-CDMA upgrade kit (for N9360A-01x)
Option U032 <sup>3</sup>	HSDPA upgrade kit
Option U100 <sup>4</sup>	N9360A <b>B version</b> upgrade kit

<sup>1</sup> Include 1 x Test USIM and 1 x antenna coupler

<sup>2</sup> Recommended to pick with RF shielded test chamber

<sup>3</sup> Field upgradeable

<sup>4</sup> Return to factory for upgrade



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