# Agilent Technologies 8960
Operational Verification (Manual Procedure)
Test Equipment Setup

Use the following procedure to manually test an 8960 that is running an E1960A GSM Test Application. A test record is included to assist in collecting test data. Make a copy of the test record to use.

The test equipment required for 8960 Operational Verification is:

ESG E4433B   Digital Signal Generator

VSA E4406A   Transmitter Tester
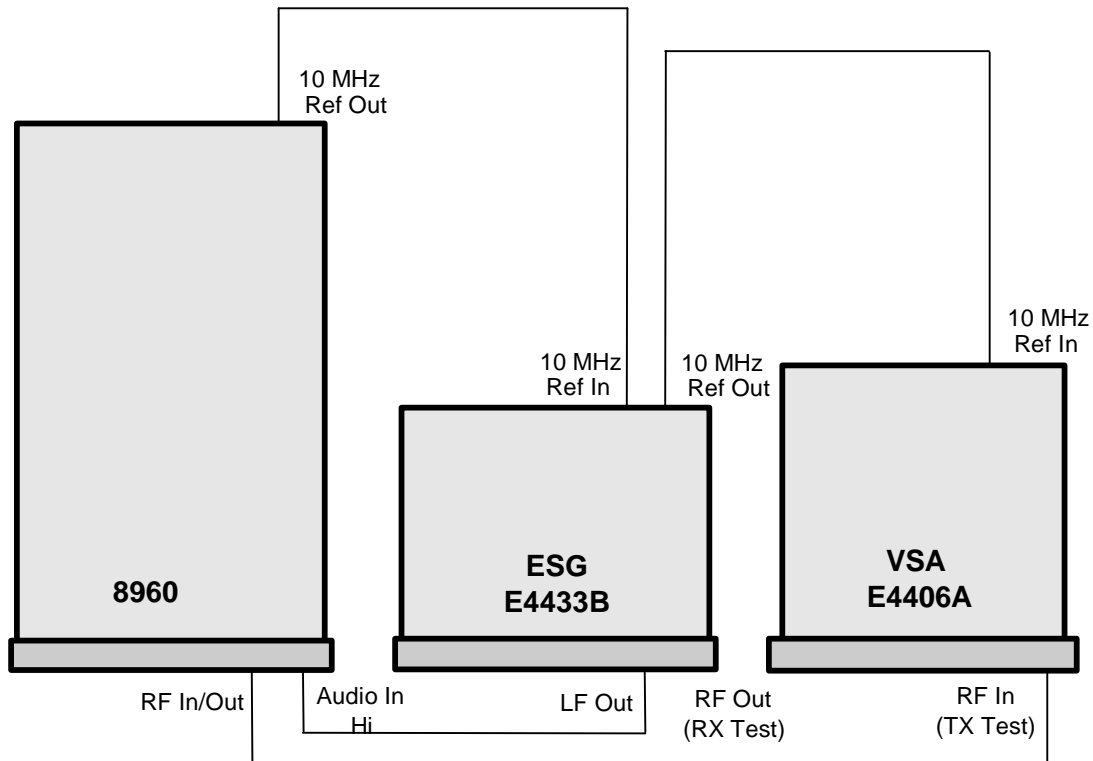
To perform the 8960 Operational Verification tests requires that the 10 MHz timebases be connected together. Connect the 10 MHz Reference Output of the 8960 to the 10 MHz Ref In of the ESG E4433B. Connect the 10 MHz Ref Out of the ESG E4433B to the 10 MHz Ref In of the VSA E4406A with BNC cables.

The RF In/Out Connector of the 8960 will be alternately connected to either the RF Out of the ESG E4433B (RX Test) or the RF Input of the VSA E4406A (TX Test) with a low loss Type-N cable.

1

Test Data Record for 8960 with E1960A GSM Test Application

Functional Verification	Expected Limit (Note 1)	Pass	Fail
Analog Generator Level Accy	$\pm$ 2.0 dB		
Analog Generator Spectral Purity			
Harmonics	$\leq$ -25 dBc		
Sub-Harmonics	$\leq$ -40 dBc		
Analog Audio Generator Accuracy	$\pm$ 0.03V		
GSM Generator			
Amplitude Flatness	$\pm$ .6 dBm		
Peak Phase Error	(PGSM/EGSM) $< \pm$ 4 Deg (DCS/PCS) $< \pm$ 6 Deg		
RMS Phase Error	$< \pm$ 2 Deg.		
Frequency Error	(18 Hz) $< \pm$ .04 ppm		
Analog Audio Analyzer Accuracy	$\pm$ 0.04V		
Analog Analyzer RF Power Meter	$\pm$ 1.6 dBm		
GSM Analyzer Frequency Measurement Accy.	$< \pm$ 24 Hz		
GSM Analyzer Residual Phase Error			
RMS Error	$< \pm$ 2 Deg		
Peak Error	$< \pm$ 8 Deg		
GSM Analyzer PVT Accy	Expected Limit (Note 1)	Pass	Fail
PVT Offset 0usec and 542.8usec	(0 dB) $\pm$ 2 dB		
PVT Offset -10usec	$\leq$ 8 dB		
PVT Offset 552.8usec	$\leq$ 8 dB		
GSM Analyzer ORFS Measurement	Expected Limit (Note 1)	Pass	Fail
ORFS Offset $\pm$ 100 kHz	$\leq$ -6 dB		
ORFS Offset $\pm$ 200 kHz	$\leq$ -33 dB		
ORFS Offset $\pm$ 250 kHz	$\leq$ -38 dB		
ORFS Offset $\pm$ 400 kHz	$\leq$ -67 dB		
ORFS Offset $\pm$ 600 kHz	$\leq$ -76 dB		
ORFS Offset $\pm$ 800 kHz	$\leq$ -78 dB		
ORFS Offset $\pm$ 1000 kHz	$\leq$ -78 dB		
ORFS Offset $\pm$ 1200 kHz	$\leq$ -79 dB		

Note 1 - Expected test limit levels may vary according to test instrument source used. Expected limits listed may require modification.

8960 Operational Verification
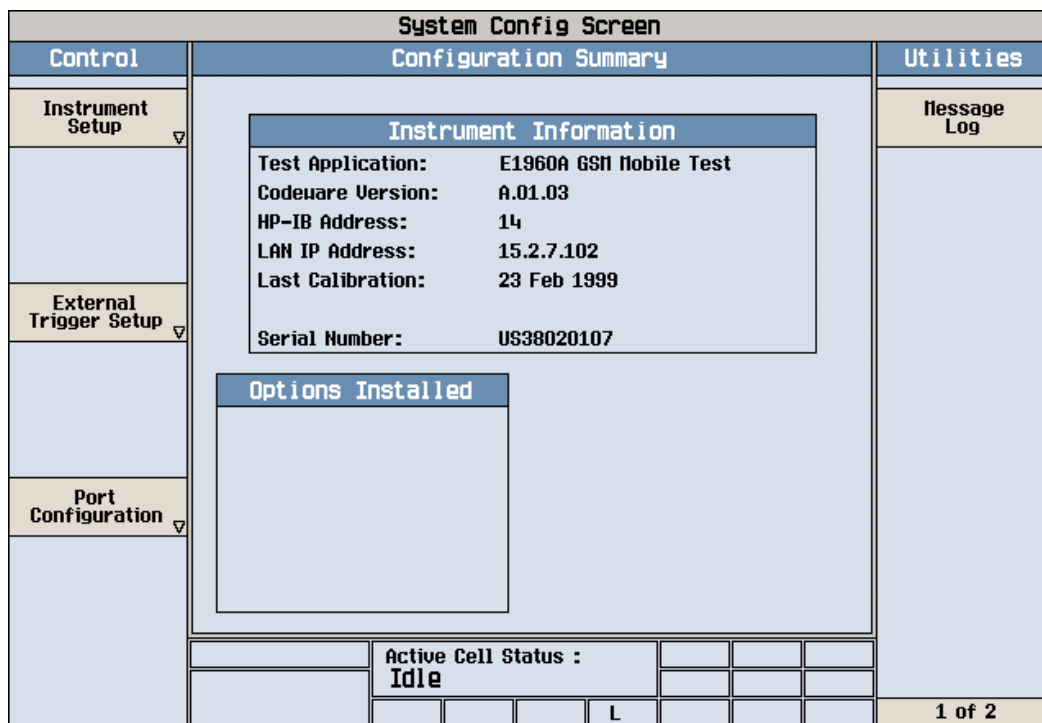
Analog Generator Level Accuracy

Analog Generator Level Accuracy is a test to insure that the 8960 can set a basic level and then step in 10 dB increments accurately.

The expected limit is:

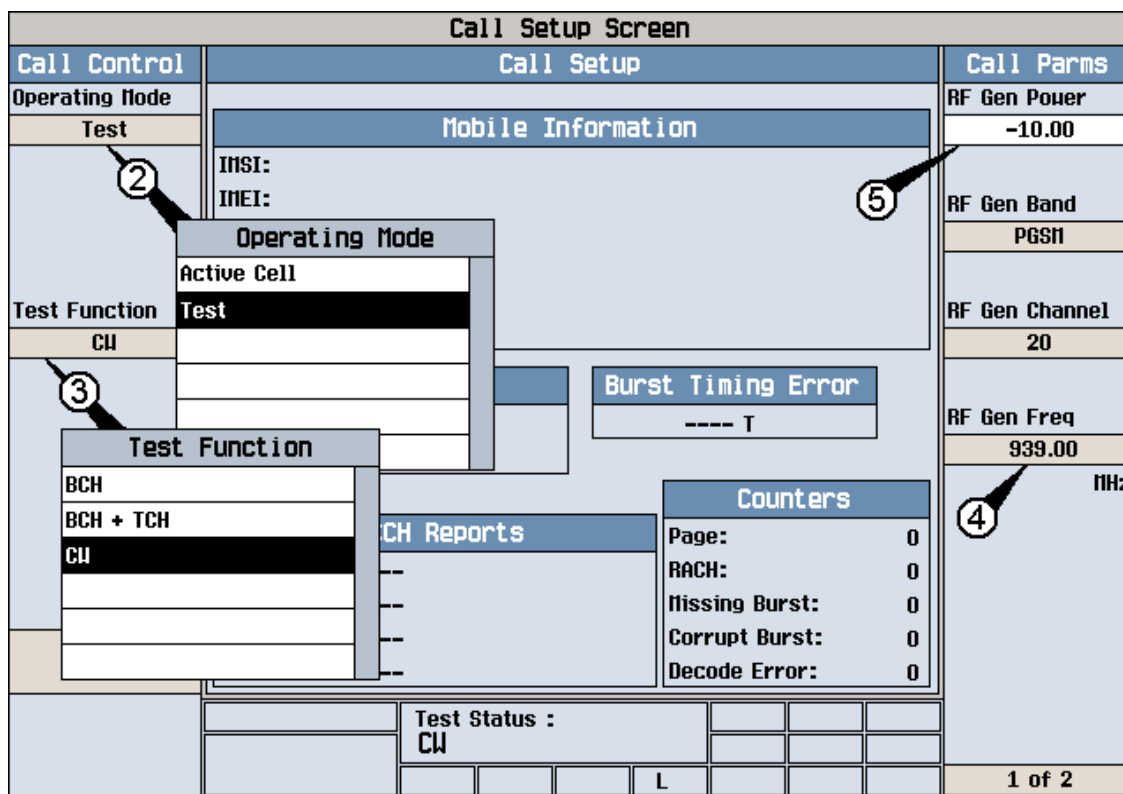 RF Generator Output Level, RF In/Out (2 sources) -   ± 2.0 dB

The current operating firmware in the 8960 does not allow manual operation of amplitude or frequency using incremental steps for either Signal Generator 1 or 2; a PC with controlling software is required.

Connect the 8960 RF In/Out Connector to the E4406A RF Input.

System Config Screen		
Control	**Configuration Summary**	**Utilities**
Instrument Setup ▽	**Instrument Information**	**Message Log**
	Test Application: E1960A GSM Mobile Test	
	Codeware Version: A.01.03	
	HP-IB Address: 14	
	LAN IP Address: 15.2.7.102	
	Last Calibration: 23 Feb 1999	
External Trigger Setup ▽	Serial Number: US38020107	
	Options Installed	
Port Configuration ▽		
	Active Cell Status : Idle	
	L	1 of 2

**On the 8960 press the 'Local' button and the 'System Configure' button .
The GPIB address must be set to: 14**

8960 Operational Verification
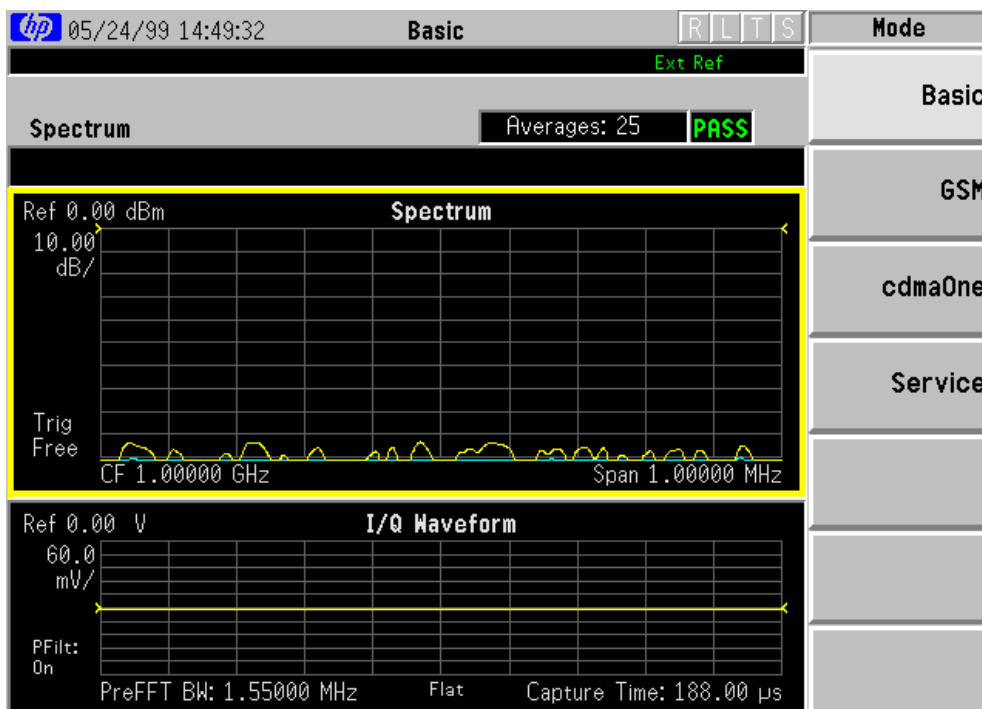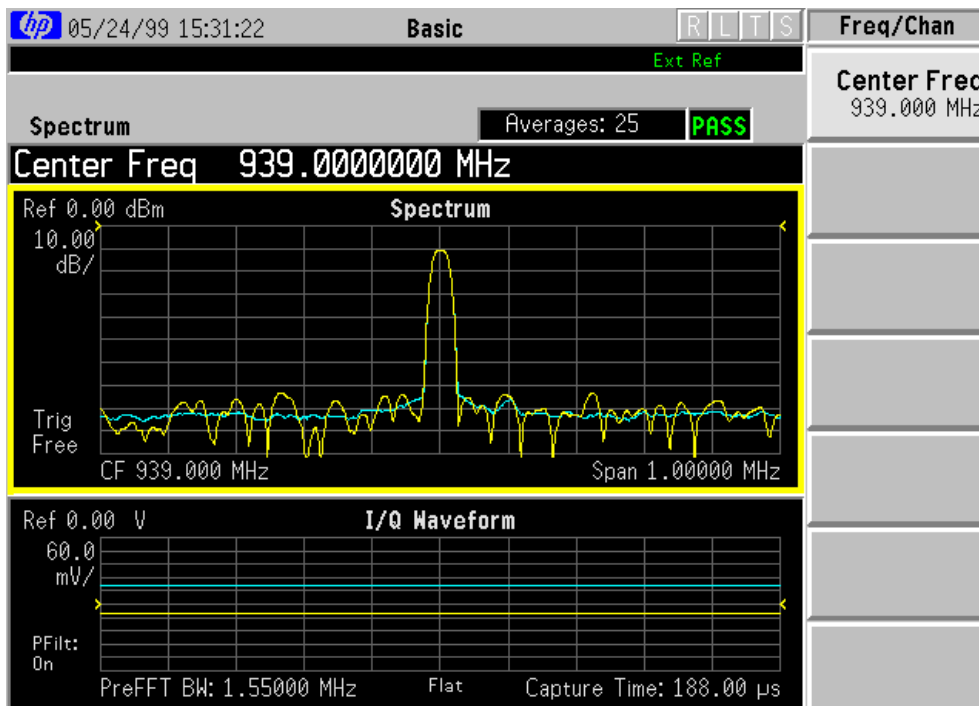
Analog Generator Level Accuracy, cont.

Call Setup Screen		
Call Control	Call Setup	Call Parms

Operating Mode — Test ②

Test Function — CW ③

Mobile Information
IMSI:
IMEI:

Operating Mode
Active Cell
Test

Test Function
BCH
BCH + TCH
CW

Burst Timing Error
---- T

CH Reports
--
--
--
--

Counters
Page: 0
RACH: 0
Missing Burst: 0
Corrupt Burst: 0
Decode Error: 0

RF Gen Power — −10.00 ⑤

RF Gen Band — PGSM

RF Gen Channel — 20

RF Gen Freq — 939.00 MHz ④

Test Status :
CW

L   1 of 2

On the 8960 perform the following set up functions:

1. Press the blue '**SHIFT**' button and the '**PRESET**' button (front panel buttons not shown above).

2. Press the display '**Operating Mode**' button and set mode to **Test** using the knob.

3. Press the display '**Test Function**' button and set function to **CW** using the knob.

4. Press the '**RF Gen Freq**' button and set frequency to **939 MHz** using the number keypad and the knob.

5. Press the ' **RF Gen Power**' button and set power to **-10 dBm** using the number keypad and the knob.

8960 Operational Verification
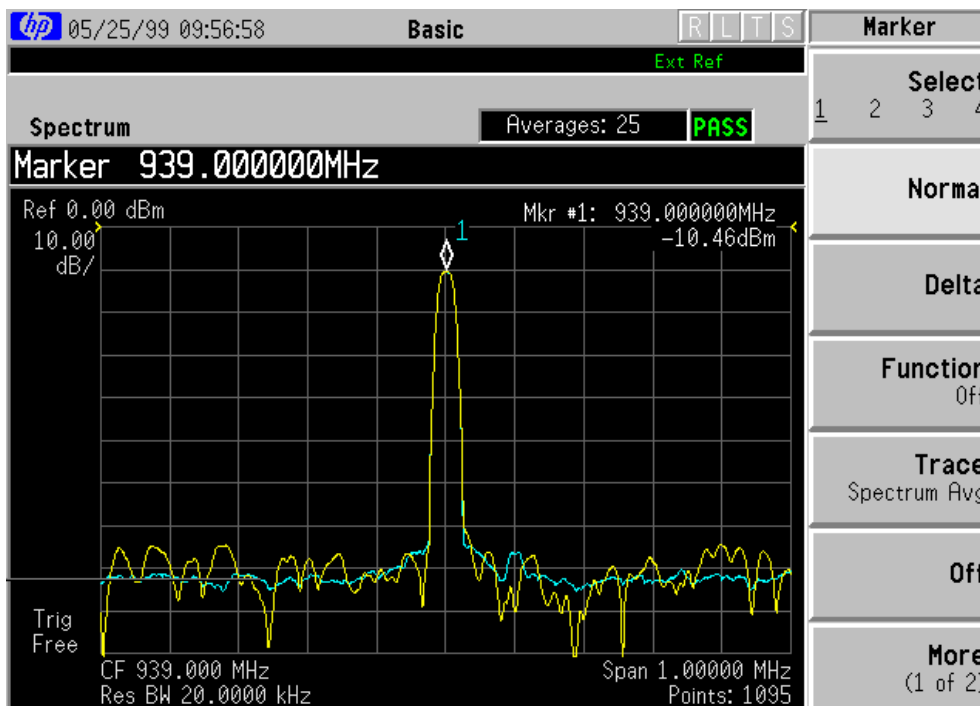**Analog Generator Level Accuracy, cont.**

On the E4406A, press the '**Preset**' System button, the '**MODE**' Control button and set to '**Basic**' Mode .
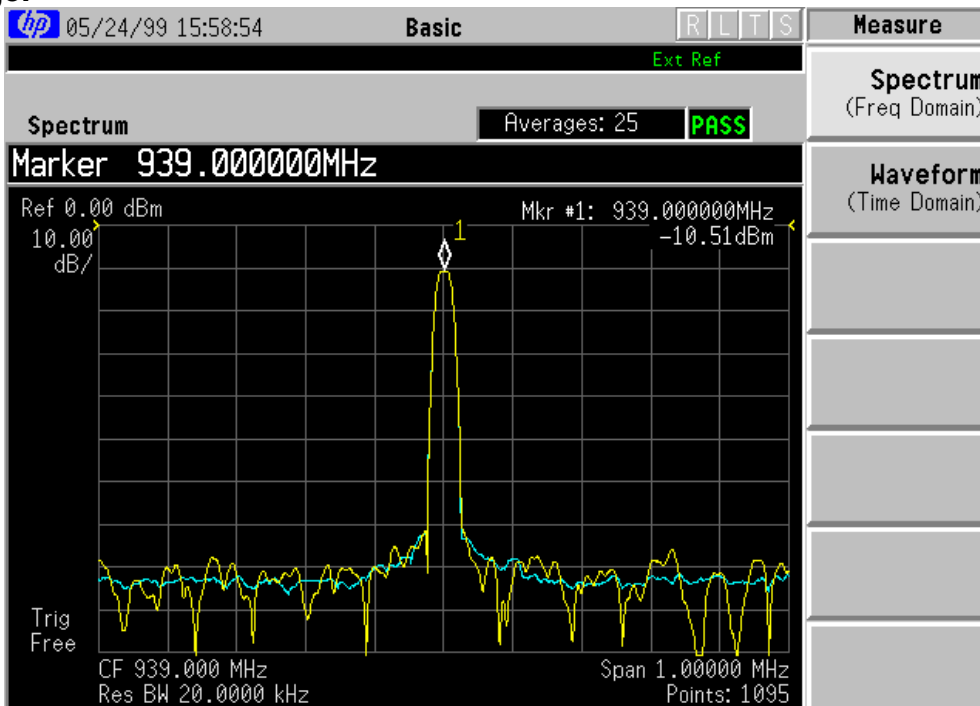

On the E4406A, press the '**FREQUENCY**' Control button and set the Center Frequency to 939 MHz.

5

**8960 Operational Verification
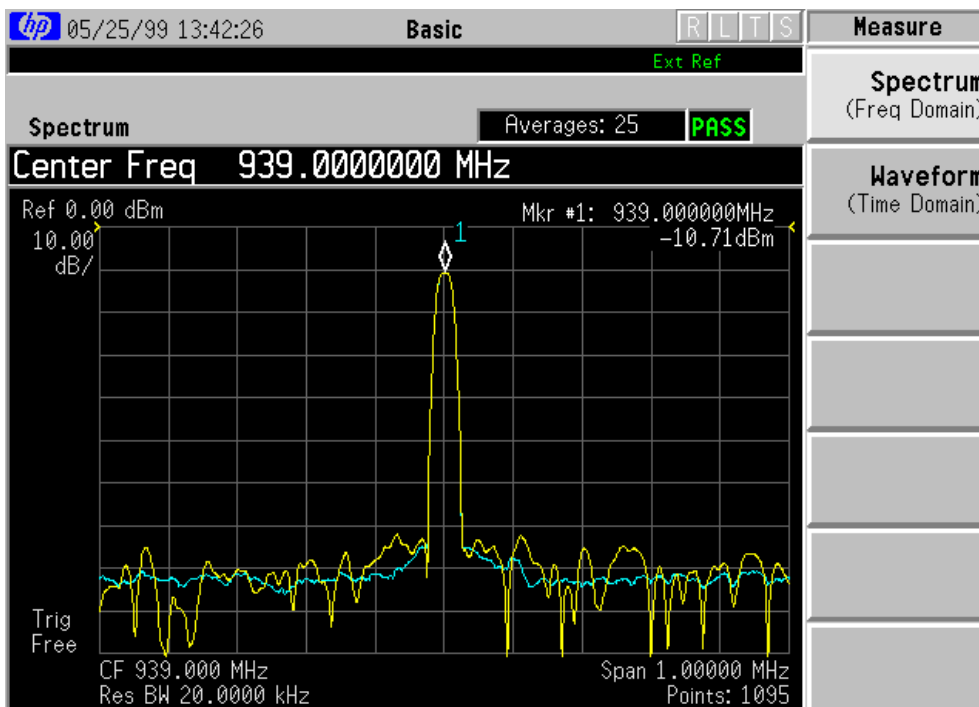Analog Generator Level Accuracy, cont.**

On the E4406A, press the 'ZOOM' button, the 'Marker' button, and the 'Search' button. Select the 'TRACE' screen button and set the trace to Spectrum Average.

On the E4406A, press the 'MEASURE' Control button.

6

8960 Operational Verification
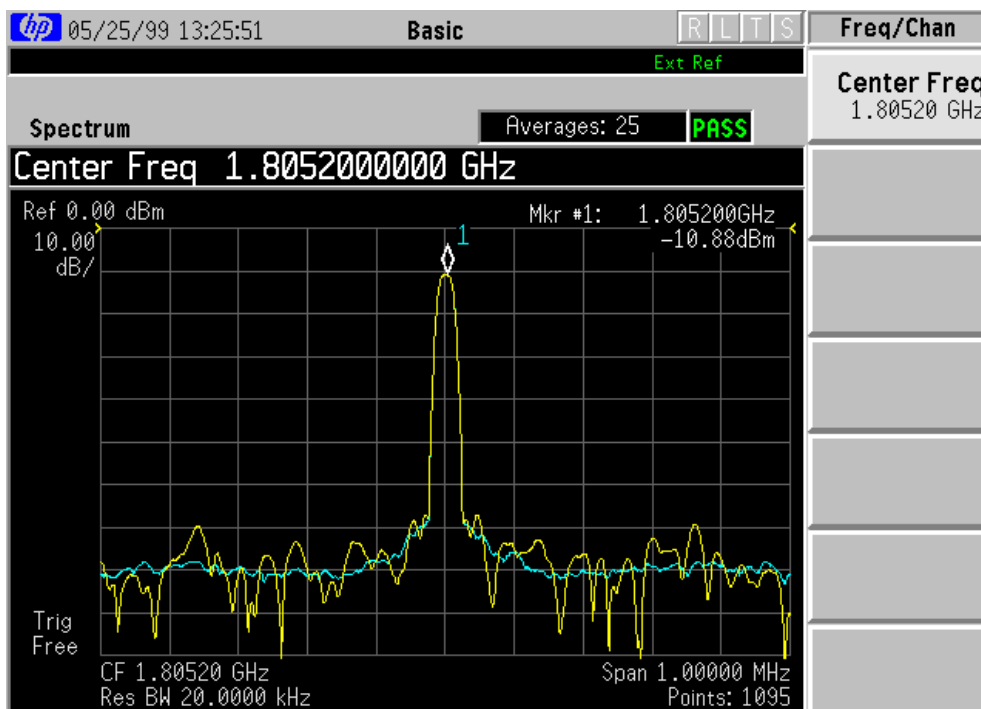**Analog Generator Level Accuracy, cont.**

**Step the 8960 down in amplitude in 10 dB increments to -80 dBm.
Insure that each level step is accurate within ± 2 dB.**

On the 8960 perform the following set up functions:

1. Press the '**RF Gen Freq**' button and set frequency to **1805.2 MHz**.

2. Press the ' **RF Gen Power**' button and set power to **-10 dBm**.

7

**8960 Operational Verification
Analog Generator Level Accuracy, cont.**

On the E4406A set Center Frequency to 1.8052 GHz. Step the 8960 down in amplitude in 10 dB increments to -80 dBm. Insure that each level step is accurate within ± 2 dB.

On the 8960 perform the following set up functions:

1. Press the '**RF Gen Freq**' button and set frequency to **1930.2 MHz**.

2. Press the '**RF Gen Power**' button and set power to **-10 dBm**.

8

8960 Operational Verification
Analog Generator Level Accuracy, cont.

On the E4406Aset Center Frequency to 1.9302 GHz. Step the 8960 down in amplitude in 10 dB increments to -80 dBm. Insure that each level step is accurate within ± 2 dB.
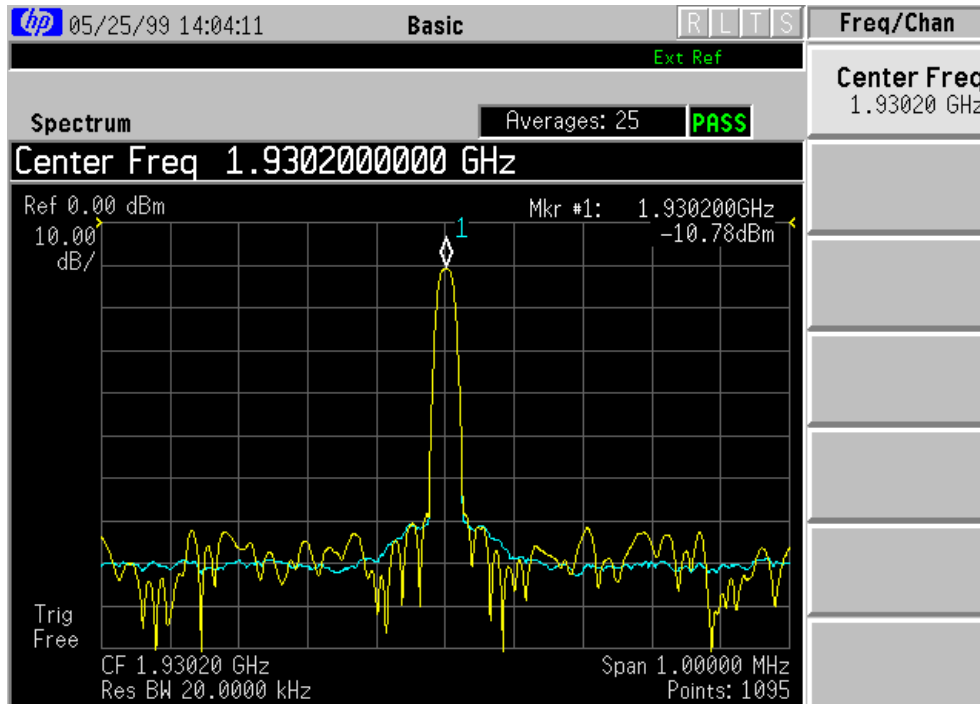
Important Note:

The 8960 contains 2 complete signal generator sources (these are very similar to the E4432/33B Signal Generator).

The operating firmware of the 8960 only provides for operation of 1 source using the manual user interface (front panel) in the analog mode. It is not possible to test the second source in a analog mode using any manual method.

However….the second source can be tested manually in a GSM transmit mode. See the test titled "GSM Generator Amplitude Flatness. Peak Phase Error, RMS Phase Error, and Frequency Error --- Source 2" in this section.

Testing source 2 in an analog mode requires using the Verification Automated Software.

8960 Operational Verification
Analog Generator Spectral Purity

Analog Generator Spectral Purity is a test to insure that the 8960 has harmonics and spurious signals within specification.The test is run by setting the 8960 to a carrier frequency of 300 MHz and power level of -10 dBm. Harmonics and spurious are checked at 450MHz, 600 MHz, 750 MHz, and 900 MHz. The expected limits are:

Spectral Purity Harmonics	-	$\leq$ -25 dBc
Sub-Harmonics	-	$\leq$ -40 dBc
Non-Harmonics	-	$\leq$ -55 dBc <1500 kHz
		$\leq$ -68 dBc >1500 kHz

The current operating firmware in the 8960 does not allow manual operation of amplitude or frequency using incremental steps for either Signal Generator 1 or 2, a PC with controlling software is required.

Connect the 8960 RF In/Out Connector to the E4406A RF Input.
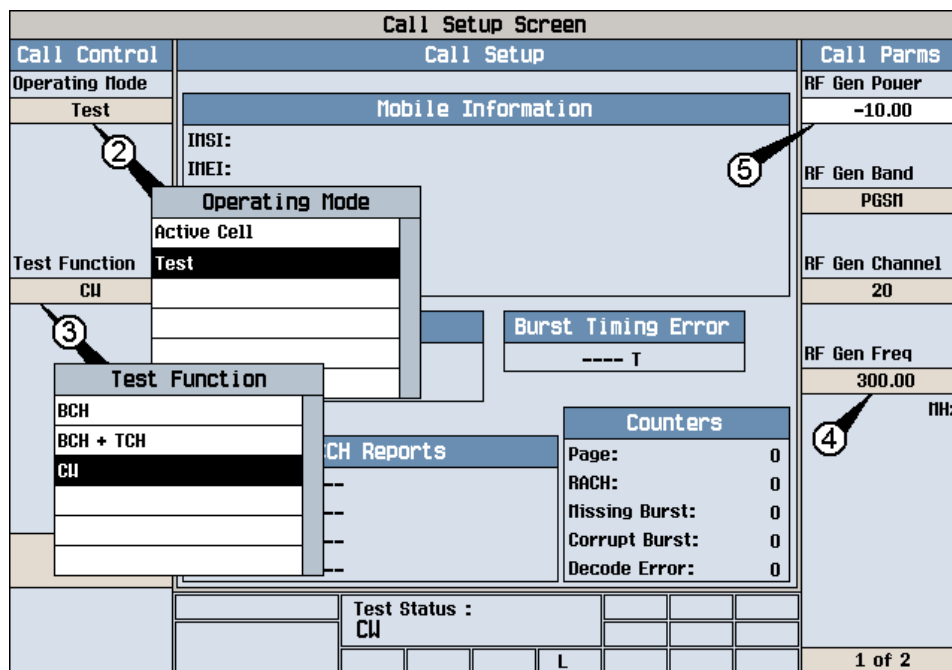
On the 8960 perform the following set up functions:

1. Press the blue '**SHIFT**' button and the '**PRESET**' button (front panel buttons not shown above).

2. Press the display '**Operating Mode**' button and set mode to **Test** using the knob. 3. Press the display '**Test Function**' button and set function to **CW** using the knob.   4. Press the '**RF Gen Freq**' button and set frequency to **300 MHz** using the number keypad and the knob.

5. Press the ' **RF Gen Power**' button and set power to **-10 dBm** using the number keypad and the knob.

10

Analog Generator Spectral Purity
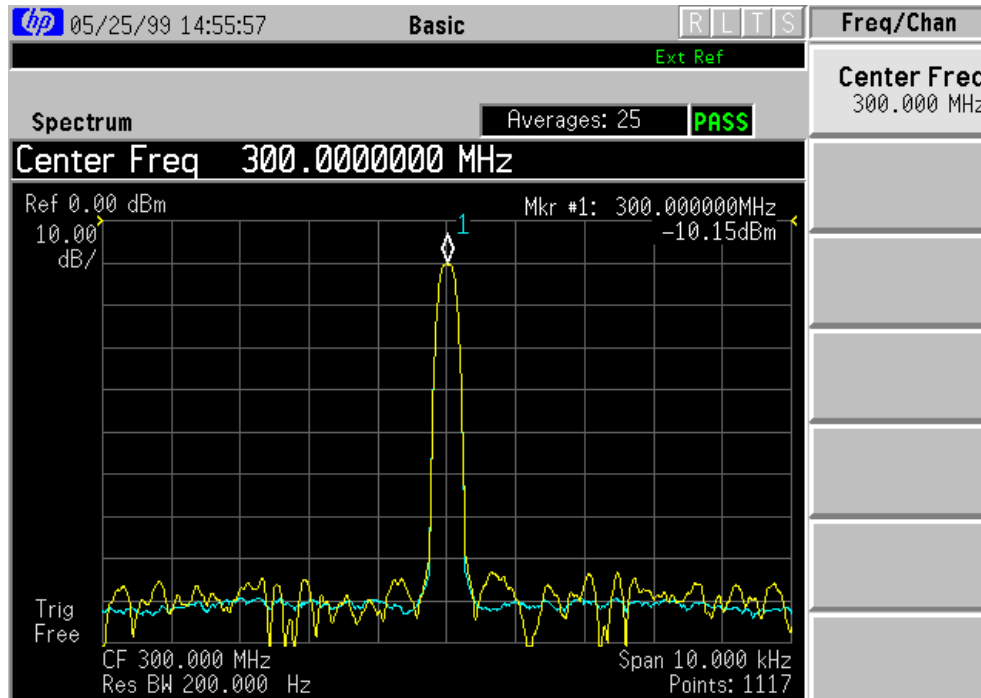
On the E4406A, press the 'Preset' System button, press the 'Mode' Control button and set to 'Basic' Mode.
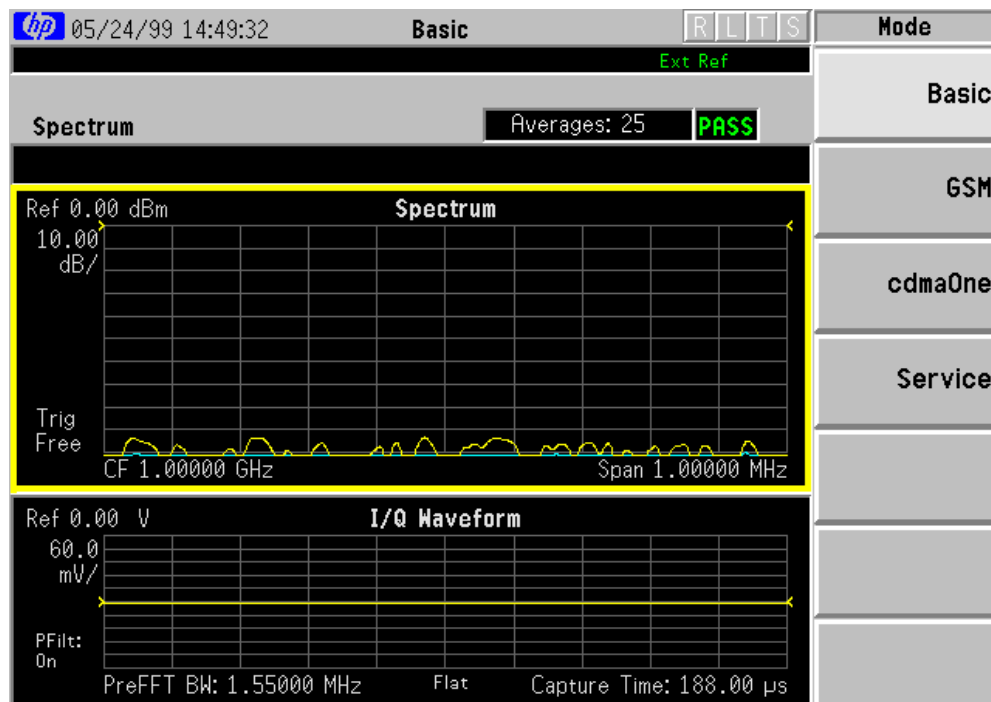
ON the E4406A make the following settings: Center Freq: 300 MHz   Span: 10 kHz

Press the 'ZOOM' button, the 'Marker' button, and the 'Search' button. Select the 'TRACE' screen button and set the trace to Spectrum Average. The 8960 amplitude should equal -10 dBm ± 2 dB.

11
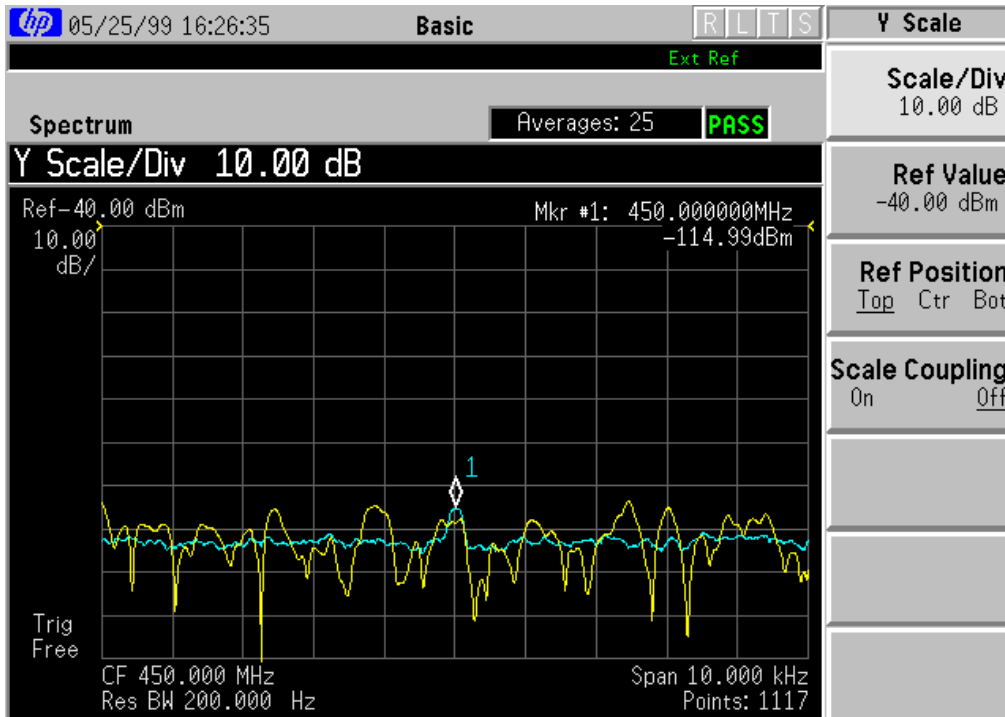
On the E4406A set the center frequency to 450 MHz. Press the 'AMPLITUDE' button and set Ref Value to -50 dBm. The Sub-Harmonic expected limit is: £-50 dBm.
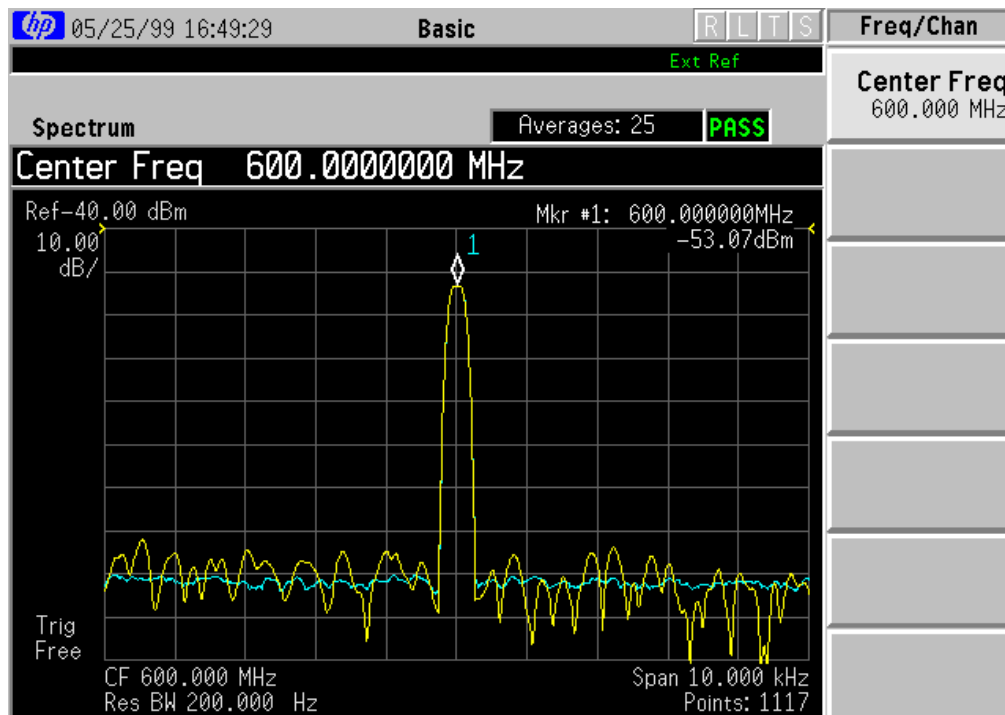
On the E4406A set Center Frequency to 600 MHz. The Harmonic expected limit is: £-35 dBm

On the E4406A set the Center Frequency to 750 MHz. The Sub-Harmonic
expected limit is: **£-50 dBm**
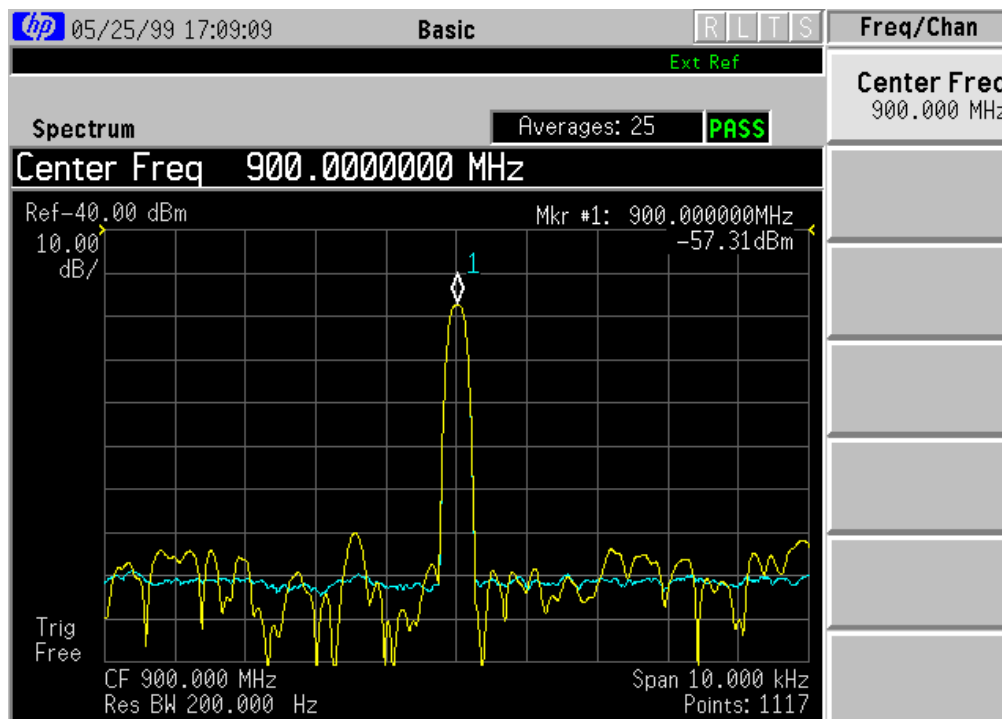
On the E4406A set the Center Frequency to 900 MHz. The Harmonic
expected limit is: **£-35 dBm** .

8960 Operational Verification
Audio Generator Accuracy

The Audio Generator test checks to insure that the 8960 has an audio source signal with reasonable performance of accuracy.

The test is run by setting the 8960 in the audio generator mode and looping an audio signal from the Audio Out BNC connector to the Audio In Hi BNC connector to measure level accuracy of the audio output. The audio generator expected limits are:

Level Accuracy   -   ± 0.03V

Connect the 8960 Audio Out Connector to the Audio In Hi Connector with a BNC cable.

Call Setup Screen		
Call Control	**Call Setup**	**Call Parms**
Operating Mode		Cell Power
Active Cell	**Mobile Information**	−85.00
	IMSI:	
	IMEI:	Cell Band
	Revision Level:	PGSM
	Supported Band:	
	Power Class: ----	Broadcast Chan
Originate Call	Called Number:	20
	Last Location **Burst Timing Error**	
Paging IMSI	MCC MNC LAC ---- T	
001012345678901	---- ---- ----	
		Counters
	SACCH Reports	Page: 0
	Timing Adv: ----	RACH: 0
	Tx Level: ----	Missing Burst: 0
Cell Info	Rx Level: ----	Corrupt Burst: 0	Mobile Loopback
	Rx Qual: ----	Decode Error: 0	
	Active Cell Status : Idle	
	L	1 of 3

Begin the test procedure by pressing the blue 'SHIFT' button and RESET.

8960 Operational Verification
Audio Generator Accuracy,cont.

```
Call Setup Screen
Control          Call Setup                    Call Parms
Operating Mode                                 RF Gen Power
   Test          Mobile Information              -10.00
             IMSI:
             IMEI:                             RF Gen Band
             Revision Level:                      PGSM
             Supported Band:
             Power Class:    ----             RF Gen Channel
Test Function    Called Number:                     20
   CW
             Loc      Instrument Selection
                  Audio Generator             RF Gen Freq
                                                 300.00
                                                    MHz




Close
Menu
                          Test Status :
                          CW
                                   L           1 of 2
```

Press the Instrument Select button. Press the knob and activate the Audio Generator screen

```
Measurement Screen
Control              Audio Generator           Audio Parms
                                               Amplitude
                                                 1.4140
                Amplitude        Frequency          V
                 1.41 V       1000.00 Hz       Pulse
                Pulsed:  Off                      Off
                State:   On

                                               Frequency
                                                 1.0000
                                                    kHz
Select
F7 to F12




                        Active Cell Status :
                        Idle
1 of 2                           L
```

Set audio amplitude to 1.414 V. Set audio frequency to 1 kHz.

**8960 Operational Verification
Audio Generator Accuracy,cont.**

Call Setup Screen		
Control	**Audio Generator**	**Call Parms**
Operating Mode		Cell Power
Active Cell	Amplitude Frequency	−85.00
	1.41 v **1000.00** Hz	Cell Band
	Pulsed: Off	**PGSM**
	State: On	
		Broadcast Chan
Originate Call		20
	Loc Measurement Selection	
	Transmit Power	
	Power vs Time	
	Phase & Frequency Error	
	Fast Bit Error	
	Bit Error	
	Analog Audio	
Close Menu	Decoded Audio	**Mobile Loopback**
	Output RF Spectrum	
	Active Cell Status : **Idle**	
	L	1 of 3

Press the 'Measurement Selection' button. Use the knob and select Analog Audio, push the knob to start selection.

Measurement Screen		
Control	**Analog Audio**	**Call Parms**
		Cell Power
Analog Audio Setup ▽	Audio In Level	−85.00
	1.00 v	Cell Band
		PGSM
		Broadcast Chan
	Continuous	20
	Audio Generator	
	Amplitude Frequency	
	1.41 v **1000.00** Hz	
	Pulsed: Off	
	State: On	
		Mobile Loopback
	Active Cell Status : **Idle**	
1 of 2	L	1 of 3

The Analog Audio measurement screen should appear. The expected limits are: Level Accuracy: ± 0.03V
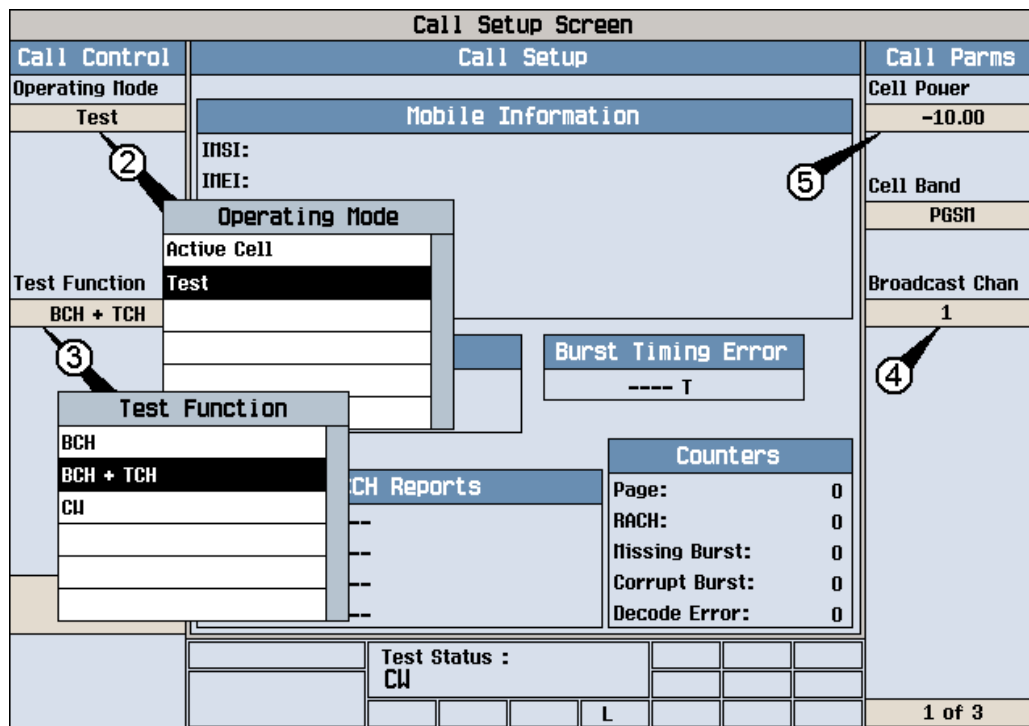
16

8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error, RMS Phase Error, and Frequency Error
Source 1

GSM Generator tests check to insure that the 8960 has a GSM Digital signal within a reasonable specification.The test is run by setting the 8960 to a traffic channel of 30 and power level of -10 dBm. The E4406A is then set in a digital measurement mode and checks the 8960 GSM signal for Amplitude Flatness (PVT), Peak Phase Error, RMS Phase Error, and Frequency Error. The expected limits are:

Amplitude Flatness   - $< \pm .6$ dBm
Peak Phase Error   - $< \pm 8$ degrees in PGSM & EGSM Bands
                          $< \pm 12$ degrees in DCS and PCS Bands
RMS Phase Error   - $< \pm 2$ degree in PGSM and EGSM Bands
Frequency Error   - $< \pm .04$ ppm + TB

On the 8960 perform the following set up functions:

1. Press the blue **'SHIFT'** button and the **'PRESET'** button (front panel buttons not shown above).

2. Press the display **'Operating Mode'** button and set mode to **Test** using the knob.

3. Press the display **'Test Function'** button and set function to **BCH + TCH** using the knob.

4. Press the **'Broadcast Chan'** button and set the channel to **1** using the number keypad and the knob.

5. Press the ' **Cell Power'** button and set power to **-10 dBm** using the number keypad and the knob.

**8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error,
RMS Phase Error, and Frequency Error, Source 1 cont.**

```
┌─────────────────────────────────────────────────────────────────────────┐
│                          Call Setup Screen                                │
├──────────────┬─────────────────────────────────────────┬──────────────────┤
│ Call Control │              Call Setup                 │   Call Parms     │
├──────────────┤                                         ├──────────────────┤
│Operating Mode│                                         │ Traffic Band     │
├──────────────┤      ┌─────────────────────────────┐    ├──────────────────┤
│    Test      │      │     Mobile Information       │    │      PGSM        │
├──────────────┤      │ IMSI:                        │    ├──────────────────┤
│              │      │ IMEI:                        │    │ Traffic Channel  │
│              │      │ Revision Level:              │    ├──────────────────┤
│              │      │ Supported Band:              │    │       124        │
│Test Function │      │ Power Class:      ----       │    ├──────────────────┤
├──────────────┤      │ Called Number:               │    │ Timeslot         │
│  BCH + TCH   │      └─────────────────────────────┘    ├──────────────────┤
│              │   ┌──────────────┐ ┌─────────────────┐   │        4         │
│              │   │ Last Location│ │Burst Timing Err.│   ├──────────────────┤
│              │   │              │ │     ---- T      │   │ Timing Advance   │
│              │   │MCC  MNC  LAC │ └─────────────────┘   ├──────────────────┤
│              │   │---- ---- ----│                       │        0         │
│              │   └──────────────┘  ┌────────────────┐   ├──────────────────┤
│              │                     │    Counters    │   │ MS TX Level      │
│              │   ┌──────────────┐  │ Page:       0  │   ├──────────────────┤
│              │   │ SACCH Reports│  │ RACH:       0  │   │       15         │
│              │   │Timing Adv:---│  │ Missing Bst: 0 │   ├──────────────────┤
│              │   │Tx Level: ----│  │ Corrupt Bst: 0 │   │ Speech           │
│   Cell       │   │Rx Level: ----│  │ Decode Err:  0 │   ├──────────────────┤
│   Info       │   │Rx Qual:  ----│  └────────────────┘   │      Echo        │
├──────────────┤  ┌──────────────────────┐               ├──────────────────┤
│              │  │ Test Status :        │               │                  │
│              │  │ Sending BCH + TCH    │    L          │     2 of 3       │
└──────────────┴──┴──────────────────────┴───────────────┴──────────────────┘
```

Go to Screen 2 of 3. Set the Traffic Channel to 124 .

```
┌─────────────────────────────────────────────────────────────────────────┐
│                          Call Setup Screen                                │
├──────────────┬─────────────────────────────────────────┬──────────────────┤
│ Call Control │              Call Setup                 │   Call Parms     │
├──────────────┤                                         ├──────────────────┤
│Operating Mode│                                         │Receiver Control  │
├──────────────┤      ┌─────────────────────────────┐    ├──────────────────┤
│    Test      │      │     Mobile Information       │    │      Auto        │
├──────────────┤      │ IMSI:                        │    ├──────────────────┤
│              │      │ IMEI:                        │    │                  │
│              │      │ Revision Level:              │    │                  │
│              │      │ Supported Band:              │    │                  │
│Test Function │      │ Power Class:      ----       │    │                  │
├──────────────┤      │ Called Number:               │    │                  │
│  BCH + TCH   │      └─────────────────────────────┘    │                  │
│              │   ┌──────────────┐ ┌─────────────────┐   │                  │
│              │   │ Last Location│ │Burst Timing Err.│   │                  │
│              │   │          LOC │ │     ---- T      │   │                  │
│              │   │MCC  MNC ┌────┴─────────────┐     │   │                  │
│              │   │---- ----│  Expected Burst  │     │   │                  │
│              │   └─────────│ TSC0             │─────┘   ├──────────────────┤
│              │             │ TSC1        Counters       │ Expected Power   │
│              │   ┌─────────│ TSC2    e:       0 │       ├──────────────────┤
│              │   │  SAC    │ TSC3    H:       0 │       │     13.00        │
│              │   │Timing Ad│ TSC4    sing Bst: 0│       ├──────────────────┤
│              │   │Tx Level:│ TSC5    rupt Bst: 0│       │ Expected Burst   │
│   Cell       │   │Rx Level:└──────── ode Error:0┘       ├──────────────────┤
│   Info       │   │Rx Qual:  ----│                       │      TSC0        │
├──────────────┤  ┌──────────────────────┐               ├──────────────────┤
│              │  │ Test Status :        │               │                  │
│              │  │ Sending BCH + TCH    │    L          │     3 of 3       │
└──────────────┴──┴──────────────────────┴───────────────┴──────────────────┘
```
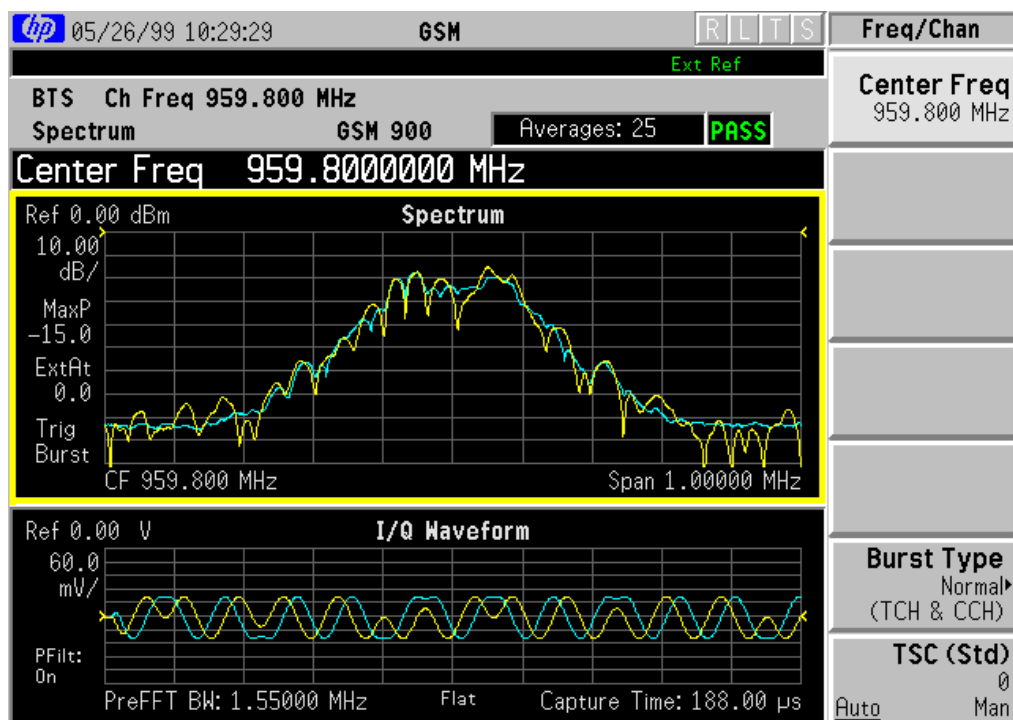
Go to Screen 3 of 3. Set the expected burst to TSC0.

8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error,
RMS Phase Error, and Frequency Error, Source 1 cont.
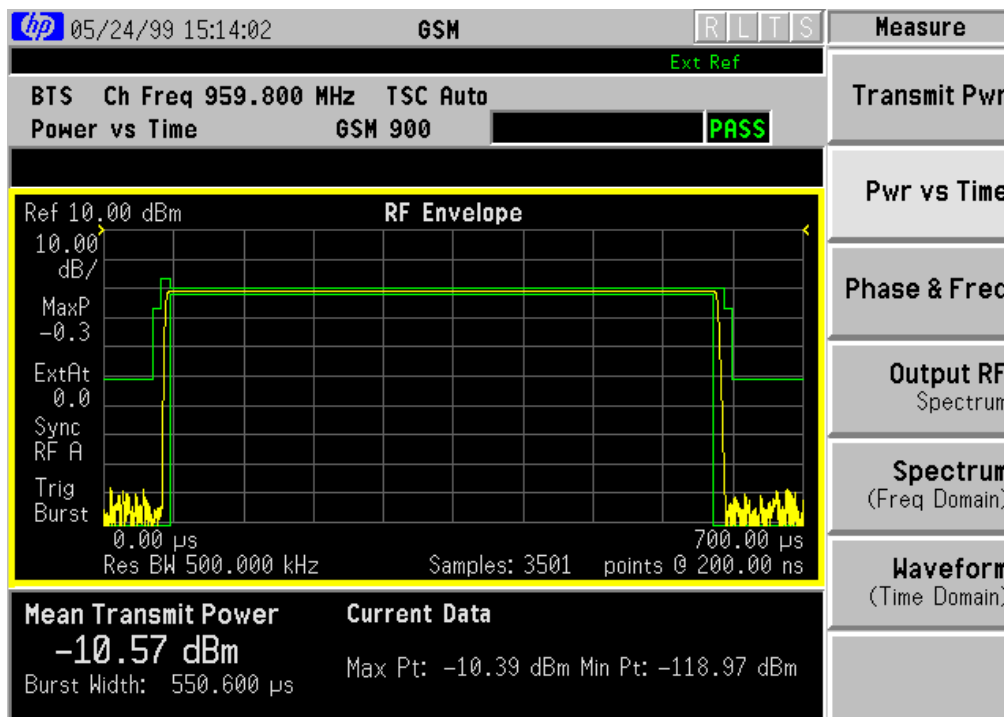
Manual
Verification

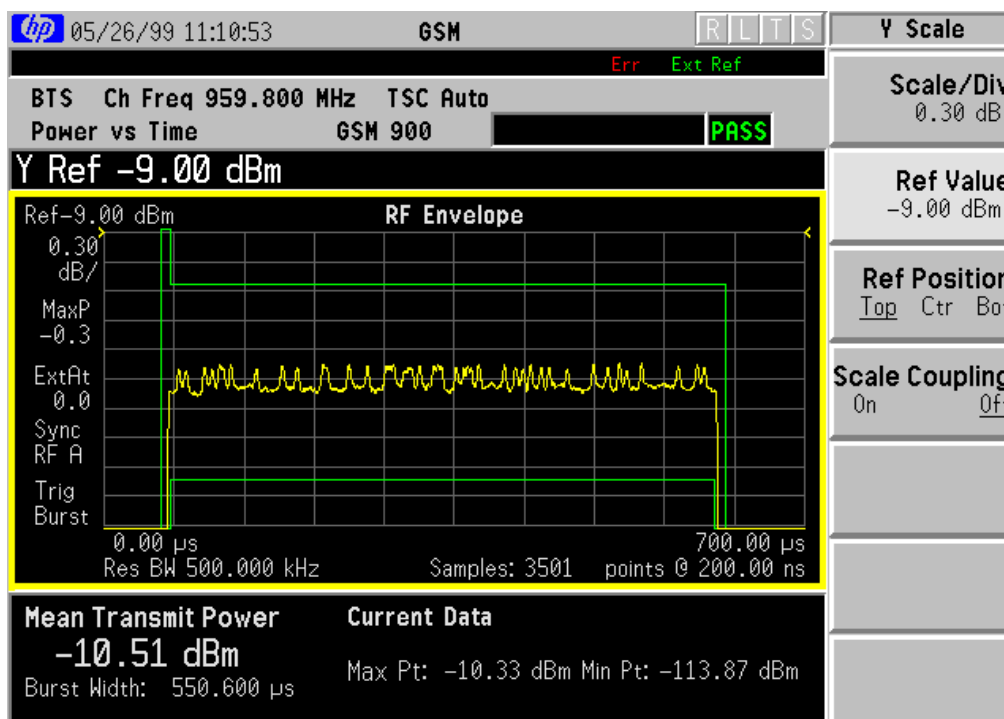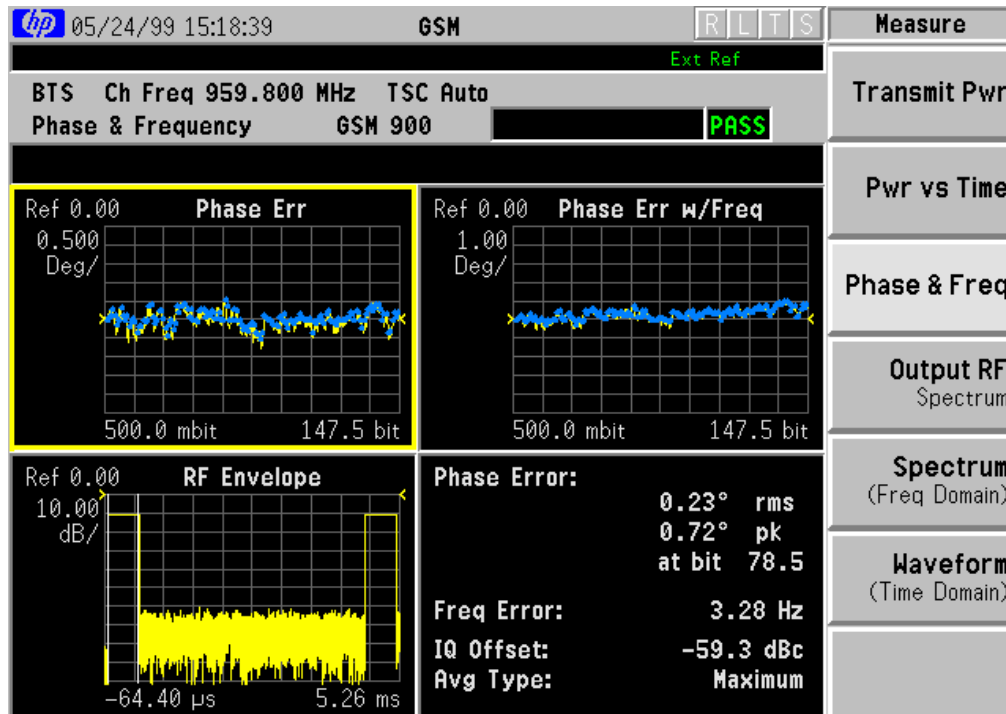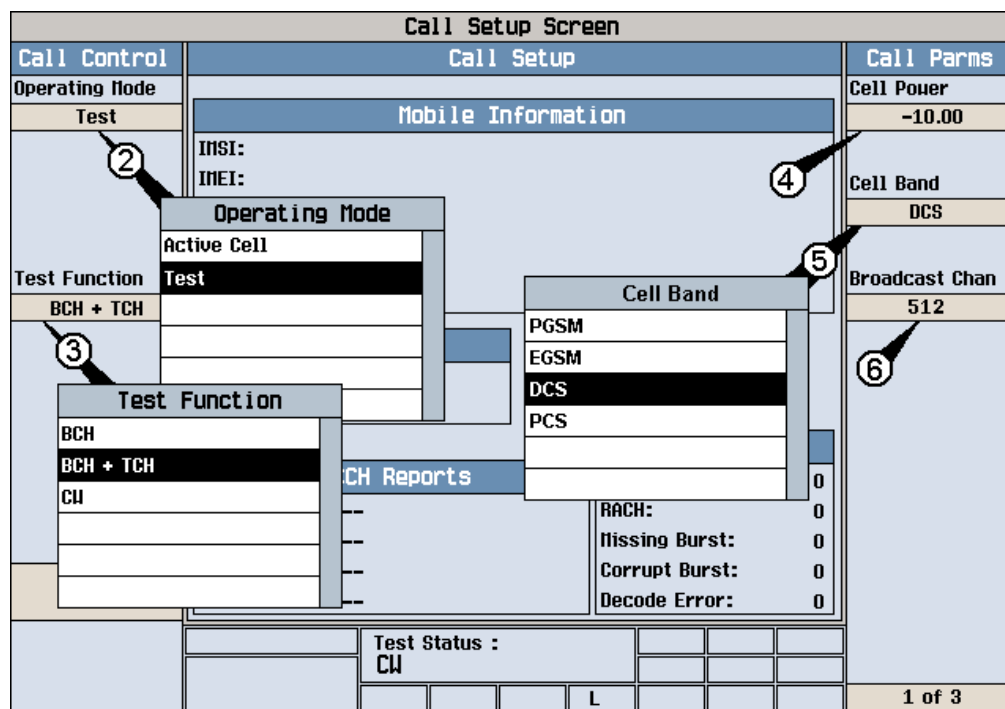**On the E4406A, press the 'MODE' Control button and set Mode field to GSM.**

On the E4406A set the Center Frequency to 959.8 MHz (channel 124). The Burst RF Spectrum should appear.

**8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error,
RMS Phase Error, and Frequency Error, Source 1 cont.**

On the E4406A, press the PVTbutton.

**On the E4406A, press the 'AMPLITUDE' Control button. Set 'Scale/Div' field
to be .3 dB and the 'Ref Value' field to be -9 dBm. The display shown above
should appear. The expected PVT limits are:** <± .6 dB flatness

**On the E4406A, press the 'Phase & Freq' button. The display shown
above should appear. The expected limits for Phase & Frequency are:**

Peak Phase Error -   <± 4 Degrees in PGSM & EGSM Bands
                                  <± 6 Degrees in DCS and PCS Bands
RMS Phase Error -   <± 2 Degrees in PGSM & EGSM Bands
Frequency Error   -   <± .04 ppm (18 Hz)

8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error, RMS Phase Error, and Frequency Error
Source 2

GSM Generator tests check to insure that the 8960 has a GSM Digital signal within a reasonable specification.The test is run by setting the 8960 to a traffic channel of 30 and power level of -10 dBm. The E4406A is then set in a digital measurement mode and checks the 8960 GSM signal for Amplitude Flatness (PVT), Peak Phase Error, RMS Phase Error, and Frequency Error. The expected limits are:

<pre>
Amplitude Flatness -   < ± .6 dBm
Peak Phase Error   -   < ± 8 degrees in PGSM & EGSM Bands
                        < ± 12 degrees in DCS and PCS Bands
RMS Phase Error   -   < ± 2 degree in PGSM and EGSM Bands
Frequency Error   -   < ± .04 ppm + TB
</pre>

On the 8960 perform the following set up functions:

1. Press the blue '**SHIFT**' button and the '**PRESET**' button (front panel buttons not shown above).

2. Press the display '**Operating Mode**' button and set mode to **Test** using the knob.

3. Press the display '**Test Function**' button and set function to **BCH+TCH** using the knob.

4. Press the ' **Cell Power**' button and set power to **-10 dBm** using the number keypad and the knob.

5. Press the '**Cell Band**' button and set the cell band type to **DCS** using the knob.

6. Press the '**Broadcast Chan**' button and set the channel to **512** using the number keypad and the knob.

22

8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error,
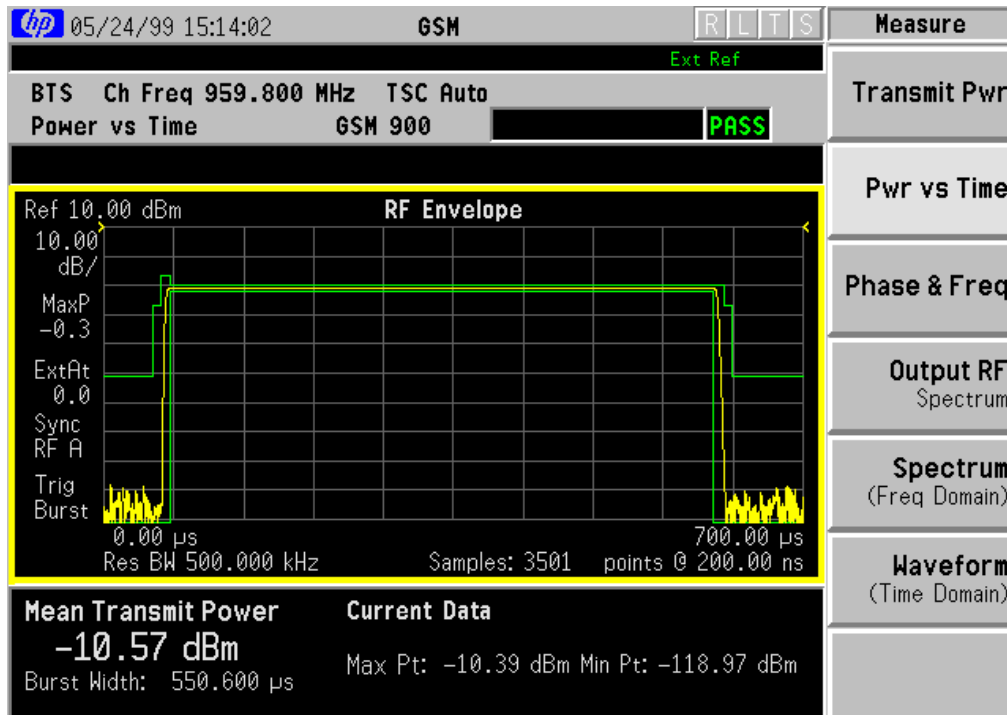**RMS Phase Error, and Frequency Error, Source 2 cont.**

Manual
Verification

```
                          Call Setup Screen
┌─────────────┬──────────────────────────────────┬────────────────┐
│ Call Control│           Call Setup             │   Call Parms   │
│Operating Mode│                                  │  Traffic Band  │
│    Test     │         Mobile Information        │      PGSM      │
│             │  IMSI:                            │                │
│             │  IMEI:                         ①  │ Traffic Channel│
│             │  Revision Level:                  │      124       │
│             │  Supported Band:                  │                │
│Test Function│  Power Class:      ----        ②  │    Timeslot    │
│  BCH + TCH  │  Called Number:                   │       4        │
│             │  ┌─────────────┐ ┌──────────────┐ │ Timing Advance │
│             │  │Last Location│ │Burst Timing  │ │       0        │
│             │  │MCC  MNC  LAC│ │    Error     │ │                │
│             │  │---- ---- ---│ │   ---- T     │ │  MS TX Level   │
│             │  └─────────────┘ ┌──────────────┐ │      15        │
│             │  ┌─────────────┐ │   Counters   │ │                │
│             │  │SACCH Reports│ │ Page:      0 │ │                │
│             │  │Timing Adv:--│ │ RACH:      0 │ │    Speech      │
│             │  │Tx Level: ---│ │Missing Brst:0│ │     Echo       │
│  Cell       │  │Rx Level: ---│ │Corrupt Brst:0│ │                │
│  Info       │  │Rx Qual:  ---│ │Decode Error:0│ │                │
│             │  ┌──────────────────────────────┐ │                │
│             │  │ Test Status :                │ │                │
│             │  │ Sending BCH + TCH            │ │    2 of 3      │
└─────────────┴──────────────────────────────────┴────────────────┘
```

Go to Screen 2 of 3. Set the Traffic Band to PGSM and the Traffic Channel to 124.

```
                          Call Setup Screen
┌─────────────┬──────────────────────────────────┬────────────────┐
│ Call Control│           Call Setup             │   Call Parms   │
│Operating Mode│                                  │Receiver Control│
│    Test     │         Mobile Information        │      Auto      │
│             │  IMSI:                            │                │
│             │  IMEI:                            │                │
│             │  Revision Level:                  │                │
│             │  Supported Band:                  │                │
│Test Function│  Power Class:      ----           │                │
│  BCH + TCH  │  Called Number:                   │                │
│             │  ┌─────────────┐ ┌──────────────┐ │                │
│             │  │Last Location│ │Burst Timing  │ │                │
│             │  │MCC  MNC  LAC│ │  ---- T      │ │                │
│             │  │---- ----┌───────────────┐     │ │              │
│             │         │ Expected Burst│     │ Expected Power │
│             │  ┌──────│ TSC0          │────┐ │    13.00       │
│             │  │ SAC  │ TSC1          │  0 │ │                │
│             │  │Timing│ TSC2          │  0 │ │ Expected Burst │
│             │  │Tx Lev│ TSC3          │st: 0│ │     TSC0      │
│  Cell       │  │Rx Lev│ TSC4          │t:  0│ │                │
│  Info       │  │Rx Qua│ TSC5        ↓ │or: 0│ │                │
│             │  ┌──────────────────────────────┐ │                │
│             │  │ Test Status :                │ │                │
│             │  │ Sending BCH + TCH            │ │    3 of 3      │
└─────────────┴──────────────────────────────────┴────────────────┘
```

Go to Screen 3 of 3. Set the expected burst to TSC0.

8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error,
RMS Phase Error, and Frequency Error, Source 2 cont.

Manual
Verification

On the E4406A, press the 'MODE' Control button and set Mode field to GSM.

On the E4406A set the Center Frequency to 959.8 MHz (channel 124). The
Burst RF Spectrum should appear.

8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error, RMS Phase Error, and Frequency Error, Source 2 cont.

On the E4406A, press the PVTbutton.

On the E4406A, press the 'AMPLITUDE' Control button. Set 'Scale/Div' field to be .3 dB and the 'Ref Value' field to be -9 dBm. The display shown above should appear. The expected PVT limits are: <± .6 dB flatness

**8960 Operational Verification
GSM Generator Amplitude Flatness, Peak Phase Error,
RMS Phase Error, and Frequency Error, Source 2 cont.**
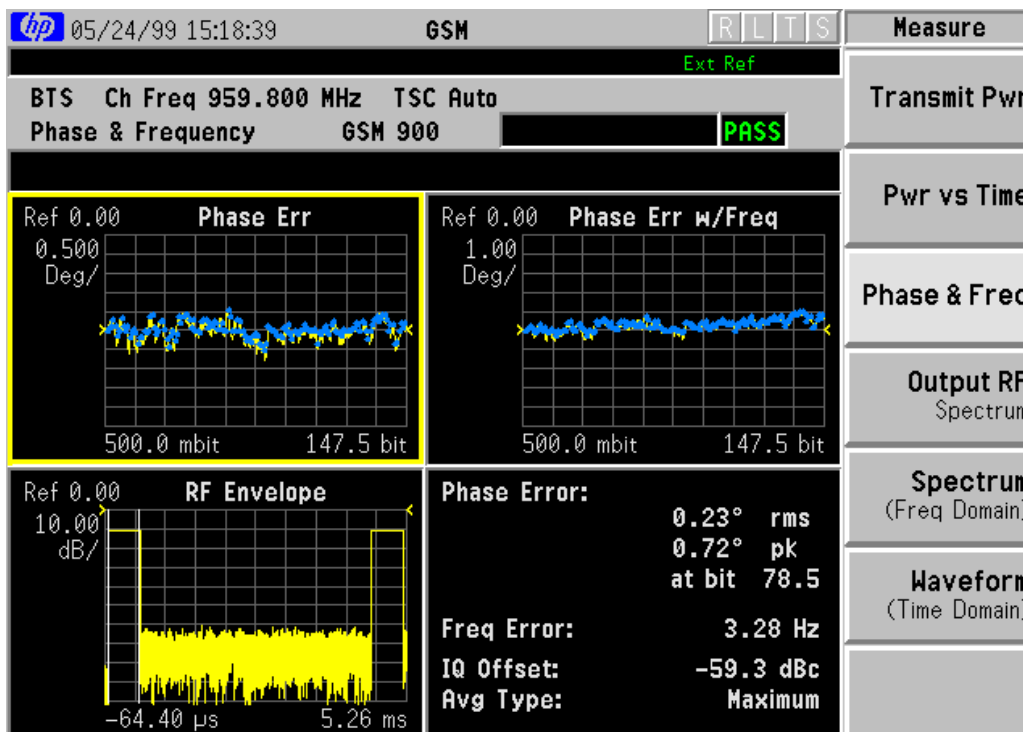
On the E4406A, press the 'Phase & Freq' button. The display shown above should appear. The expected limits for Phase & Frequency are:

Peak Phase Error   -   <± 4 Degrees in PGSM & EGSM Bands
                              <± 6 Degrees in DCS and PCS Bands
RMS Phase Error   -   <± 2 Degrees in PGSM & EGSM Bands
Frequency Error   -   <± .04 ppm (18 Hz)
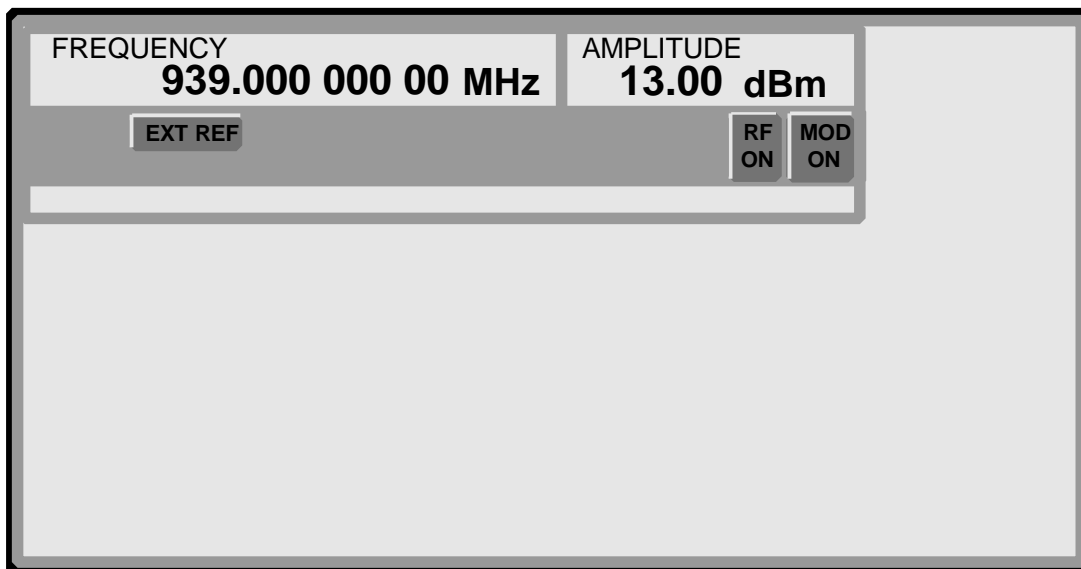
**8960 Operational Verification
Analog Audio Analyzer**

The Analog Audio Analyzer is tested to insure that the 8960 can accurately measure an audio signal within a reasonable limit.

The test is run by setting the 8960 into the Audio Analyzer measurement mode. The E4433B is then set to output an Audio signal on the LF Out connector at 1.414 Vp at a frequency of 1 kHz. The Analog Audio Measurement Accuracy expected limit is:

    Levels 10mv to 20V Peak - ± 0.04V
    Frequency 200 Hz to 8 kHz

Connect a BNC cable between the E4433B LF Out connector and the 8960 Audio In Hi connector.

```
                        Call Setup Screen
Call Control |           Call Setup            |    Call Parms
Operating Mode |                               |    Cell Power
  Active Cell  |      Mobile Information        |      -85.00
             | IMSI:                          |
             | IMEI:                          |    Cell Band
             | Revision Level:                |      PGSM
             | Supported Band:                |
             | Power Class:      ----         |    Broadcast Chan
  Originate  | Called Number:                 |       20
    Call     |
             | Last Location    Burst Timing Error
 Paging IMSI | MCC    MNC    LAC     ---- T
001012345678901| ----   ----   ----
             |                       Counters
             | SACCH Reports      Page:        0
             | Timing Adv: ----   RACH:        0
             | Tx Level:   ----   Missing Burst:  0
    Cell     | Rx Level:   ----   Corrupt Burst:  0    Mobile
    Info     | Rx Qual:    ----   Decode Error:   0    Loopback
             |          Active Cell Status :
             |             Idle
             |                       L              1 of 3
```

Begin the test procedure by pressing the blue 'SHIFT' button and RESET.

**8960 Operational Verification
Analog Audio Analyzer, cont.**

Call Setup Screen		
Control	**Call Setup**	**Call Parms**

Control
Operating Mode
Active Cell

Originate
Call

Close
Menu

Call Setup

Mobile Information
IMSI:
IMEI:
Revision Level:
Supported Band:
Power Class: ----
Called Number:

Loc	Measurement Selection
	Transmit Power
	Power vs Time
	Phase & Frequency Error
	Fast Bit Error
	Bit Error
	Analog Audio
	Decoded Audio
	Output RF Spectrum

Active Cell Status :
Idle

Call Parms
Cell Power
-85.00

Cell Band
PGSM

Broadcast Chan
20

Mobile
Loopback

1 of 3

**Press the 'Measurement Selection' button. Use the knob and select
Analog Audio, push the knob to start selection.**

FREQUENCY
4.000 000 000 00 GHz

AMPLITUDE
-135.0 dBm

EXT REF

RF Off   MOD ON

Modulation Status Information

MOD	STATE	DEPTH/DEV	SOURCE	RATE	WAVEFORM
LF Out	On	1.414 Vp	FuncGen	1.0000 kHz	Sine

LF Out
Off On

LF Out Amplitude
1.414V

LF Out Source
(Func Gen)▶

LF Out Waveform
(Sine)▶

LF Out Freq
1.0000 kHz

LF Out Period
(N/A)

LF Out Width
(N/A)

**On the E4433B press the LF Out button. Set LF Out to <u>On</u>. Set LF
Amplitude to 1.414Vp. Set the LF Out Frequency to be 1.0000 kHz.**

**8960 Operational Verification
Analog Audio Analyzer, cont.**

Measurement Screen		
Control	**Analog Audio**	**Call Parms**

```
┌─────────────────┬──────────────────────────────┬─────────────────┐
│     Control     │         Analog Audio         │   Call Parms    │
├─────────────────┼──────────────────────────────┼─────────────────┤
│ Analog Audio    │                              │ Cell Power      │
│ Setup        ▽  │                              │   -85.00        │
│                 │        Audio In Level        │                 │
│                 │          0.99 v              │ Cell Band       │
│                 │                              │   PGSN          │
│                 │                              │                 │
│                 │                              │ Broadcast Chan  │
│                 │                  Continuous  │     20          │
│                 │                              │                 │
│                 │                              │                 │
│                 │                              │                 │
│                 │                              │                 │
│                 │                              │ Mobile          │
│                 │                              │ Loopback        │
│                 │  Active Cell Status :        │                 │
│                 │  Idle                        │                 │
│     1 of 2      │              L               │     1 of 3      │
└─────────────────┴──────────────────────────────┴─────────────────┘
```

**The 8960 Analog Audio screen should display a voltage level measurement
of the audio signal from the E4433B .**

The Analog Audio measurement expected limit is ± 0.04V

**8960 Operational Verification
Analog Analyzer RF Power Meter**

The Analog Analyzer RF Power Meter is tested to insure that the 8960 can accurately measure an RF signal within a reasonable limit.

The test is run by setting the 8960 into a manual measurement mode. The E4433B is then set to output a CW RF signal at various levels and frequencies. The Analog RF Power Meter Accuracy expected limits are:

Levels $\geq$ -20 to +43 dBM   -   < $\pm$ 1.60 dB

Frequency 810 to 960 MHz

Begin by connecting a cable between the RF Out port of the E4433B and the RF In/Out port of the 8960.

FREQUENCY	AMPLITUDE	
939.000 000 00 MHz	**13.00 dBm**	
EXT REF		RF ON MOD ON

Set the E4433B to output a signal at a frequency of 939 MHz, amplitude +13 dBm
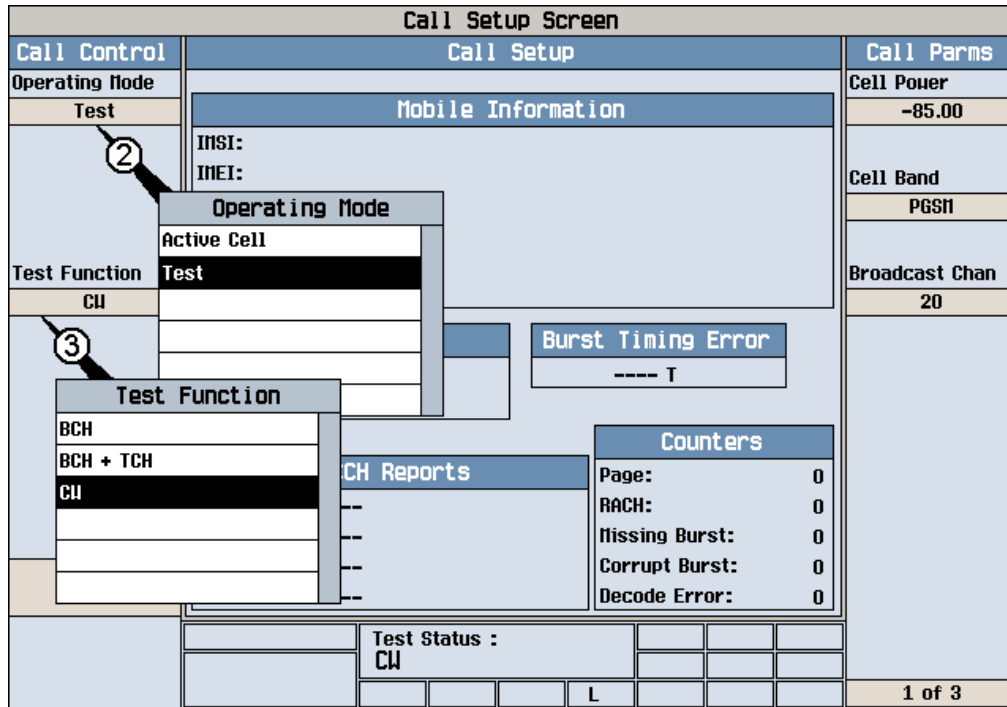
```
                        Call Setup Screen
 Call Control              Call Setup              Call Parms
 Operating Mode                                    Cell Power
     Test              Mobile Information            -85.00

                   IMSI:
                ②  IMEI:                           Cell Band
                                                     PGSM
             Operating Mode
             Active Cell
 Test Function  Test                              Broadcast Chan
     CW                                                20

            ③                    Burst Timing Error
       Test Function               ---- T
       BCH
       BCH + TCH
       CW                    Counters
                   CH Reports  Page:              0
                   --          RACH:              0
                   --          Missing Burst:     0
                   --          Corrupt Burst:     0
                   --          Decode Error:      0

                        Test Status :
                        CW
                                            L        1 of 3
```

On the 8960 perform the following set up functions:

1. Press the blue '**SHIFT'** button and the '**PRESET'** button (front panel buttons not shown above).

2. Press the display '**Operating Mode'** button and set mode to **Test** using the knob.

3. P̶r̶e̶s̶s̶ ̶t̶h̶e̶ ̶d̶i̶s̶p̶l̶a̶y̶ ̶'̶T̶e̶s̶t̶ ̶F̶u̶n̶c̶.̶.̶.̶ ̶s̶e̶t̶ ̶.̶.̶.̶ ̶C̶W̶ ̶.̶.̶.̶ ̶t̶h̶e̶ knob.

```
                        Call Setup Screen
 Control                  Call Setup              Call Parms
 Operating Mode                                   RF Gen Power
     Test              Mobile Information           -85.00

                   IMSI:
                   IMEI:                           RF Gen Band
                   Revision Level:                   PGSM
                   Supported Band:
                   Power Class:   ----
 Test Function     Called Number:                 RF Gen Channel
     CW                                                20

                   Loc     Measurement Selection
                   [=]  Transmit Power            RF Gen Freq
 Close                   Power vs Time              939.00
 Measurement             Phase & Frequency Error       MHz
                         Fast Bit Error
                         Bit Error
                         Analog Audio
                         Decoded Audio
 Close                   Output RF Spectrum
 Menu
                   [=] Background  Test Status :
                                   CW
                                            L        1 of 2
```

Press 'Measurement Selection' button and select 'Transmit Power' as the Operating Mode.

31
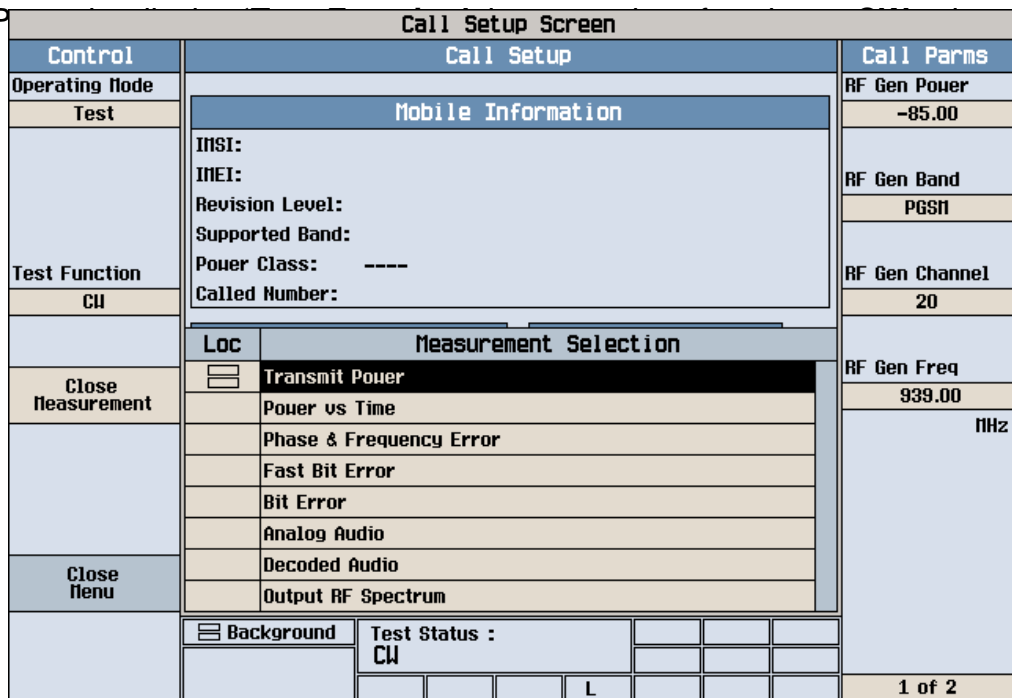
**8960 Operational Verification
Analog Analyzer RF Power Meter, cont.**

```
                    Measurement Screen
Control               Transmit Power           Call Parms
                                               RF Gen Power
Transmit Power                                    -85.00
   Setup     ▽
                      Transmit Power
                      14.63 dBm              RF Gen Band
                                                  PGSM

                                  Continuous  RF Gen Channel
                                                  20
          Transmit Power Setup      Value
         Multi-Measurement Count     Off     RF Gen Freq
         Trigger Arm             Continuous     939.00
         Trigger Source          Immediate         MHz
         Trigger Delay            0.000 s
         Trigger Qualification      On
         Measurement Timeout        Off
  Close
  Menu
                      Test Status :
                      CW
  1 of 2                        L              1 of 2
```

Press 'Transmit Power Setup' button and set Trigger Source to 'Immediate'.

```
                    Measurement Screen
Control               Transmit Power           Call Parms
                                               Receiver Control
Transmit Power                                     Auto
   Setup     ▽
                      Transmit Power
                      13.01 dBm

                                  Continuous

                                               Expected Power
                                                  13.00

                                               Expected Burst
                                                  TSC0
                      Test Status :
                      CW
  1 of 2                        L              2 of 2
```

On screen 2 of 2 set Expected Power to +13.00 dBm. RF Power measurement Specification is < ± 1.63 dB.

8960 Operational Verification
Analog Analyzer RF Power Meter, cont.

FREQUENCY
939.000 000 00 MHz

AMPLITUDE
-15.00 dBm

EXT REF

RF
ON

MOD
ON
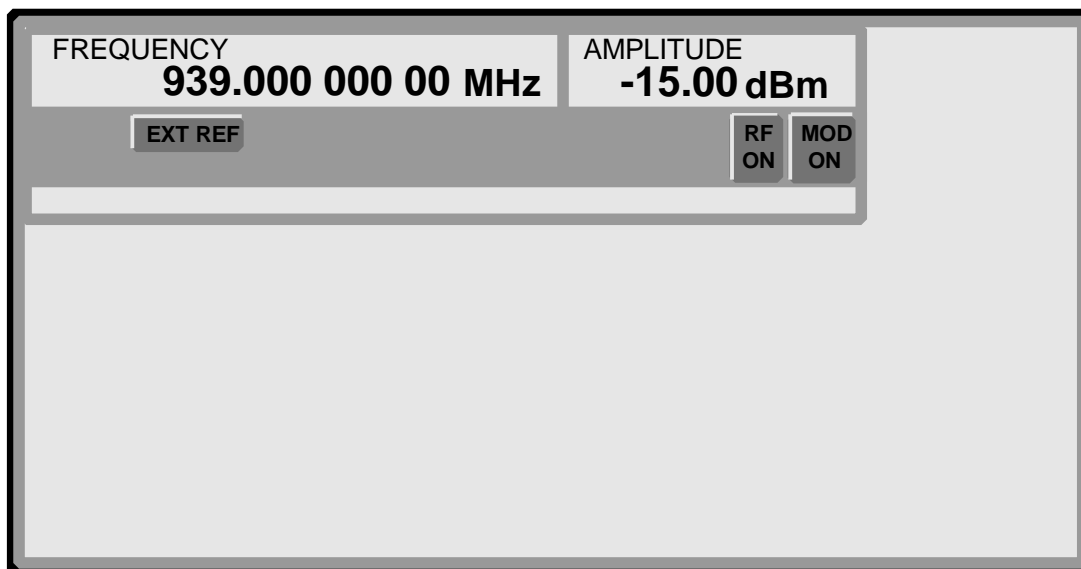
On the E4433B set the Amplitude to -15 dBm.

Measurement Screen		
Control	Transmit Power	Call Parms
Transmit Power Setup ▽		Receiver Control
	Transmit Power	Auto
	-15.68 dBm	
	Continuous	
		Expected Power
		−15.00
		Expected Burst
		TSC5
	Test Status : CW	
1 of 2	L	2 of 2
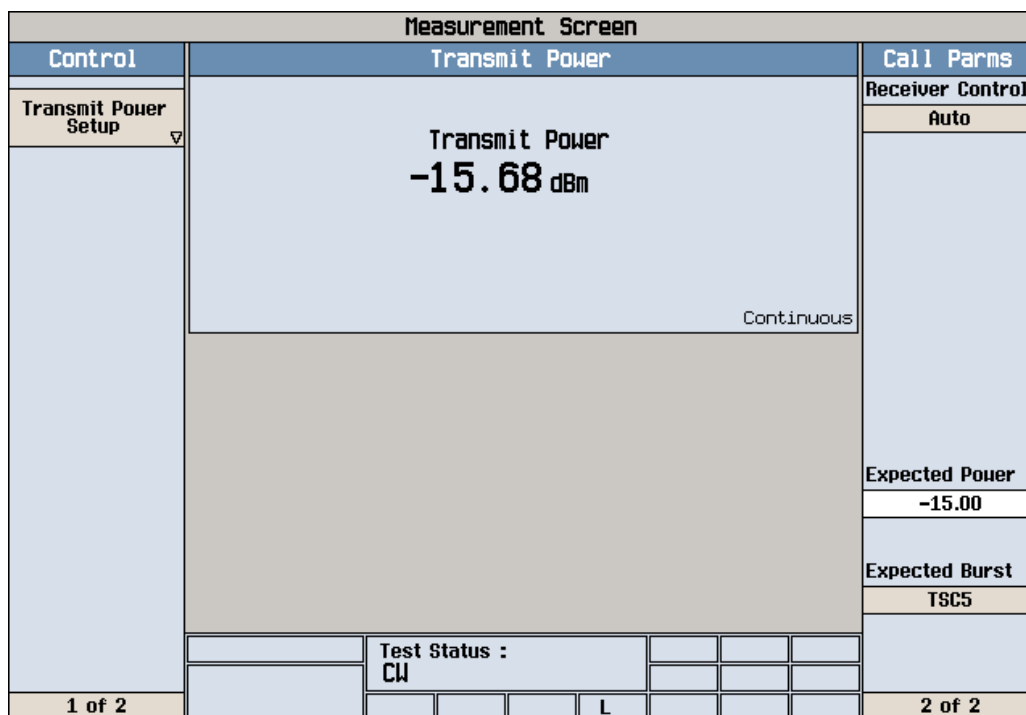
On the 8960 set Expected Power to -15.00 dBm.
RF Power measurement expected limit is < ± 1.60 dB.

**8960 Operational Verification
Analog Analyzer RF Power Meter, cont.**

```
┌─────────────────────────────────────────────────────────────┐
│                                                              │
│  FREQUENCY                    AMPLITUDE                       │
│     1.850 000 000 00  GHz        13.00  dBm                   │
│          EXT REF                            RF    MOD         │
│                                             ON    ON          │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
│                                                              │
└─────────────────────────────────────────────────────────────┘
```
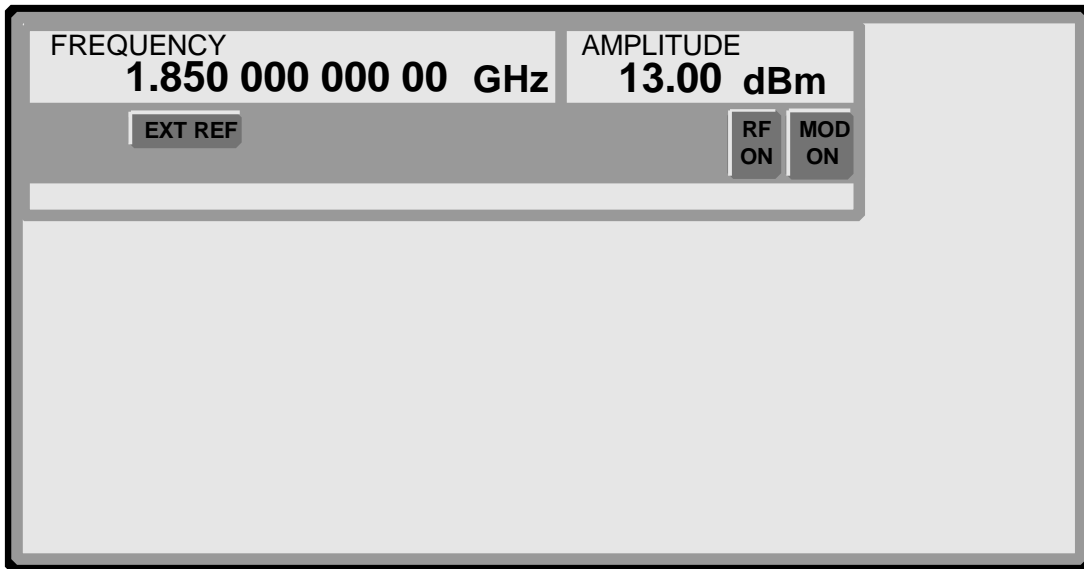
Change the E4433B amplitude to +13 dBm and frequency to 1.85 GHz .

```
┌─────────────────────────────────────────────────────────────┐
│                     Measurement Screen                       │
├──────────────┬────────────────────────────┬─────────────────┤
│   Control    │       Transmit Power       │   Call Parms    │
├──────────────┼────────────────────────────┼─────────────────┤
│Operating Mode│                            │Receiver Control │
│    Test      │       Transmit Power       │      Auto       │
│              │        13.01 dBm           │                 │
│              │                            │                 │
│              │                            │                 │
│Test Function │                            │                 │
│    CW        │               Continuous   │                 │
│              │                            │                 │
│   Close      │                            │                 │
│ Measurement  │                            │                 │
│              │                            │ Expected Power  │
│              │                            │     13.00       │
│              │                            │                 │
│              │                            │ Expected Burst  │
│   Close      │                            │      TSC0       │
│   Menu       │                            │                 │
│              │    Test Status :           │                 │
│              │      CW                     │                 │
│              │                L           │     2 of 2      │
└──────────────┴────────────────────────────┴─────────────────┘
```

On screen 2 of 2 of the 8960 set expected power to +13.00 dBm.

RF Power measurement expected limit is < ± 1.60 dB.

8960 Operational Verification
GSM Analyzer

The GSM Analyzer is tested to insure that the 8960 can accurately measure a GSM burst signal within a reasonable limit.

The test is run by setting the 8960 into GSM Analyzer manual measurement mode. The ESG E4433B is then set to output a GSM burst signal at +15 dBm amplitude. The GSM Analyzer Measurement Accuracy expected limits are:

Frequency Error
 Measurement Accy. -   < ± 24 Hz + Time Base
Residual Phase Error
 Measurement Accy RMS   -   < ± 2 Degree
 Measurement Accy. Peak -   < ± 8 Degrees
Power versus Time
 Rel. Measurement Accy at Time Offset -   ± 2 dB
ORFS
 Rel. Measurement Accy Freq. Offset -   ± 3 dB

FREQUENCY	AMPLITUDE	GSM
939.000 000 00 MHz	**13.00 dBm**	Off **On**

EXT REF   GSM   RF ON   MOD ON

ENVLP   I / Q

Data Format
Pattern **Framed**

GSM On

Data Format: Framed
Mod Type: MSK
GSM: STANDARD
Nxt Frame: Primary

Bits/Symbol: 1
SymRate: 270.8333ksps
Filter: 0.300 Gaussian
Chan: P-GSMBase 1
I/Q Scaling: 100%

Data: PN23
Repeat: Cont
0Pol: Normal
Diff Encode: On

Configure Timeslots ▶

Data (N/A) ▶

Frame Repeat
Single **Cont** ▶

Frame Trigger (N/A) ▶

More (1 of 2)

GSM Timeslot Pattern

0	1	2	3	4	5	6	7
On Normal	Off Custom	Off Custom	Off Custom	Off Custom	Off Custom	Off Custom	Off Custom

Begin by connecting a cable between the RF Out port of the E4433B and the RF In/Out port of the8960. Set the E4433B to output a signal at a frequency of 939 MHz, GSM On, Burst On or Framed Data, and amplitude +13 dBm

On the 8960 perform the following set up functions:

1. Press the blue '**SHIFT**' button and the '**PRESET**' button (front panel buttons not shown above).

2. Press the display '**Operating Mode**' button and set mode to **Test** using the

Select screen 3 of 3. Set 'Receiver Control' field to Manual. Set 'Manual Freq' to 939 MHz. Set 'Expected Power' to +13 dBm. Set 'Expected burst to TSC0.

Measurement Screen		
Control	**Transmit Power**	**Call Parms**

Control

Operating Mode
Test

Test Function
BCH

Close
Measurement

Close
Menu

Transmit Power

Transmit Power
13.01 dBm

Continuous

Loc	Measurement Selection
▬	Transmit Power
	Power vs Time
	Phase & Frequency Error
	Fast Bit Error
	Bit Error
	Analog Audio
	Decoded Audio
	Output RF Spectrum

Test Status :
Sending BCH

L

Call Parms

Receiver Control
Manual

Manual Band
PGSM

Manual Channel
30

Manual Freq
939.00
MHz

Expected Power
13.00

Expected Burst
TSC0

3 of 3

Press 'Measurement Selection' button and select 'Transmit Power' as the Operating Mode. Transmit Power window should display a reading of approximately +13 dBm

Measurement Screen		
Control	**Phase & Frequency Error**	**Call Parms**

Control

Phase & Freq.
Setup ▽

Swap Window
Positions

Phase & Frequency Error

	Peak Phase °	RMS Phase °	Frequency Hz
Minimum	0.12	0.12	1.22
Maximum	0.97	0.19	4.64
Average	0.41	0.14	2.18

50 /100   Continuous

Phase & Freq Setup	Value
Multi-Measurement Count	10
Trigger Arm	Continuous
Trigger Source	Auto
Trigger Delay	0.000 s
Trigger Qualification	On
Burst Synchronization	Midamble
Measurement Timeout	Off

Test Status :
Sending BCH

1 of 2   L

Call Parms

Receiver Control
Manual

Manual Band
PGSM

Manual Channel
30

Manual Freq
939.00
MHz

Expected Power
13.00

Expected Burst
TSC0

3 of 3

Press 'Measurement Selection' button and select 'Phase & Frequency Error' as the Operating Mode. Press 'Phase & Frequency Setup' button. Select Multi-Measurement Count value to be 10. Close Menu to turn off the Setup window.

37

Measurement Screen			
Control	**Phase & Frequency Error**		**Call Parms**

Phase & Freq. Setup ▽

	Peak Phase °	RMS Phase °	Frequency Hz
Minimum	0.12	0.12	1.22
Maximum	0.97	0.19	4.64
Average	0.41	0.14	2.18

Continuous

Receiver Control
Manual

Manual Band
PGSM

Manual Channel
30

Transmit Power

Transmit Power
13.01 dBm

Continuous

Swap Window Positions

Manual Freq
939.00
MHz

Expected Power
13.00

Expected Burst
TSC0

Test Status :
Sending BCH

1 of 2 | | L | 3 of 3

The Phase and Frequency Error window should appear and display average readings of Peak and RMSPphase error and Frequency error.

The expected measurement limits are:

Peak error is <± 8 Deg, RMS error is <±2 Deg, Frequency error is <±24 Hz.

Measurement Screen			
PvT Setup	**Power vs Time: Numeric Screen 1**		**Call Parms**

Measurement Setup ▽

Offset (us)	Level (dBc)		Offset (us)	Level (dBc)
−28.00	−84.99		0.00	−0.03
−18.00	−82.83		321.20	0.03
−10.00	−8.31		331.20	0.00

Measurement Offsets ▽

Continuous

Receiver Control
Manual

Manual Band
PGSM

Manual Channel
30

Power vs Time Measurement Setup	Value
Multi-Measurement Count	10
Trigger Arm	Continuous
Trigger Source	Auto
Trigger Delay	0.000 s
Burst Synchronization	Midamble
Measurement Timeout	Off

Close Menu

Manual Freq
939.00
MHz

Expected Power
13.00

Expected Burst
TSC0

Test Status :
Sending BCH

L | 3 of 3

Press 'Measurement Selection' button and select 'Power vs. Time' as the Operating Mode. Press the 'Power vs. Time Setup' button and then the 'Measurement Setup' button, set the Multi-Measurement Count value to be 10. Close menu to turn off measurement setup window.

38

Measurement Screen		
PvT Setup	**Power vs Time: Numeric Screen 1**	**Call Parms**

PvT Setup

Measurement Setup ▽

Measurement Offsets ▽

Offset (us)	Level (dBc)
−28.00	−84.99
−18.00	−82.83
−10.00	−8.31

Offset (us)	Level (dBc)
0.00	−0.03
321.20	0.03
331.20	0.00

10/10   Continuous

Phase & Frequency Error

Peak Phase
0.42°

RMS Phase
0.15°

Frequency
0.45 Hz   Continuous

Return to PvT Control

☰ Background   Test Status :
Sending BCH

Call Parms
Receiver Control
Manual

Manual Band
PGSM

Manual Channel
30

Manual Freq
939.00
MHz

Expected Power
13.00

Expected Burst
TSC0

3 of 3

Press 'Return to PvT Control' button then press the 'Change View' button.

Measurement Screen		
Change View	**Power vs Time: Numeric Screen 1**	**Call Parms**

Change View

Summary

Numeric 1 of 2

Numeric 2 of 2

Offset (us)	Level (dBc)
−28.00	−84.99
−18.00	−82.83
−10.00	−8.31

Offset (us)	Level (dBc)
0.00	−0.03
321.20	0.03
331.20	0.00

10/10   Continuous

Phase & Frequency Error

Peak Phase
0.42°

RMS Phase
0.15°

Frequency
0.45 Hz   Continuous

Return to PvT Control

☰ Background   Test Status :
Sending BCH

Call Parms
Receiver Control
Manual

Manual Band
PGSM

Manual Channel
30

Manual Freq
939.00
MHz

Expected Power
13.00

Expected Burst
TSC0

3 of 3

Press the 'Numeric 1 of 2' button. The Power vs Time Numeric Screen 1 should appear. The expected limits are:

0 usec - 0dBc ±2dBc   -10 usec - ≤ 8dBc

Measurement Screen

| Change View | Power vs Time: Numeric Screen 2 | Call Parms |

Call Parms
Receiver Control — Manual
Manual Band — PGSM
Manual Channel — 30
Manual Freq — 939.00 MHz
Expected Power — 13.00
Expected Burst — TSC0

Power vs Time: Numeric Screen 2

Offset (us)	Level (dBc)	Offset (us)	Level (dBc)
339.20	0.09	552.80	-14.31
349.20	0.06	560.80	-84.99
542.80	0.07	570.80	-82.83

10/10   Continuous

Change View buttons: Summary, Numeric 1 of 2, Numeric 2 of 2, Return to PvT Control

Phase & Frequency Error

Peak Phase **0.42°**   RMS Phase **0.15°**

Frequency **0.45** Hz

Continuous

Background   Test Status : Sending BCH   L   3 of 3

Press the 'Numeric 2 of 2' button. The Power vs Time Numeric Screen 2 should appear. The expected limits are: 542.8usec - 0dBc ±2dBc   552.8usec - ≤ 8 dBc

Note on measured values: Power versus Time measurements are depend on the accuracy of the source being measured. In the example above the E4433B had performance of -14 dBc at a 552.8 usec offset on the burst. Variation in burst timing can vary the offset in dBc greatly. This measurement is meant to show consistency between 8960 units using the same identical source for each unit tested.

Measurement Screen

ORFS: Modulation Screen 1

Offset (kHz)	Level (dB)	Offset (kHz)	Level (dB)
400.00	-71.13	----	----
600.00	-80.61	----	----
----	----	----	----
----	----	----	----

TX Power: 14.88 dBm   30 kHz BW Power: 4.31 dBm

Continuous

Call Parms
Cell Power — -85.00
Cell Band — PGSM
Broadcast Chan — 20
Mobile Loopback

ORFS Setup buttons: Measurement Setup, Modulation Frequencies, Switching Frequencies, Close Menu

Measurement Setup	Value
Multi-Measurement Count	20
Multi-Measurement Count (Switching)	10
Trigger Arm	Continuous
Trigger Source	Auto
Trigger Delay	0.000 s
Measurement Timeout	Off

Background   Active Cell Status : Connected   L   1 of 3

Press 'Measurement Selection' button and select 'Output RF Spectrum' as the Operating Mode. Press the 'ORFS Setup' and then the 'Measurement Setup' button. Set Multi-Measurement Count value to 20. Close menu to turn off window.

8960 Operational Verification
GSM Analyzer, cont.

Measurement Screen

ORFS Setup	ORFS: Modulation Screen 1	Call Parms

ORFS: Modulation Screen 1

Offset (kHz)	Level (dB)	Offset (kHz)	Level (dB)
400.00	-70.10	-200.00	-34.69
600.00	-79.91	200.00	-35.92
-100.00	-9.63	-250.00	-41.78
100.00	-4.21	250.00	-38.79

TX Power: 14.88 dBm   30 kHz BW Power: 7.47 dBm

Continuous

ORFS Setup buttons: Measurement Setup, Modulation Frequencies, Switching Frequencies, Close Menu

Modulation Frequencies	Value
Modulation Offset 1	400.0 kHz
Modulation Offset 2	600.0 kHz
Modulation Offset 3	-100.0 kHz
Modulation Offset 4	100.0 kHz
Modulation Offset 5	-200.0 kHz
Modulation Offset 6	200.0 kHz
Modulation Offset 7	-250.0 kHz
Modulation Offset 8	250.0 kHz

Background   Test Status : Sending BCH

L

Call Parms

Receiver Control Manual

Manual Band PGSM

Manual Channel 30

Manual Freq 939.00 MHz

Expected Power 13.00

Expected Burst TSC0

3 of 3

The ORFS measurement screen must be configured for offset frequency values to make a measurement. Press the 'Modulation Frequencies' button. Load the default frequencies into each offset by rotating the knob to each offset and pressing the 'ON' button. Load frequencies 100 kHz to 1200 kHz. Close the menu.

Measurement Screen

Change View	ORFS: Modulation Screen 2	Call Parms

ORFS: Modulation Screen 2

Offset (kHz)	Level (dB)	Offset (kHz)	Level (dB)
-400.00	-73.74	-1000.00	-85.34
-600.00	-81.78	1000.00	-84.68
-800.00	-85.25	-1200.00	-87.24
800.00	-85.46	1200.00	-85.19

TX Power: 14.87 dBm   30 kHz BW Power: 9.16 dBm

Continuous

Power vs Time: Numeric Screen 1

Offset (us)	Level (dBc)	Offset (us)	Level (dBc)
-28.00	-84.63	0.00	-0.03
-18.00	-86.43	321.20	0.03
-10.00	-1.64	331.20	0.01

Continuous

Change View buttons: Modulation Numeric 1 of 3, Modulation Numeric 2 of 3, Modulation Numeric 3 of 3, Switching Numeric, Return to ORFS Control

Background   Test Status : Sending BCH

L

Call Parms

Receiver Control Manual

Manual Band PGSM

Manual Channel 30

Manual Freq 939.00 MHz

Expected Power 13.00

Expected Burst TSC0

3 of 3

Press 'Return to ORFS Control' button. Press 'Change View' button and select which modulation numeric screens to view by pressing either the 'Modulation Numeric 1 of 3' or the 'Modulation Numeric 2 of 3' buttons..

**8960 Operational Verification
GSM Analyzer, cont.**

Measurement Screen					
Change View	**ORFS: Modulation Screen 2**				**Call Parms**
	Offset (kHz)	Level (dB)	Offset (kHz)	Level (dB)	Receiver Control
Modulation Numeric 1 of 3	−400.00	−73.74	−1000.00	−85.34	Manual
	−600.00	−81.78	1000.00	−84.68	
	−800.00	−85.25	−1200.00	−87.24	Manual Band
Modulation Numeric 2 of 3	800.00	−85.46	1200.00	−85.19	PGSM
	TX Power: 14.87 dBm		30 kHz BW Power: 9.16 dBm		Manual Channel
Modulation Numeric 3 of 3				Continuous	30
	Power vs Time: Numeric Screen 1				Manual Freq
Switching Numeric					939.00
	Offset (us)	Level (dBc)	Offset (us)	Level (dBc)	MHz
	−28.00	−84.63	0.00	−0.03	Expected Power
	−18.00	−86.43	321.20	0.03	13.00
	−10.00	−1.64	331.20	0.01	
Return to ORFS Control					Expected Burst
				Continuous	TSC0
	Background	Test Status : Sending BCH			
			L		3 of 3

The expected ORFS measurement limits are: (example)

ORFS Offsets	± 100 kHz	-	≤ -6 dB
ORFS Offsets	± 200 kHz	-	≤ -33 dB
ORFS Offsets	± 250 kHz	-	≤ -38 dB
ORFS Offsets	± 400 kHz	-	≤ -67 dB
ORFS Offsets	± 600 kHz	-	≤ -76 dB
ORFS Offsets	± 800 kHz	-	≤ -78 dB
ORFS Offsets	± 1000 kHz	-	≤ -78 dB
ORFS Offsets	± 1200 kHz	-	≤ -79 dB
ORFS Offsets	> 1200 kHz	-	≤ -80 dB

Note: A measured value (example: -79 dB at 600 kHz) is dependent on the performance of the source being measured. In this example a typical E4433B may have ORFS performance of -79 dB at 600 kHz from the carrier. The values may change however according to the source. The measured accuracy of a source should be consistent for every 8960 unit. The measurement done for this test is meant to show test consistency between 8960 units using the same identical source for each unit tested.