Nemko Test Report No.:	3L0477RUS1
Applicant:	Enfora, Inc. 661 E. 18th Street Plano, TX 75074
Equipment Under Test:	EnablerII-G Model GSM0108
In Accordance With:	FCC Part 22, Subpart H 800 MHz Cellular Subscriber Units
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	Tom Tidwell, Frontline Manager
Date:	12/09/03

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Section 1. Summary of Test Results

Manufacturer: Enfora, Inc.

Model No.: GSM0108

Serial No.: SN1

General: All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 22, Subpart H.

☒ New Submission ☐ Production Unit

☐ Class II Permissive Change ☒ Pre-Production Unit

This test report relates only to the item(s) tested.

The following deviations from, additions to, or exclusions from the test specifications have been made. none

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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	2.1046	Complies
Audio Frequency Response	2.1047	NA
Audio Low Pass Filter Response	2.1047	NA
Modulation Limiting	2.1047	NA
Occupied Bandwidth	2.1049	Complies
Spurious Emissions at Antenna Terminals	2.1051	Complies
Field Strength of Spurious Emissions	2.1053	Complies
Frequency Stability	2.1055	Complies

Footnotes:

The device is digital only.

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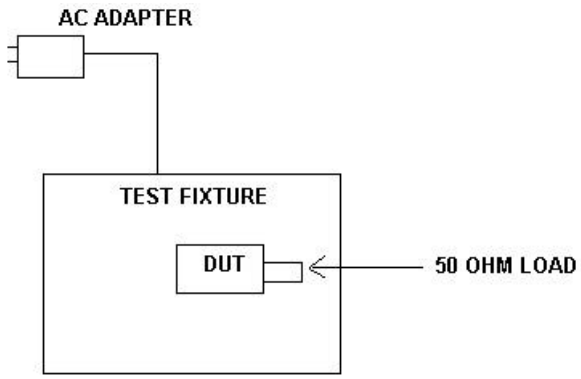
Section 2. General Equipment Specification

Frequency Range:	824.2 to 848.8 MHz
Tunable Bands:	824.2 to 848.8 MHz
Necessary Bandwidth:	300 kHz
Emission Designator:	270K0G7W
Output Impedance:	50 ohms
RF Power Output (rated):	33 dBm (2 Watts)
Number of Channels:	124
Channel Spacing:	300 kHz
Operator Selection of Frequency:	Software Controlled
Power Output Adjustment Capability:	Software Controlled

Operational Description

This device is a wireless GSM/GPRS wireless modem that operates in the 800 MHz cellular band.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 12/1/03

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Output Power (dBm)	Rated Power (dBm)
824.2	32.2	33
836.52	32.2	33
848.8	32.4	33

Equipment Used: 1036-1064-1065-1629

Measurement Uncertainty: +/- 1.7 dB dB

Temperature: 22 °C

Relative Humidity: 40 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth GSM	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 12/01/03

Test Results: Complies.

Measurement Data: See attached graph.

Equipment Used: 1036-1064-1065-1629

Measurement Uncertainty: $1x10^{-7}$ ppm

Temperature: 22 °C

Relative Humidity: 40 %

Test Plot – Occupied Bandwidth

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot — **Occupied Bandwidth**

Page 1 of 1

Complete X
Preliminary:

Job No.:	3L0477	Date:	12/1/2003
Specification:	PART22	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	GSM0108		
Configuration:	TX IN TEST FIXTURE		
Sample Number:	1		
Location:	Lab 1	RBW:	20 kHz
Detector Type:	Peak	VBW:	20 kHz

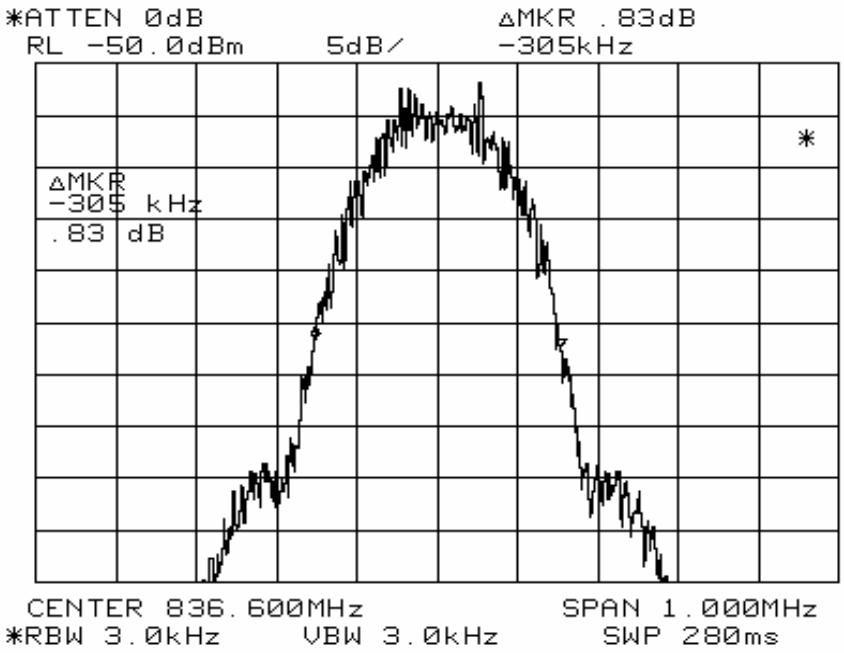
Measurement Distance: NA m

Test Equipment Used

Antenna:	993	Directional Coupler:	
Pre-Amp:		Cable #1:	1484
Filter:		Cable #2:	1485
Receiver:	1464	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

Additional equipment used:

Measurement Uncertainty: $1X10^{-7}$ ppm



Notes:

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions At Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 12/1/03

Test Results: Complies.

Measurement Data: See attached graph.

Equipment Used: 1036-1064-1065-1629

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 40 %

Test Plots – Spurious Emissions at Antenna Terminals

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Tel: (972) 436-9600
Fax: (972) 436-2667

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Data Plot — **Spurious Emissions at Antenna Terminals**

Page 1 of 3

Complete X

Job No.: 3L0477 Date: 12/1/2003 Preliminary:

Specification: PART22 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 40

E.U.T.: GSM0108

Configuration: TX IN TEST FIXTURE

Sample Number: 1

Location: Lab 1 RBW: Refer to plots Measurement

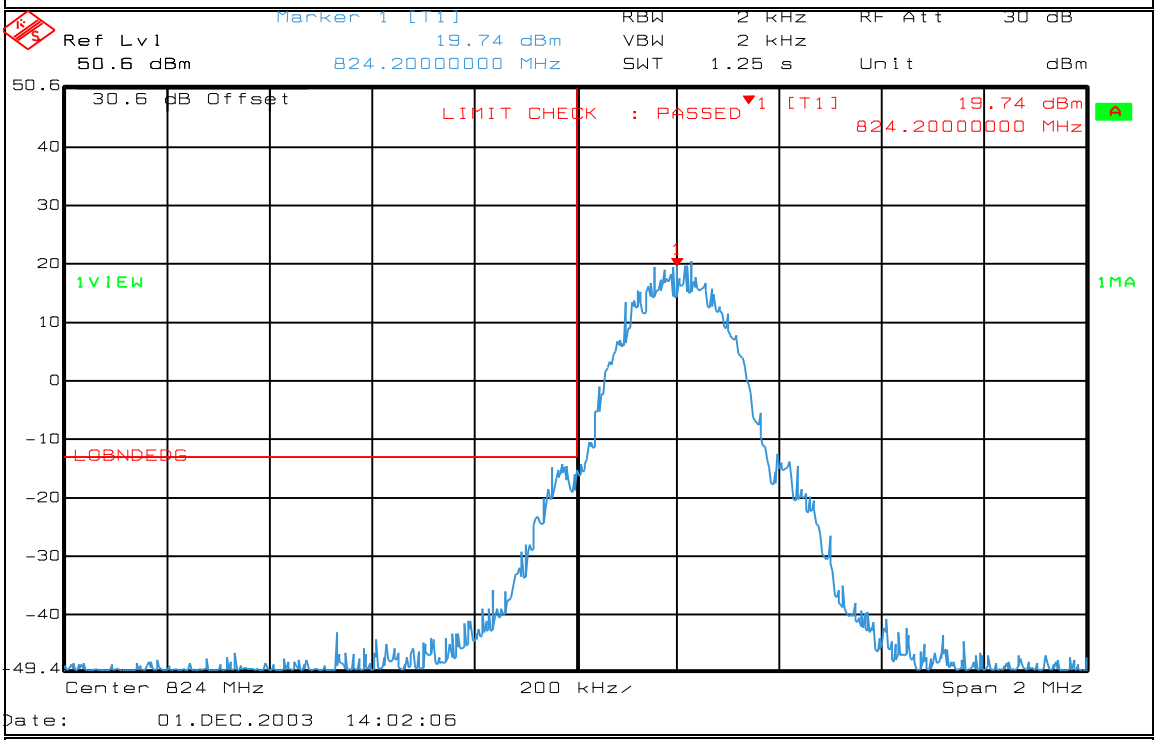
Detector Type: Peak VBW: Refer to plots Distance: NA m

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1629
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1064	Cable #4:	
Attenuator #2:	1065	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **LOWER BAND EDGE**

Test Plots – Spurious Emissions at Antenna Terminals

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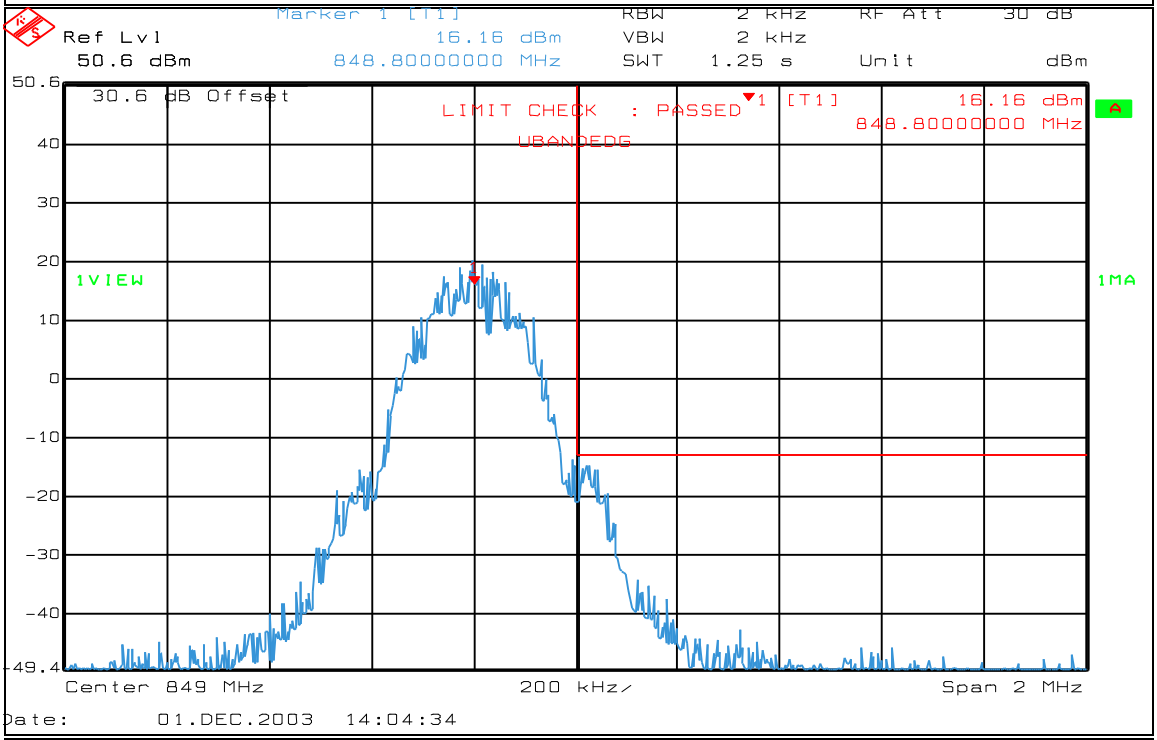
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	3L0477	Date:	12/1/2003
Specification:	PART22	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	GSM0108		
Configuration:	TX IN TEST FIXTURE		



Notes: **UPPER BAND EDGE**

Test Plots – Spurious Emissions at Antenna Terminals

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802 N. Kealy
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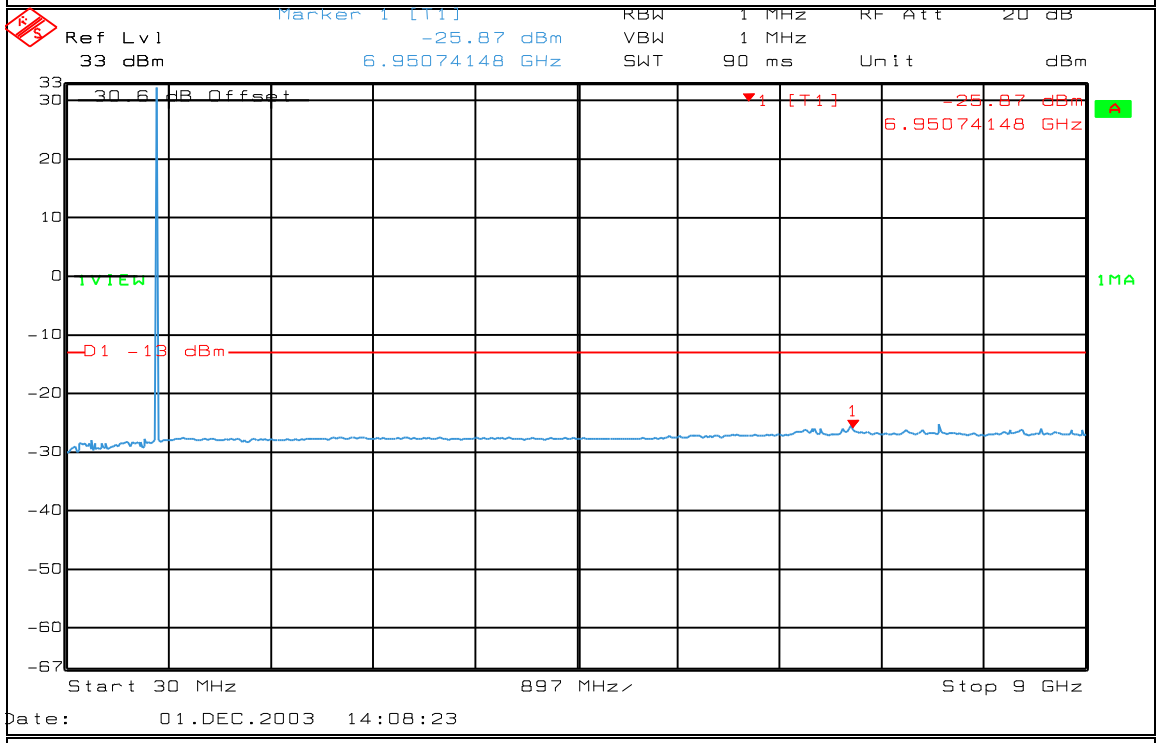
Data Plot — **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.: 3L0477 Date: 12/1/2003
Specification: PART22 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: GSM0108
Configuration: TX IN TEST FIXTURE



Notes: MARKER INDICATES HIGHEST EMISSION LEVEL (NOISE FLOOR)

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: Dustin Oaks	DATE: 12/1/03

Test Results: Complies.

Measurement Data: See attached table.

Equipment Used: 1464-993-1016-1484-1485

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 60 %

Test Data - Radiated Emissions

Dallas Headquarters:
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Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

ERP Substitution Method

Page 1 of 1 — Complete: x — Preliminary:

Job No.: 3L0477 — Date: 12/1/03

Specification: PART 22 — Temperature(°C): 20

Tested By: Dustin Oaks — Relative Humidity(%): 60

E.U.T.: GSM0108

Configuration: TX IN TEST FIXTURE INTO LOAD

Sample No:

Location: Lab 3 — RBW: 1 MHz — Measurement Distance: 3 m

Detector Type: Peak — VBW: 1 MHz

Test Equipment Used

Antenna:	993	Directional Coupler:	
Pre-Amp:	1016	Cable #1:	1484
Filter:		Cable #2:	1485
Receiver:	1464	Cable #3:	
Attenuator #1		Cable #4:	
Attenuator #2:		Mixer:	

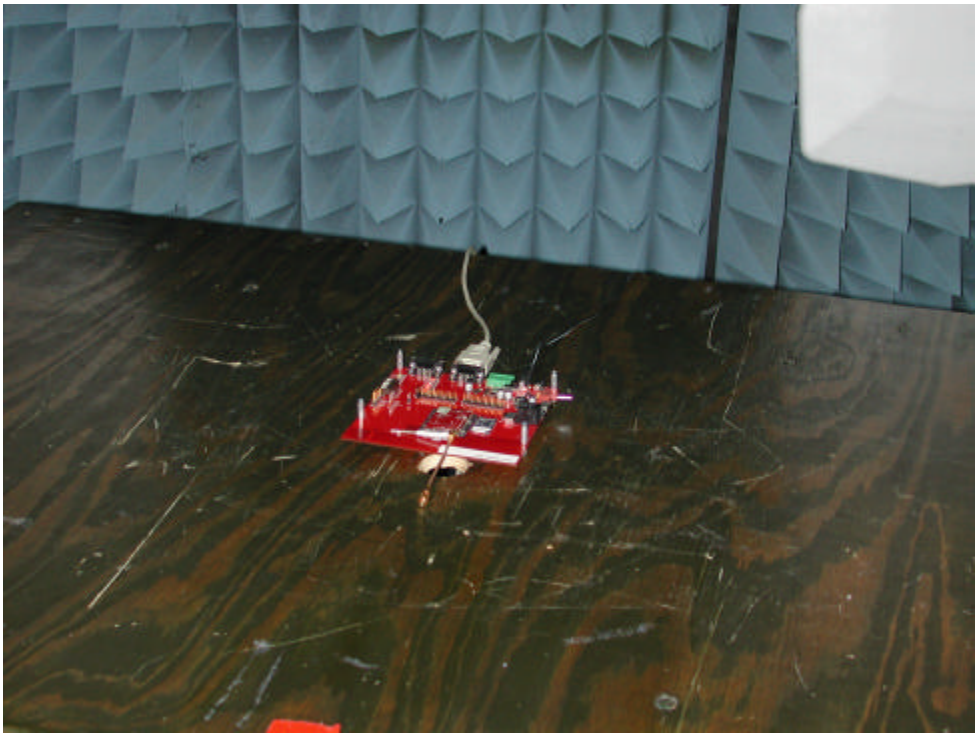
Additional equipment used:

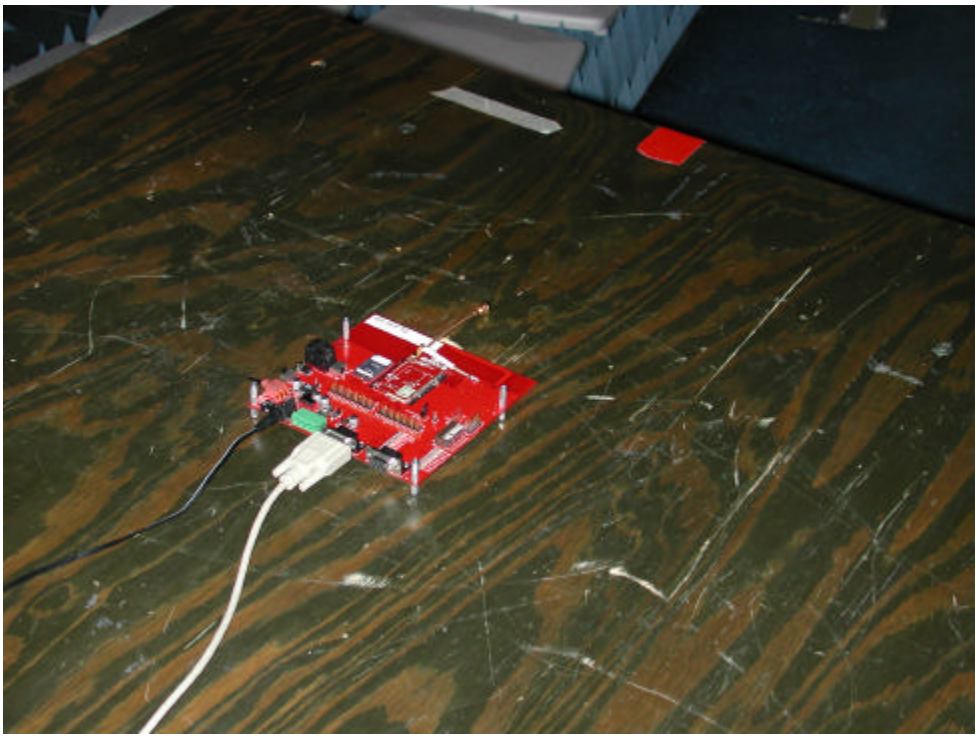
Measurement Uncertainty: +/-1.7 dB

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarity	Comments
1673.35	-49.0	-48.5		32.5	7.3	-48.5	-13.0	-35.5000	h	
2509.70	-55.2	-52.6		32.9	8.0	-52.6	-13.0	-39.5700	h	
3346.38	-53.3	-49.6		32.6	8.0	-49.6	-13.0	-36.5967	h	
5019.60	-51.5	-45.9		32.7	8.2	-45.9	-13.0	-32.8667	h	
5856.26	-56.2	-50.3		31.9	9.3	-50.3	-13.0	-37.2667	h	
8366.10	-57.7	-48.1		32.9	9.1	-48.1	-13.0	-35.1000	h	
1673.30	-46.8	-48.3		32.5	7.3	-48.3	-13.0	-35.3300	v	
2509.90	-52.6	-50.0		32.9	8.0	-50.0	-13.0	-37.0000	v	
3346.50	-50.6	-43.4		32.6	8.0	-43.4	-13.0	-30.3667	v	
4183.03	-56.0	-43.7		33	8.2	-43.7	-13.0	-30.6667	v	
5019.63	-49.8	-41.2		32.7	8.2	-41.2	-13.0	-28.1967	v	
5856.23	-57.3	-49.4		31.9	9.3	-49.4	-13.0	-36.3967	v	
6692.48	-58.8	-49.1		31.57	9.4	-49.1	-13.0	-36.0667	v	
7529.43	-58.0	-49.1		32.89	9.2	-49.1	-13.0	-36.0567	v	
8366.03	-56.3	-46.4		32.9	9.1	-46.4	-13.0	-33.3967	v	
9202.63	-56.0	-48.7		34	9.6	-48.7	-13.0	-35.6667	v	

Notes:

Photographs of Test Setup





Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE: 12/2/03

Test Results: Complies.

Measurement Data: See attached table.

Standard Test Frequency: 836.657680 MHz
Standard Test Voltage: 5 Vdc

Equipment Used: 283-1064-1065-1629-1036

Measurement Uncertainty: $1x10^{-7}$ ppm

Temperature: 22 °C

Relative Humidity: 40 %

Test Data – Frequency Stability

Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Frequency Stability

Client: ENFORA W.O.# 3L0477R

EUT: GSM0108 S/N: SN1

Date: 12/2/03 Tech: LIGHT

Standard test Frequency: 836.657680 MHz Standard Test Voltage: 3.8 Vdc

Test Equipment used:

Temperature	Voltage	Frequency Error (kHz)	Comments
20 °C	3.8	0.000	
20 °C	4.37	0.000	
20 °C	3.25	0.000	
10 °C	3.8	4.058	
0 °C	3.8	5.410	
-10 °C	3.8	5.861	
-20 °C	3.8	5.185	
-30 °C	3.8	3.381	
30 °C	3.8	0.901	
40 °C	3.8	-0.226	
50 °C	3.8	-0.226	

Section 8. Test Equipment List

Nemk	Descrip	Manufac Model	Serial	Calibra Da	Calibra D
10	SPECTRUM	ROHDE & ESE	83084	12/1	12/1
10	ATTENU	NAR 776B	NO	C	N/
10	ATTENU	NAR 776B	NO	C	N/
16	CABI	MEGAP 10311	N/	C	N/
14	Spectrum	Hewlett 856	3551A0	02/1	02/1
14	Cable 2.0-	Sto PR90-	N/	07/2	07/2
14	Cable 2.0-	Sto PR90-	N/	07/2	07/2
10	Pre-	HEWLETT 844	2749A0	8/28	8/28
9	Horn	A H SAS-	X	01/0	01/0
2	Environmental Chamber with	ENVIROTR SH27 &	12901	04/2	04/2

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output	PARA. NO.: 1.1046

Minimum Standard:

§22.913 Effective radiated power limits. - The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

Method Of Measurement:

Detachable Antenna:
The power at antenna terminals is measured using power meter.

Integral Antenna:

Test Method: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

NAME OF TEST: Audio Frequency Response	PARA. NO.: 2.1047

Minimum Standard: No specific limit expressed in the FCC Rules.

From 300 to 3000 Hz the audio frequency response should not vary more than +1 to –3 dB from a true 6dB octave pre-emphasis characteristic as referred to 1000 Hz level (with the exception of a permissible 6dB per octave roll-off from 2500 to 3000 Hz).

Method Of Measurement:

Operate the transmitter with the compressor disabled, and monitor the output with a frequency deviation meter or standard test receiver without standard 750-microsecond de-emphasis, with expander disabled, and without C-message weighted filter (see 6.6.2). Apply a sine wave audio input to the transmitter external audio input port, vary the modulating frequency from 300 to 3000 Hz and observe the input levels necessary to maintain a constant ±2.9 kHz system deviation.

NAME OF TEST: Audio Low Pass Filter Response	PARA. NO.: 2.1047

Minimum Standard: No specific limit expressed in the FCC Rules.

For mobile stations, signals should be attenuated as a function of frequency as follows:

i. In the frequency ranges 3.0 to 5.9 Hz and 6.1 to 15 kHz, 40 log (f/3) dB.
ii. In the frequency range 5.9 to 6.1 kHz, 35 dB
iii. In the frequency range above 15 kHz, 28 dB.

Method Of Measurement:

Adjust the audio input frequency to 1000 Hz and adjust the input level to 20 dB greater than that required to produce ±8 kHz deviation. Note the output level on the frequency deviation meter or standard test receiver. Using the output level as reference (0dB), vary the modulating frequency from 3000 Hz to 30,000 Hz and observe the change in output while maintaining a constant audio input level.

NAME OF TEST: Modulation Limiting	PARA. NO.: 2.1047

Minimum Standard: No specific requirement expressed in the FCC Rules.

The levels of the modulating signals should be set to the values specified below and should be maintained within ±10% of these values.

Voice: ±12 kHz
SAT: ±2 kHz
Wideband Data: ±8 kHz
ST: ± 8 kHz

Method Of Measurement:

Voice: A 1 kHz audio tone is injected at levels between -45 and +20 dBVrms. The peak deviation is noted. This is repeated with a 300 Hz tone and a 3 kHz tone. A plot showing the family of curves is presented.

SAT: A SAT tone is generated by the mobile station and the peak deviation is measured.

Wideband Data: Wideband data is generated by the mobile station and the peak deviation is measured.

ST: ST data is generated by the mobile station and the peak deviation is measured.

NAME OF TEST: Occupied Bandwidth (Voice & SAT)	PARA. NO.: 2.1049

Minimum Standard:

22.917 Emission limitations for cellular equipment. - The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

NAME OF TEST: Occupied Bandwidth (WBD & SAT)	PARA. NO.: 2.1049

Minimum Standard:

22.917 Emission limitations for cellular equipment. - The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

NAME OF TEST: Spurious Emission at Antenna Terminals	PARA. NO.: 2.1051

Minimum Standard:

22.917 Emission limitations for cellular equipment. - The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053

Minimum Standard:

22.917 Emission limitations for cellular equipment. - The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

Test Method: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

The spectrum is searched to 10 GHz.

NAME OF TEST: Frequency Stability PARA. NO.: 2.1055

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Freq. Range (MHz)	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	2.5	2.5

Table C-1

Method Of Measurement:

Frequency Stability With Voltage Variation:
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

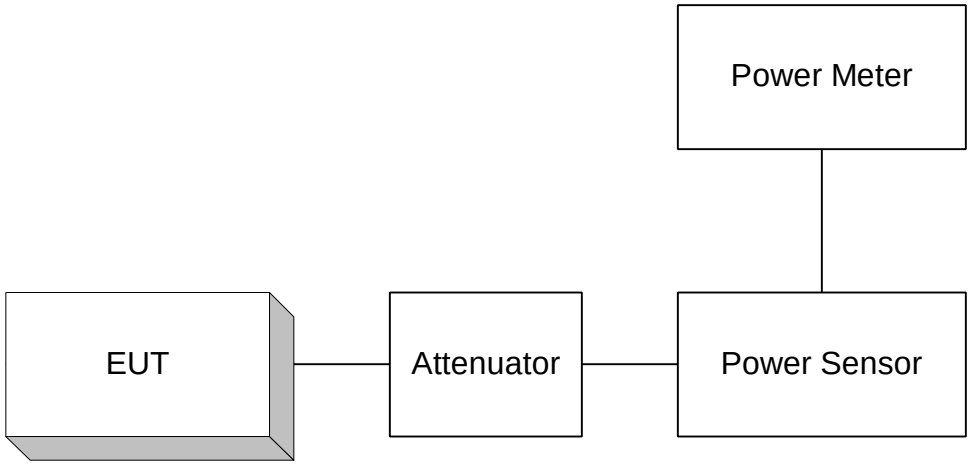
Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

Devices that operate within a network and use dynamic power and frequency adjustment, the device is placed in call mode using a test set during this testing.

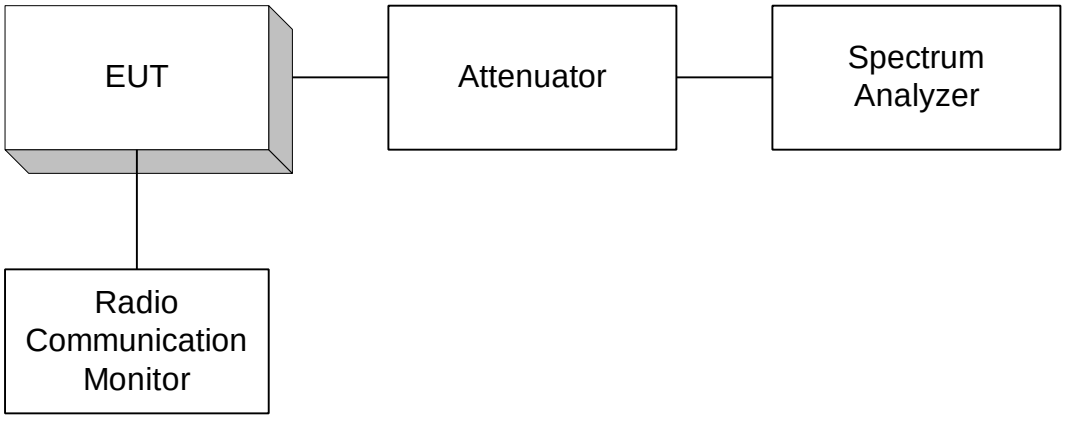
For devices that use complex digital modulation and cannot produce an unmodulated rf signal, the device is placed into call mode with a test set and the frequency error and rho parameters are recorded at each temperature and voltage variation.

ANNEX B - TEST DIAGRAMS

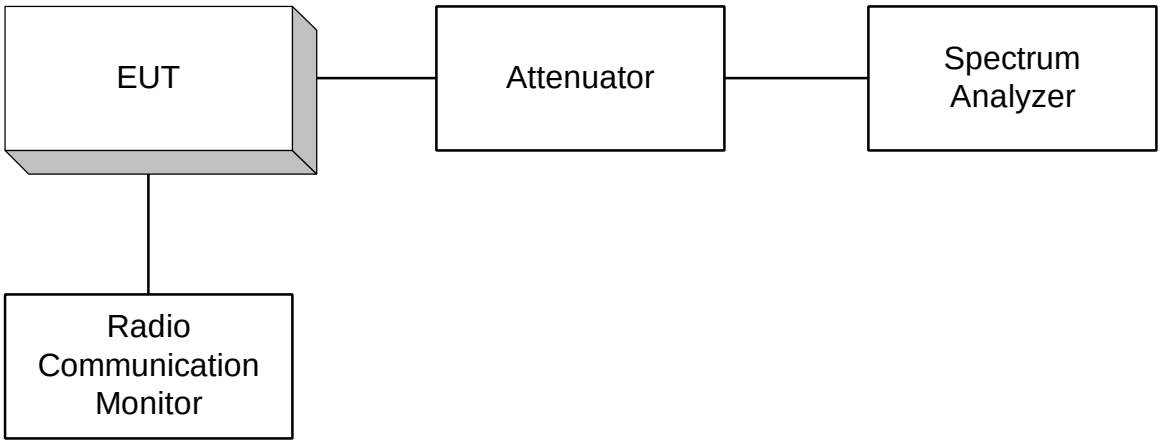
Para. No. 2.1046 - R.F. Power Output



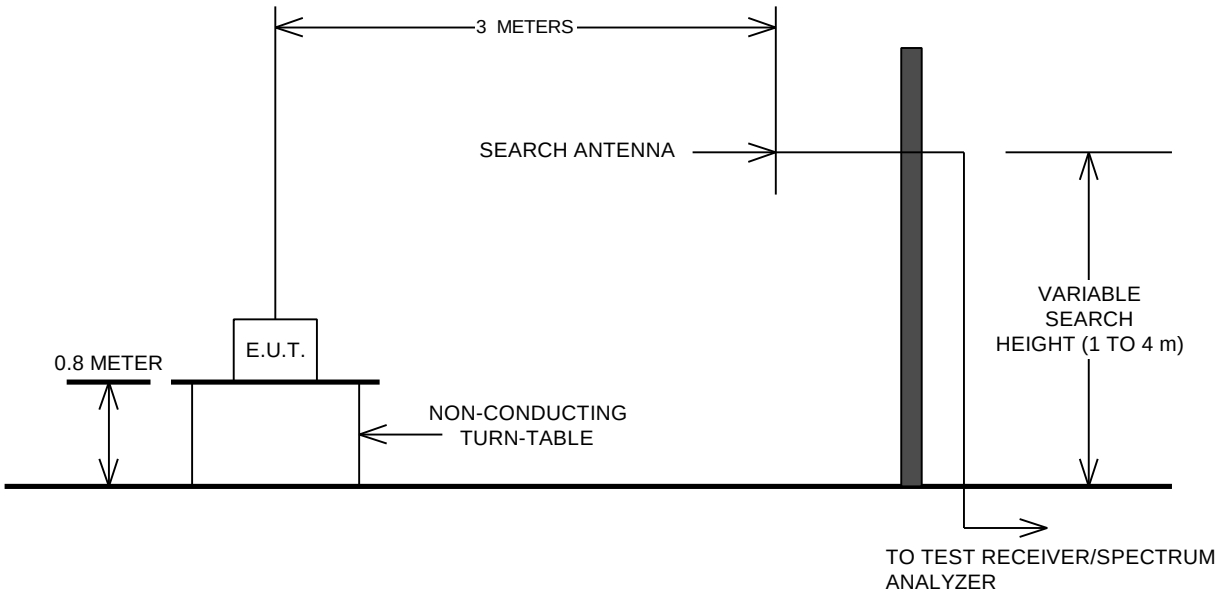
Para. No. 2.1049 - Occupied Bandwidth



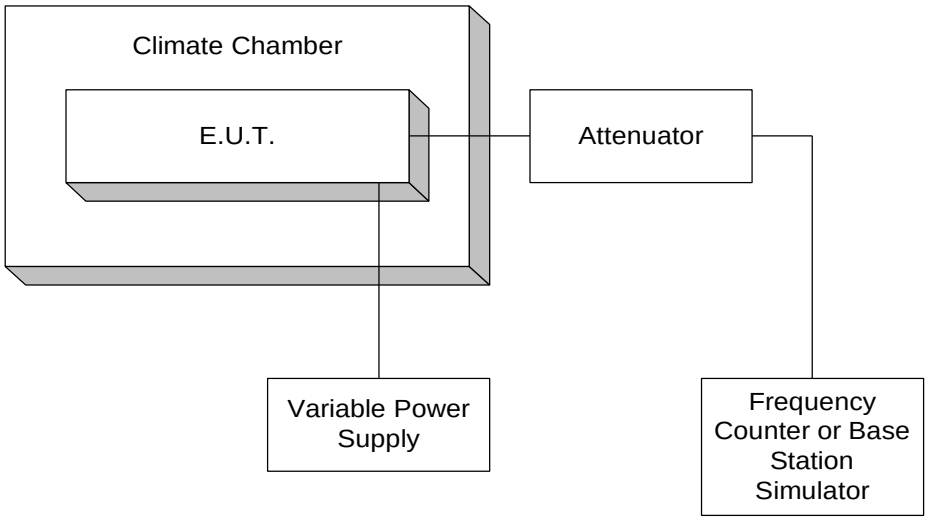
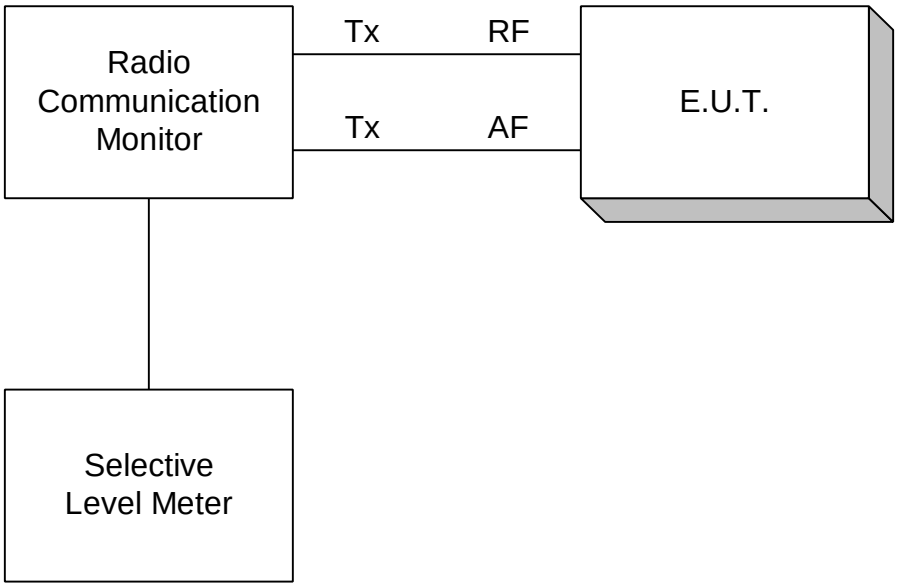
Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability



Para. No. 2.1045 – Audio Frequency Response, Audio Low Pass Filter Response And Modulation Limiting