

Nemko Test Report: 3L0477RUS2Rev2

Applicant: Enfora Inc.
661 E/ 18th Street
Plano, Texas 75074

**Equipment Under Test:
(E.U.T.)** Aspen – GSM/GPRS Wireless Modem
GSM0108

In Accordance With: **FCC Parts 24, Subpart E**
Broadband PCS Subscriber Station

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, TX
75057-3136

Authorized By:



Tom Tidwell, Frontline Manager

Date: 29Sept03

Total Number of Pages: 38

EQUIPMENT: GSM0108

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EQUIPMENT: GSM0108

Section 1. Summary of Test Results

Manufacturer: Enfora Inc.

Model No.: GSM0108

Serial No.: 28

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 24, Subpart E.



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.

See " Summary of Test Data".

TESTED BY: Eldon BerryDATE: 26 Aug., 2003

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This report applies only to the items tested.

EQUIPMENT: GSM0108**Summary Of Test Data**

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	2W eirp	Complies
Occupied Bandwidth (TDMA)	24.238	Not Specified	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.235	+/- 0.05 ppm	Complies

Footnotes:

EQUIPMENT: GSM0108

Section 2. General Equipment Specification

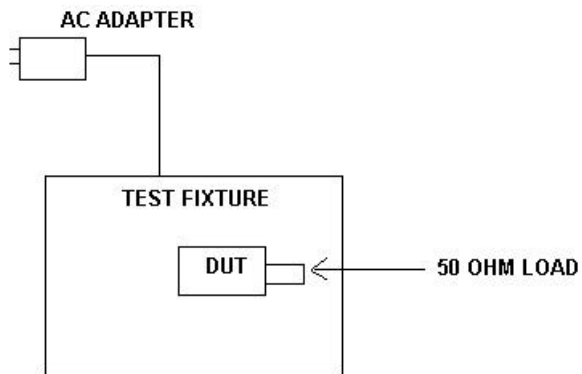
Supply Voltage Input:	3.3 - 5 Vdc
Frequency Bands:	☒ Block A 1850 – 1865 MHz ☒ Block D 1865 – 1870 MHz ☒ Block B 1870 – 1885 MHz ☒ Block E 1885 – 1890 MHz ☒ Block F : 1890 – 1895 MHz ☒ Block C 1895 – 1910 MHz GPRS 270KG7W ☒
Output Impedance:	50 ohms
RF Output (Rated):	1 Watt

EQUIPMENT: GSM0108

System Description

This device is a wireless GSM/GPRS wireless modem that operates in the PCS band and in the 800 MHz "AMPS" band.

System Diagram



EQUIPMENT: GSM0108

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 24.232(b)
TESTED BY: Eldon Berry	DATE: 22Aug03

Test Results: Complies.**Measurement Data:****RF Power Output (Conducted)**

Job No.: 3L0477R	Date: 8/22/03
Specification: CFR 47, Part 24	Temperature(°C): 21
Tested By: Eldon Berry	Humidity(%) 50
E.U.T.: GSM0108	
Configuration: EUT on test fixture.	
Detector: Average	

Test Equipment Used:

Power Meter: E4418B	Directional Coupler:
Power Sensor: E9304A	Cable #1: 1083
Load:	Cable #2:
Spectrum Analyzer: NA	Cable #3:
Attenuator #1: 1604	Cable #4:
Attenuator #2:	Cable #5:
Attenuator #3:	Cable #6:
Attenuator #4:	Power Splitter:

Measurement Uncertainty: +/- .7 dB

Frequency MHz	Channel	Modulation Type	Output Power (dBm)	Output Power (mW)
1850.2	512	GPRS	29.8	954.99
1880.2	662	GPRS	29.7	933.25
1909.8	810	GPRS	28.8	758.58

Power meter set for 12.5 % duty cycle.

Cable and attenuator verified with generator # 1053

Typical antenna gain is 3.3 dBi. Thus the maximum eirp from above would be 29.8 dBm + 3.3 dBi = 33.1 dBm (2 watts).

EQUIPMENT: GSM0108

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.238
TESTED BY: Eldon Berry	DATE: 22Aug03

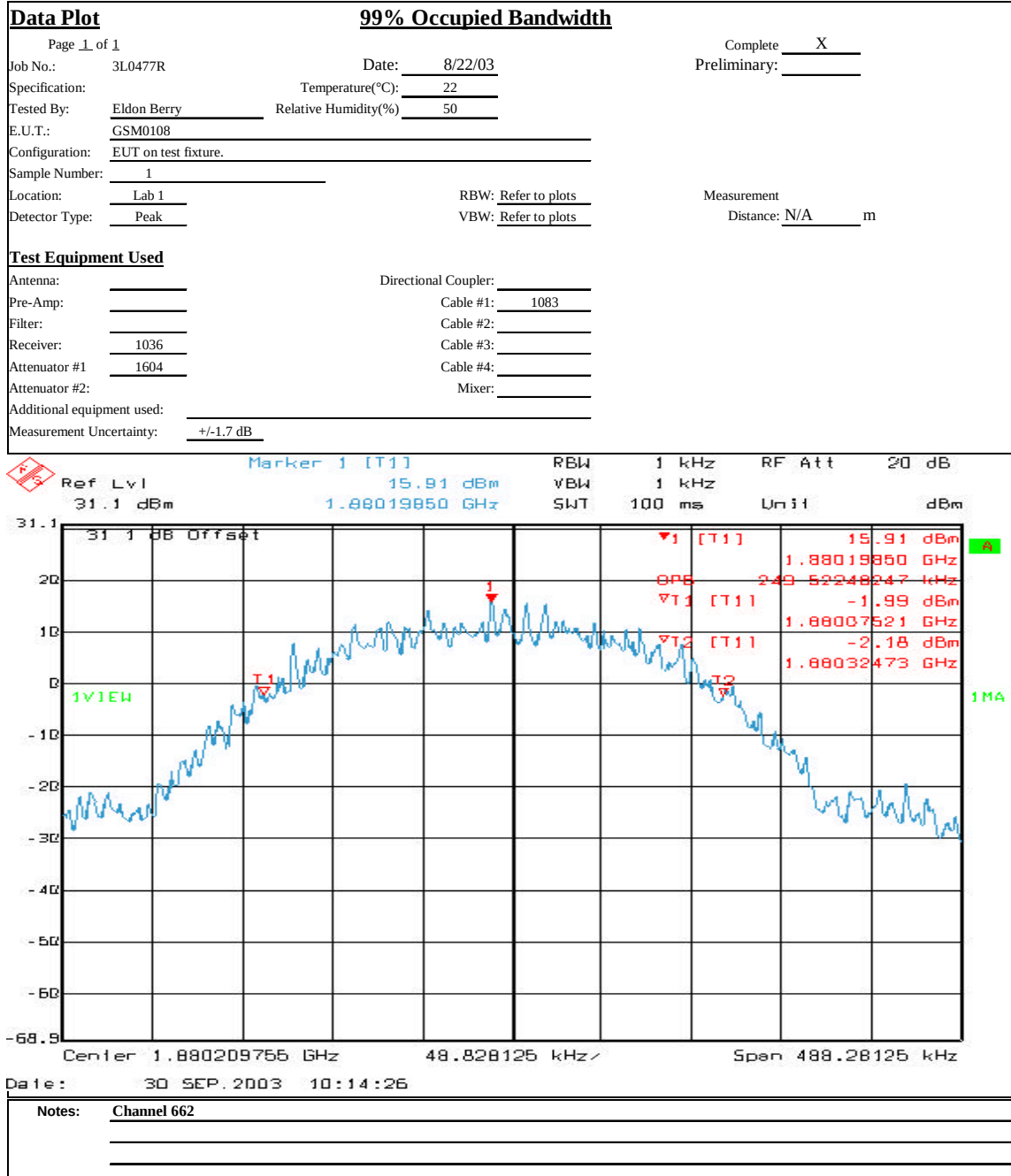
Test Results: Complies.

Test Data: See attached plots.

EQUIPMENT: GSM0108

Test Plot – Occupied Bandwidth

Nemko Dallas, Inc.



EQUIPMENT: GSM0108

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 24.238
TESTED BY: Eldon Berry	DATE: 22Aug03

Test Results: Complies.

Test Data: See attached plots.

EQUIPMENT: GSM0108

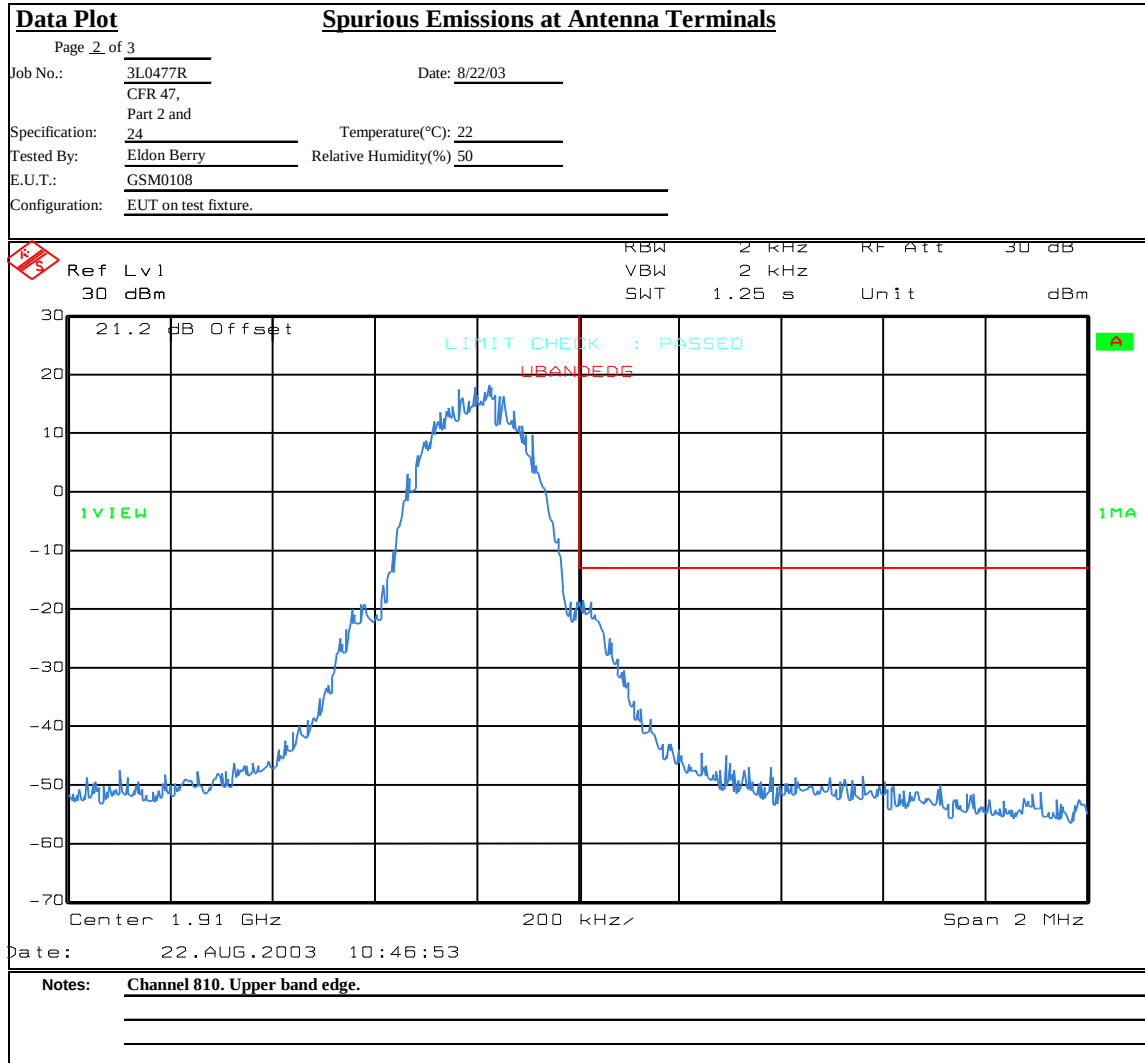
Test Plots – Spurious Emissions at Antenna Terminals

Nemko Dallas, Inc.

Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 3		Complete ☒ Preliminary: ☐	
Job No.:	3L0477R	Date:	8/22/03
Specification:	CFR 47, Part 2 and 24	Temperature(°C):	22
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		
Sample Number:	S01		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots
		Measurement Distance:	na m
Test Equipment Used			
Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1083
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1:	1604	Cable #4:	
Attenuator #2:		Mixer:	
Additional equipment used:			
Measurement Uncertainty:		+/-1.7 dB	
Notes: Channel 512. Lower band edge. 			

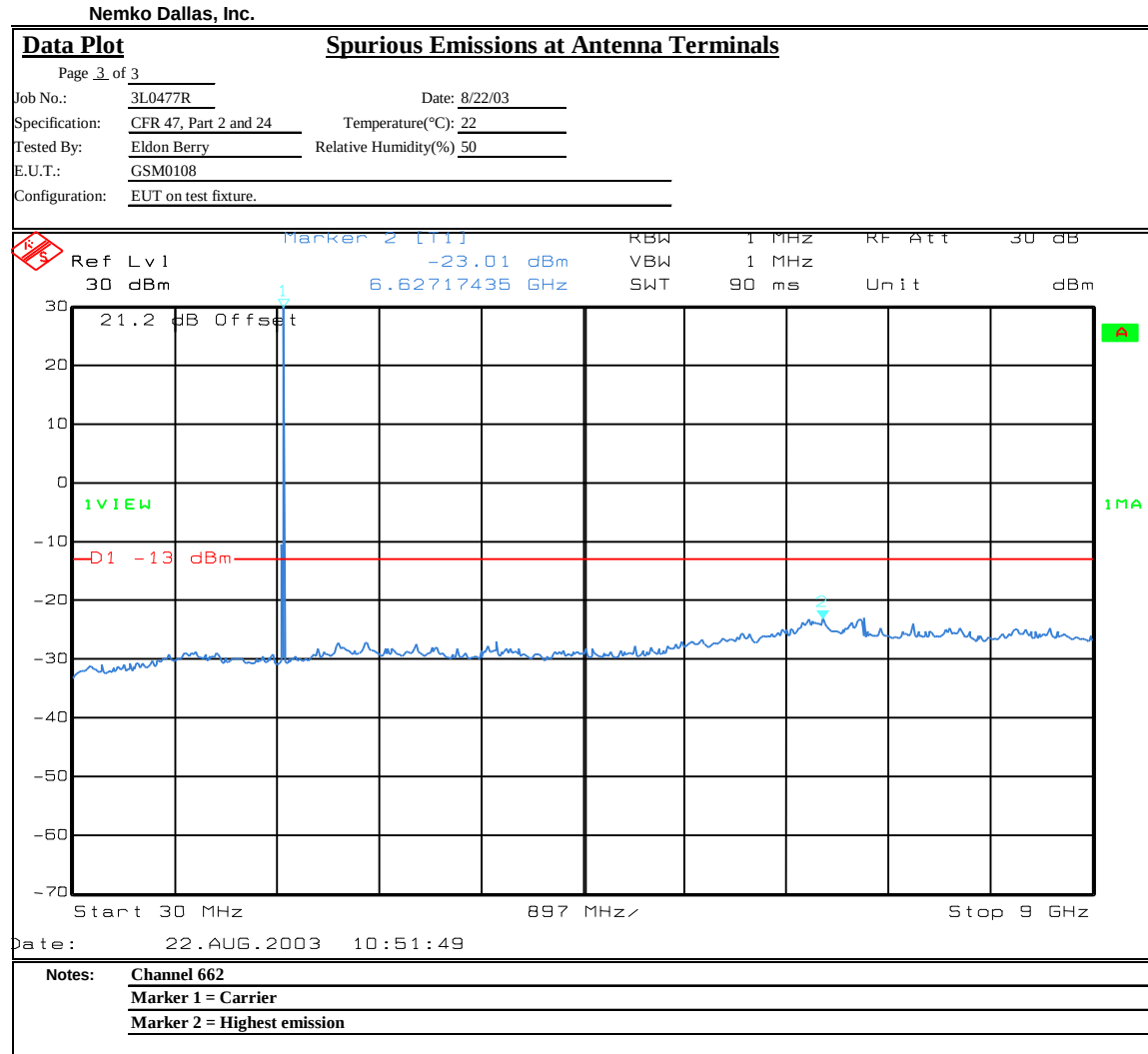
EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals



EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals



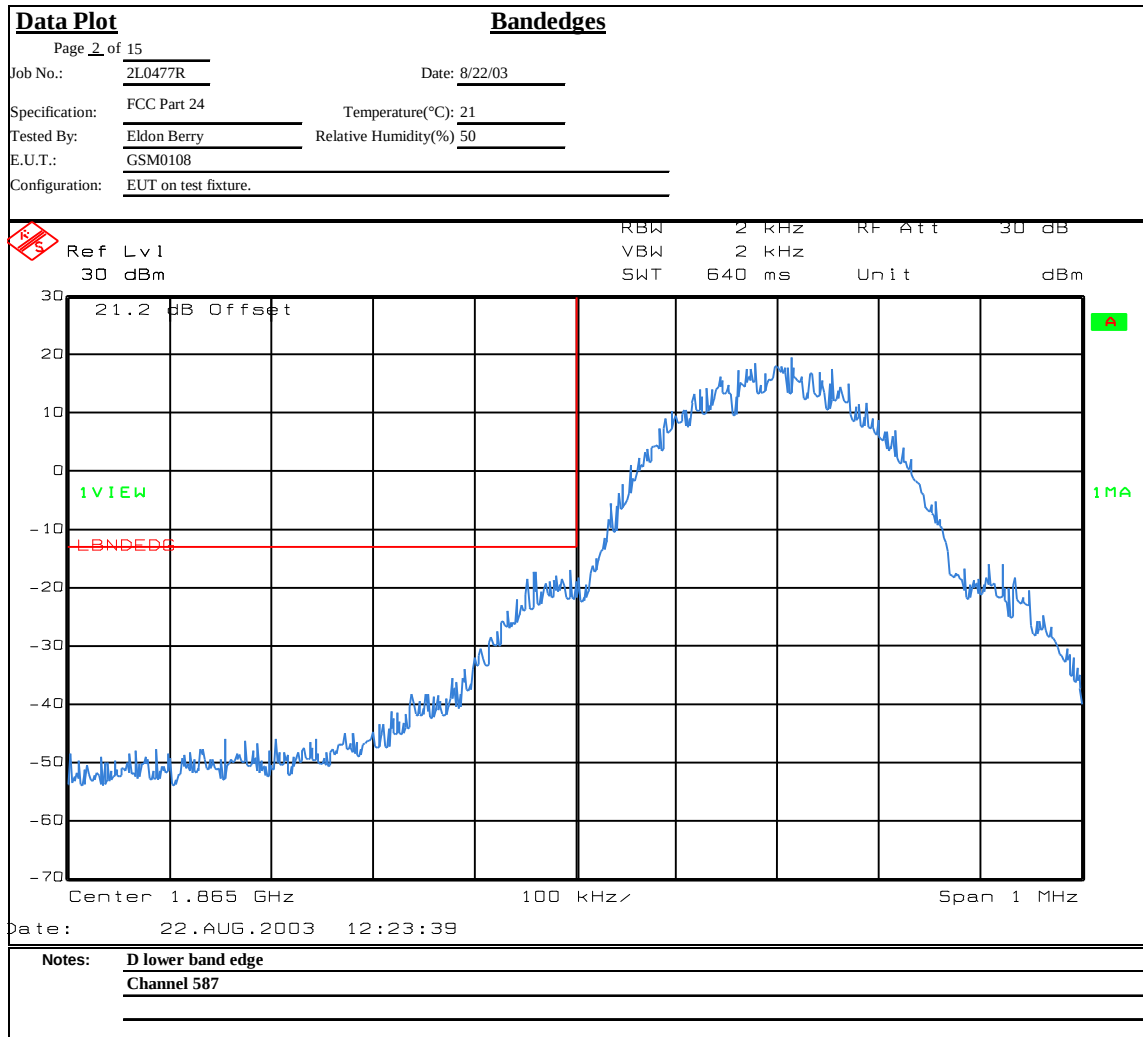
EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals

Data Plot		Bandedges													
Page 1 of 15		Complete <u>X</u>													
Job No.: 2L0477R	Date: 8/22/03	Preliminary: _____													
Specification: FCC Part 24	Temperature(°C): 21														
Tested By: Eldon Berry	Relative Humidity(%): 50														
E.U.T.: GSM0108															
Configuration: EUT on test fixture.															
Sample Number: S01															
Location: Lab 1		RBW: Refer to plots													
Detector Type: Peak		VBW: Refer to plots													
Test Equipment Used															
Antenna: _____		Directional Coupler: _____													
Pre-Amp: _____		Cable #1: 1083													
Filter: _____		Cable #2: _____													
Receiver: 1036		Cable #3: 0													
Attenuator #1: 1604		Cable #4: _____													
Attenuator #2: _____		Mixer: _____													
Additional equipment used: _____															
Measurement Uncertainty: +/-1.7 dB															
<table border="0" style="width: 100%;"> <tr> <td>RBW</td> <td>2 kHz</td> <td>RF Att</td> <td>30 dB</td> </tr> <tr> <td>VBW</td> <td>2 kHz</td> <td></td> <td></td> </tr> <tr> <td>SWT</td> <td>640 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>				RBW	2 kHz	RF Att	30 dB	VBW	2 kHz			SWT	640 ms	Unit	dBm
RBW	2 kHz	RF Att	30 dB												
VBW	2 kHz														
SWT	640 ms	Unit	dBm												
Date: 22.AUG.2003 12:22:13 Notes: A upper band edge Channel 585															

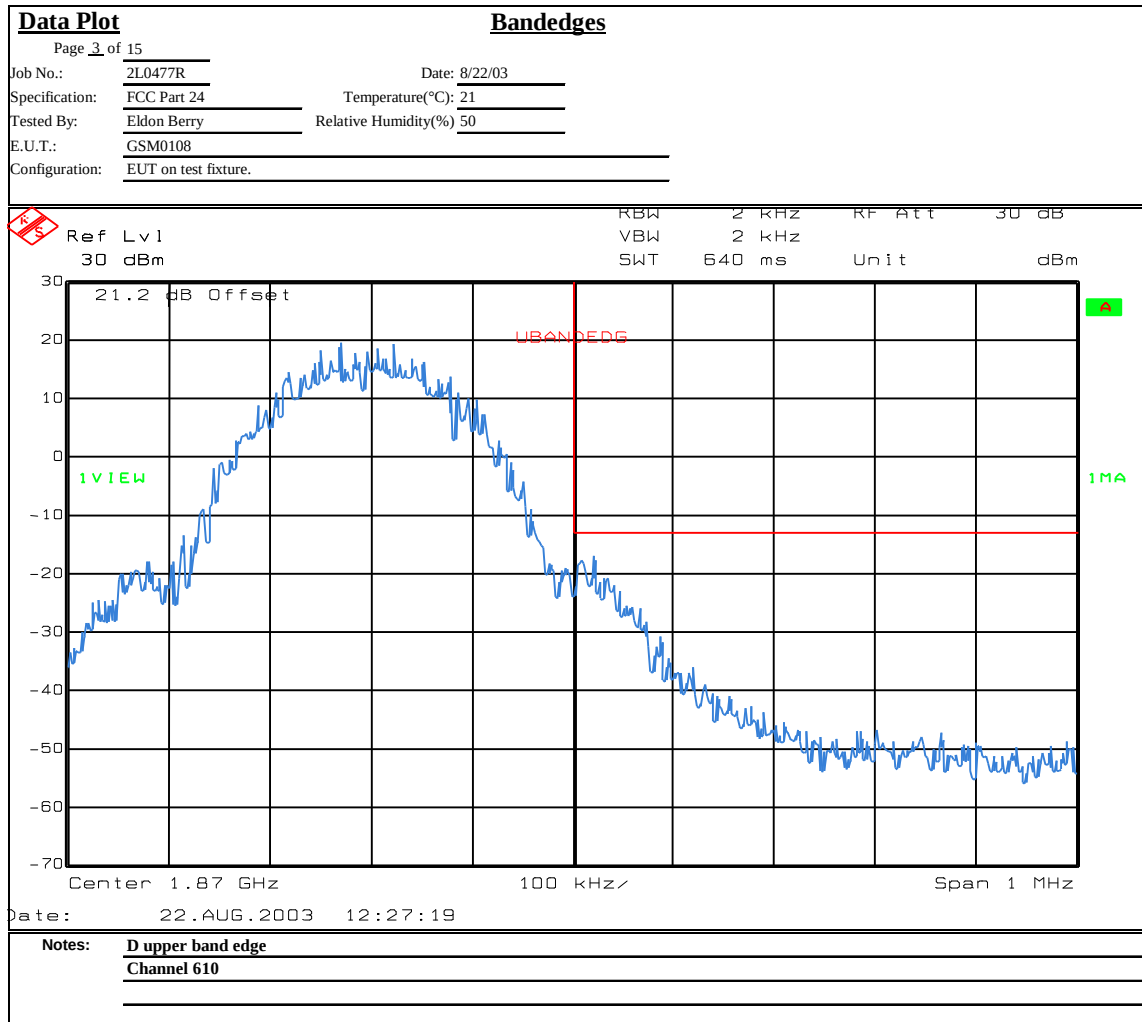
EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals



EQUIPMENT: GSM0108

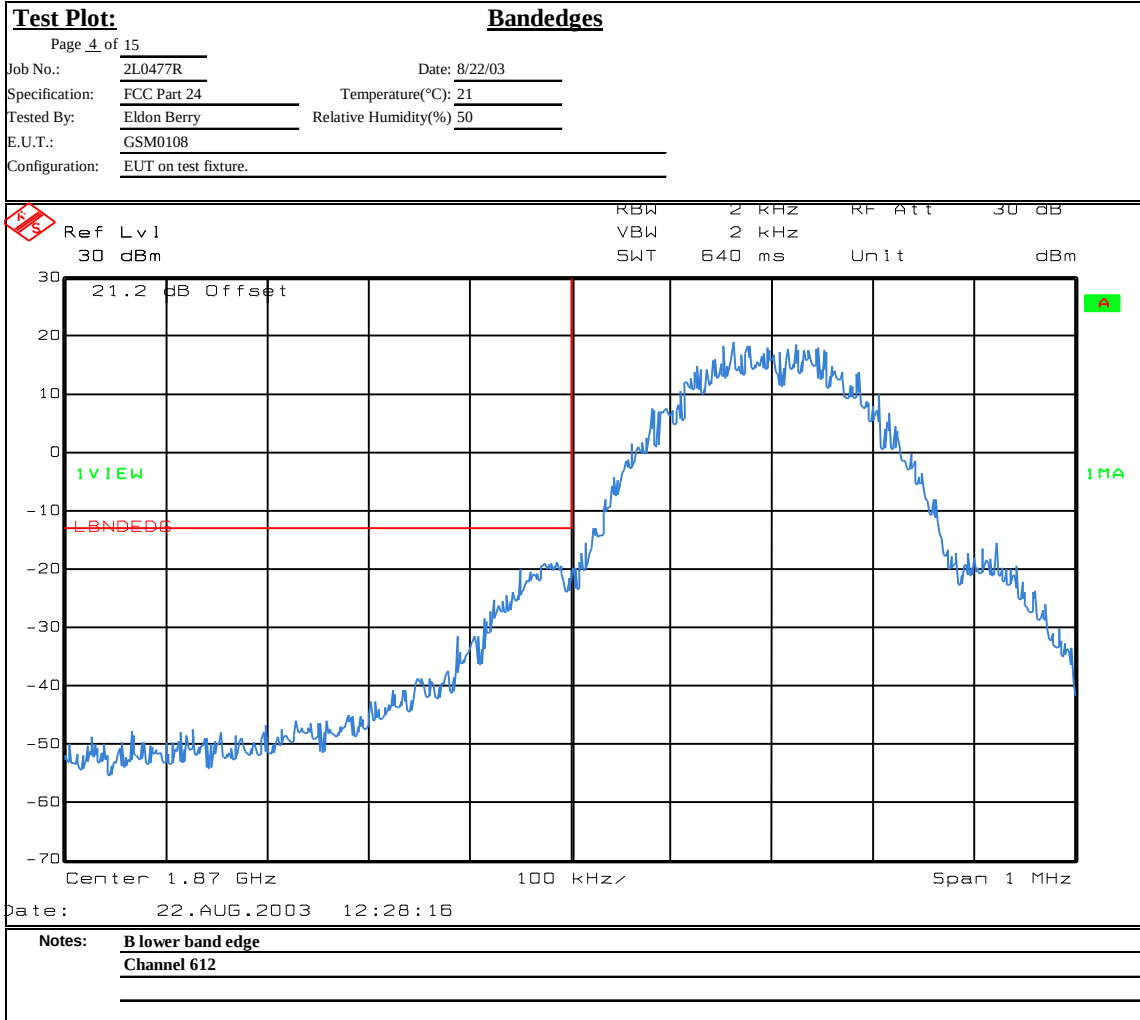
Test Plots – Spurious Emissions at Antenna Terminals



EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals

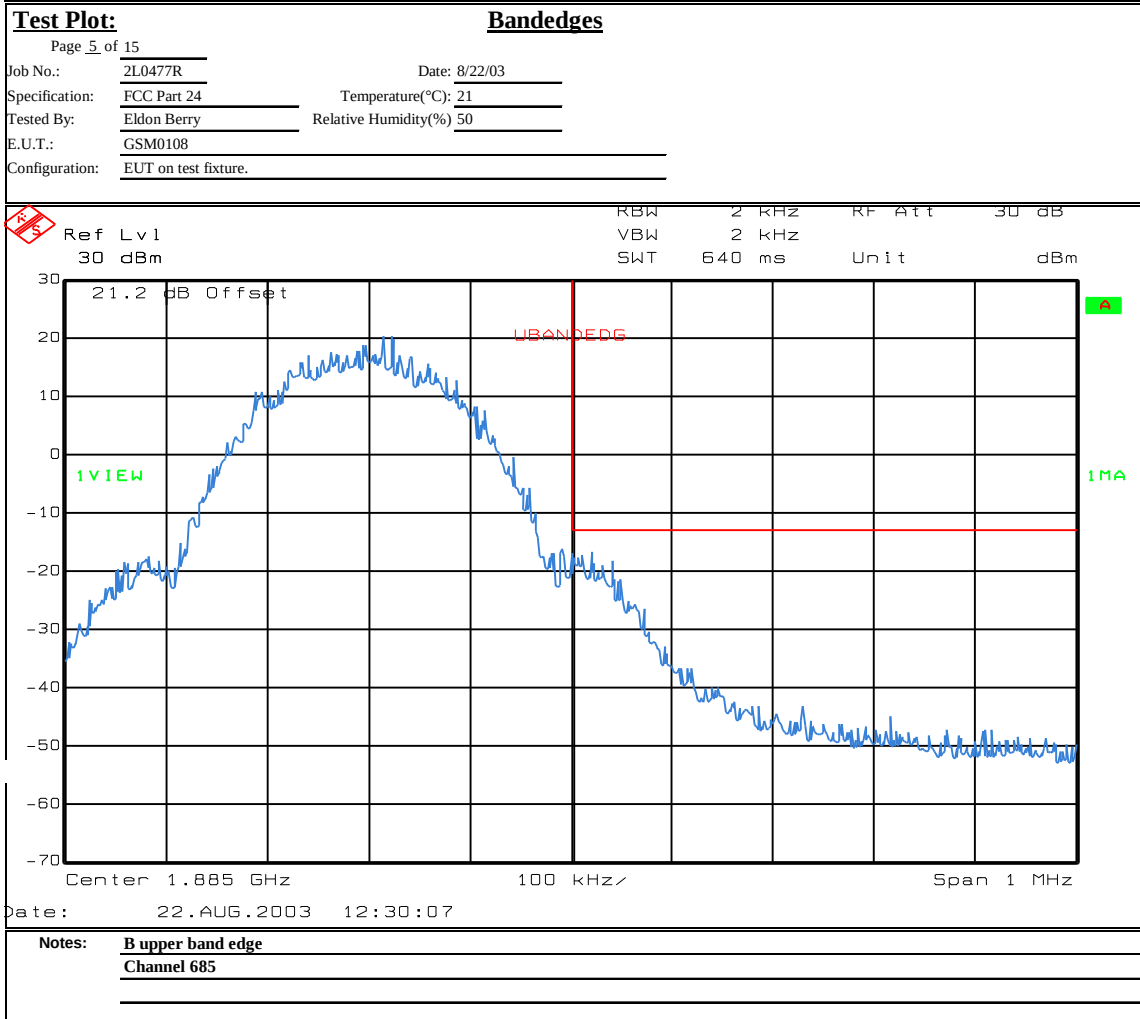
Nemko USA, Inc.



EQUIPMENT: GSM0108

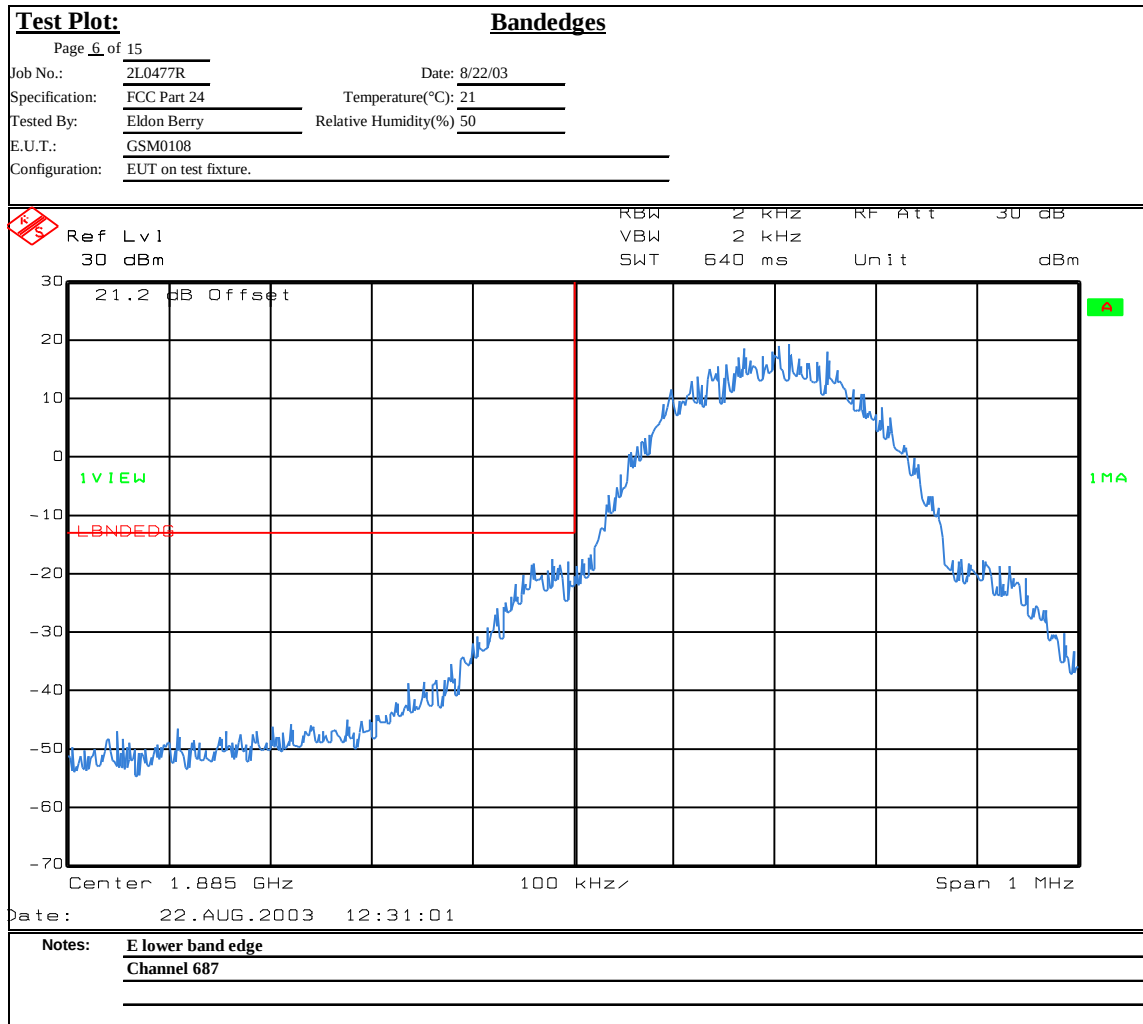
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.



EQUIPMENT: GSM0108

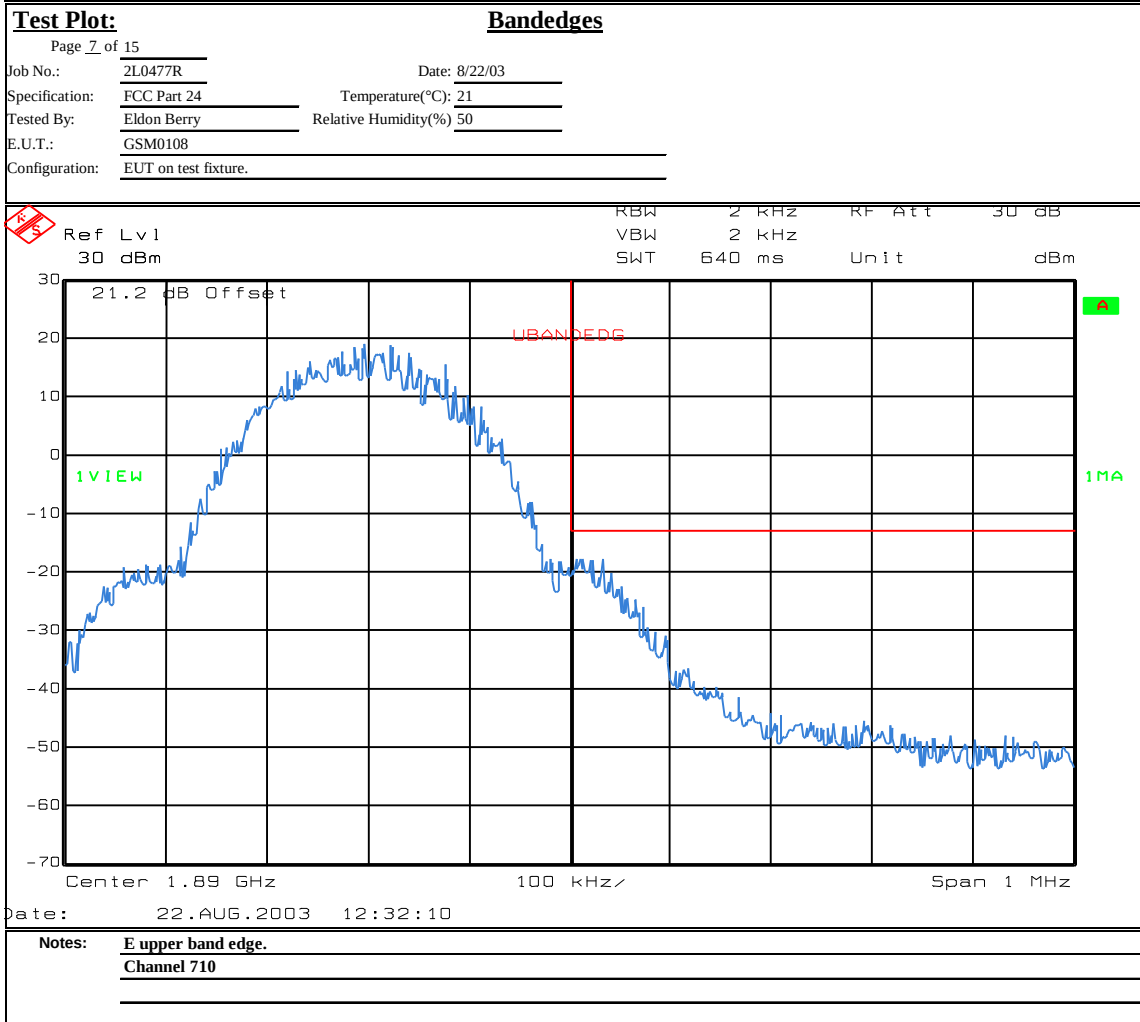
Test Plots – Spurious Emissions at Antenna Terminals



EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals

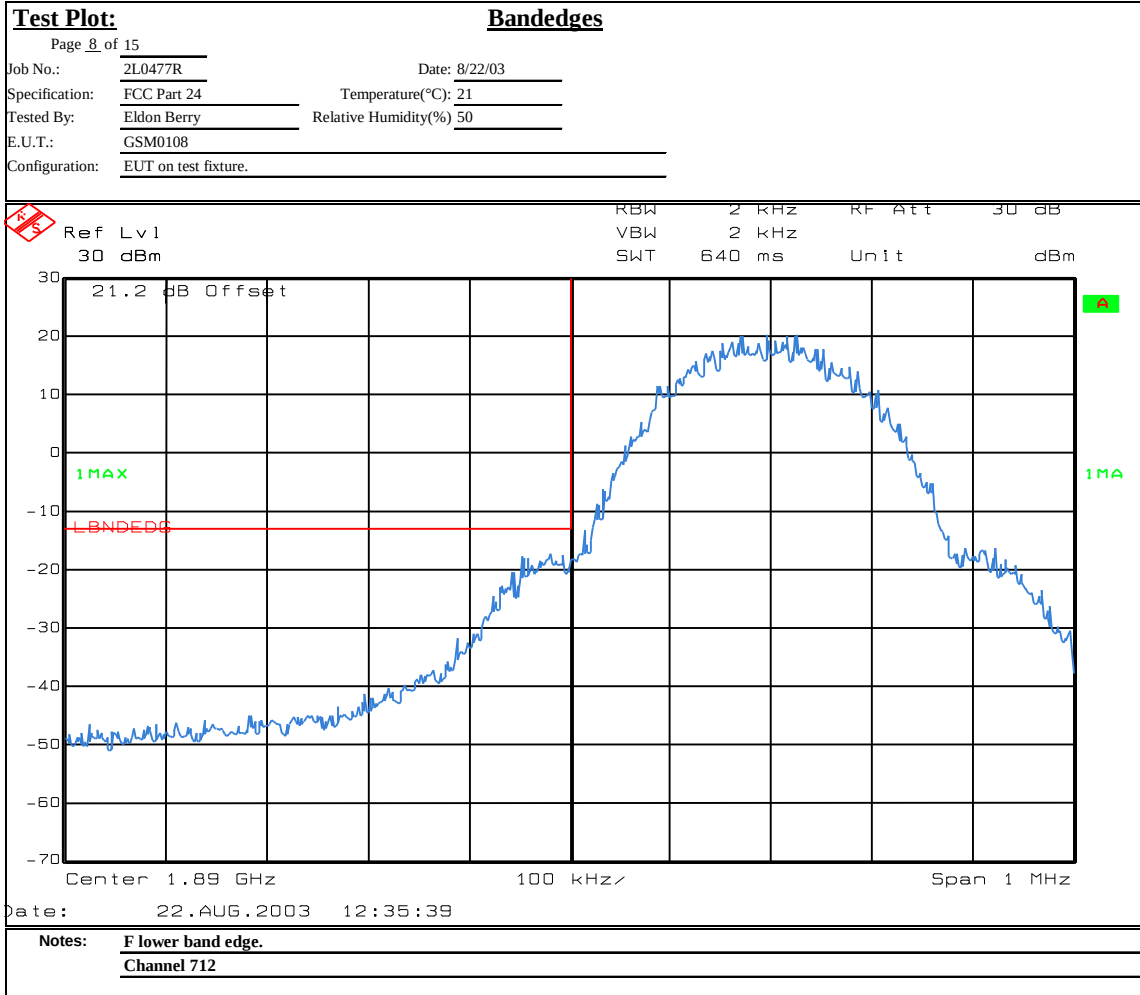
Nemko USA, Inc.



EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals

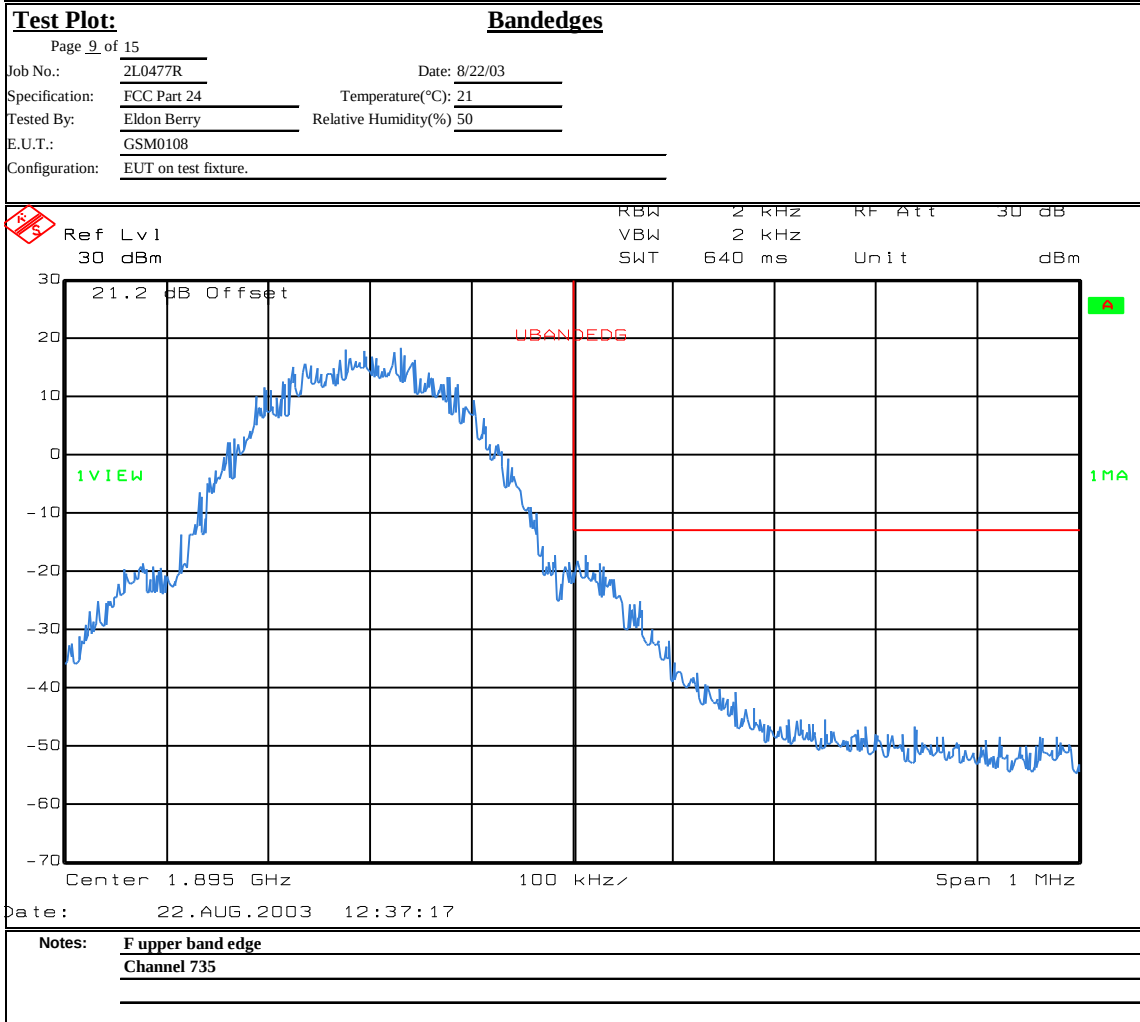
Nemko USA, Inc.



EQUIPMENT: GSM0108

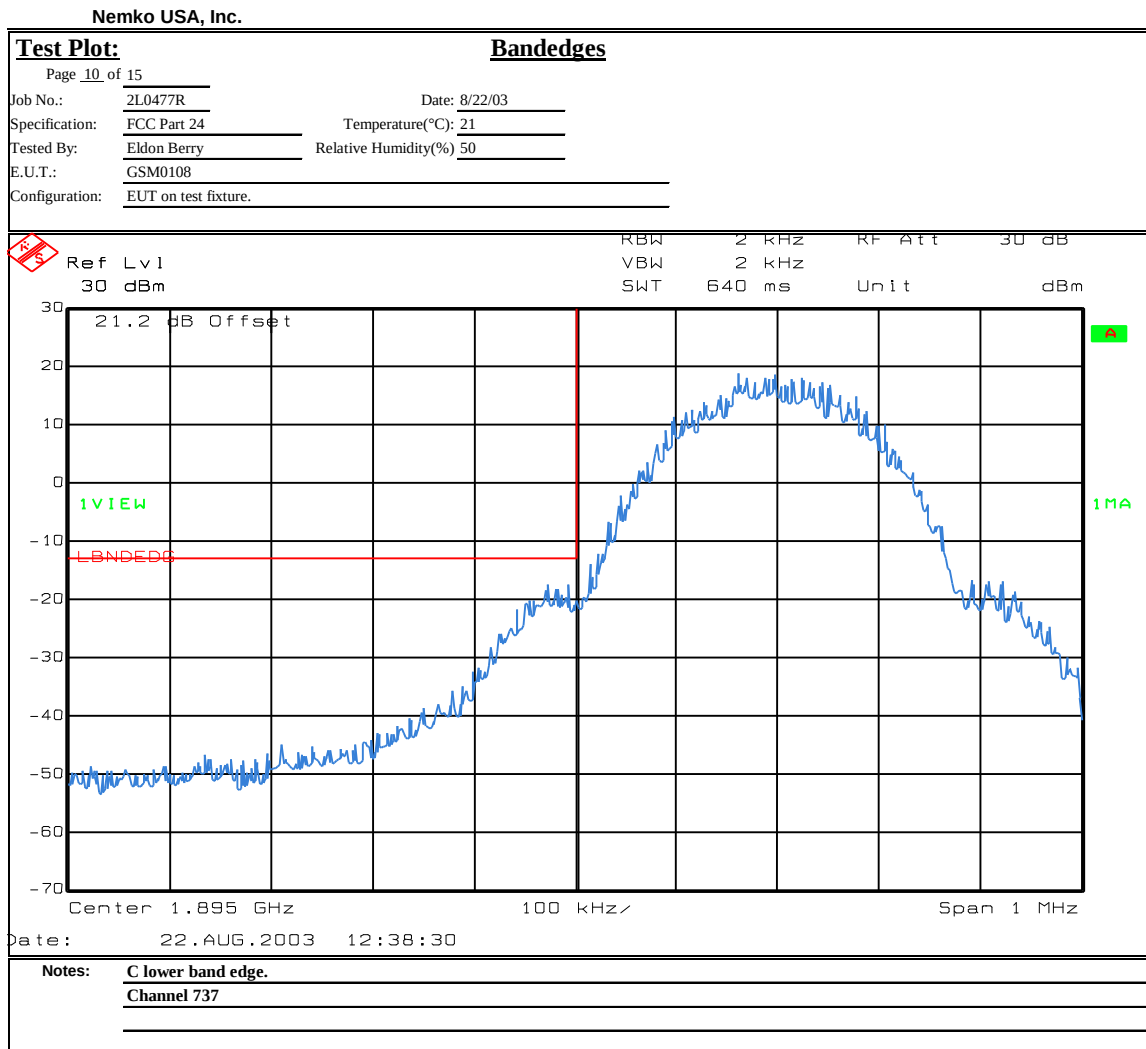
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.



EQUIPMENT: GSM0108

Test Plots – Spurious Emissions at Antenna Terminals



EQUIPMENT: GSM0108

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 24.238
TESTED BY: Eldon Berry	DATE: 22Aug03

Test Results: Complies.

Test Data: See attached table.

EQUIPMENT: GSM0108

Test Data - Radiated Emissions

Nemko Dallas, Inc.

EIRP Substitution Method

Page 1 of 1

Complete XPreliminary

Job No.: 3L0477R Date: 8/22/03
 Specification: PT 24 Temperature(°C): 22
 Tested By: Eldon Berry Relative Humidity(%) 50
 E.U.T.: GSM0108
 Configuration: EUT on test fixture.
 Sample No: 1
 Location: AC 3 RBW: 1 MHz
 Detector Type: Peak VBW: 1 MHz

 Measurement
 Distance: 3 m
Test Equipment Used

Antenna: 1304 Directional Coupler:
 Pre-Amp: 1016 Cable #1: 1484
 Filter: 1482 Cable #2: 1485
 Receiver: 1464 Cable #3:
 Attenuator #1: Cable #4:
 Attenuator #2: Mixer:
 Additional equipment used:
 Measurement Uncertainty: +/-1.7 dB

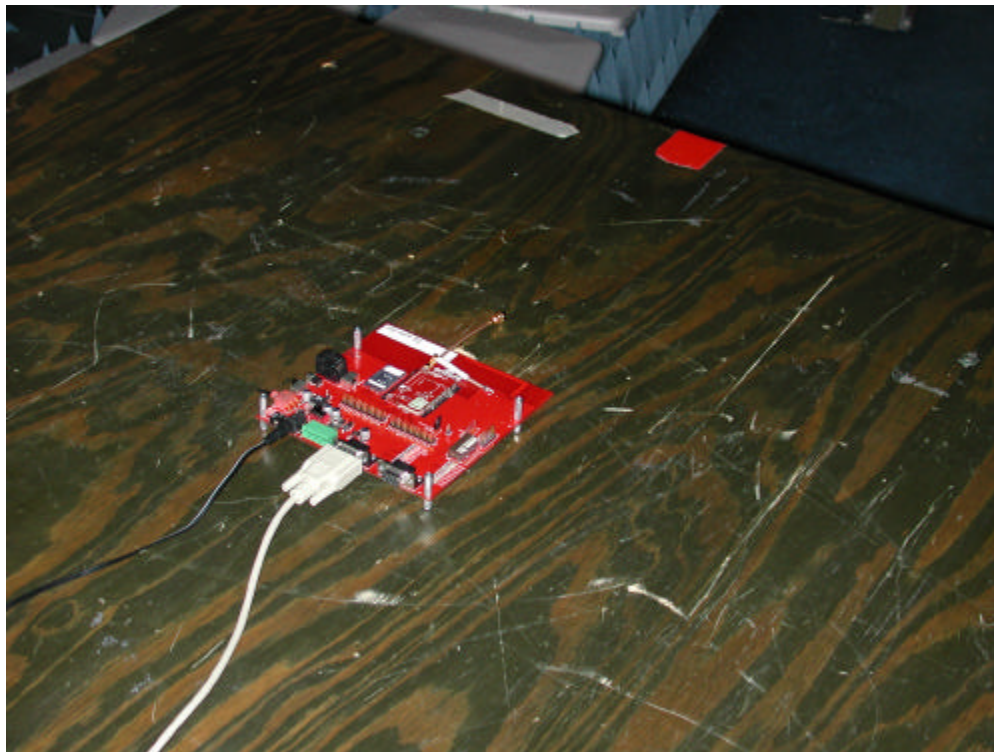
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)		EIRP (dBm)	EIRP (mW)	Polarity	Comments
3760.4	-71.3	43.3		0	10.7		-17.3	0.0188	V	Channel 662
5640.6	-61.0	39.8		28.5	11.4		-38.3	0.0001	V	
7520.8	-62.5	41.8		34.1	11.3		-43.5	0.0000	V	
9401	-54.5	41.3		33.4	11.7		-34.9	0.0003	V	
11281.2	-43.2	43.7		34.6	12.5		-21.6	0.0069	V	
13161.4	-60.0	45.8		34.5	11.9		-36.8	0.0002	V	
15041.6	-63.0	45.2		32	12.8		-37.0	0.0002	V	
16921.8	-63.0	46.0		33.3	14.5		-35.8	0.0003	V	
3760.4	-75.0	35.5		0	10.7		-28.8	0.0013	H	
5640.6	-63.8	37.8		28.5	11.4		-43.1	0.0000	H	
7520.8	-62.7	41.5		34.1	11.3		-44.0	0.0000	H	
9401	-57.7	42.3		33.4	11.7		-37.1	0.0002	H	
13161.4	-63.0	47.8		30.3	11.9		-33.6	0.0004	H	

Notes: Searched spectrum to the 10th harmonic of carrier

NOTE: The correction factor in the above table references the pre-calibrated path loss at that frequency and is the difference between the received signal level and the input to the substitution antenna. The same antennas, cables and test range are used for calibration and for measurement.

EQUIPMENT: GSM0108

Photographs of Test Setup



EQUIPMENT: GSM0108

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability

PARA. NO.: 24.235

Test Results: Complies.**Equipment Used:** Wavetek 3600D, Voltmeter # 1558, Thermometer # 619
Environmental Chamber # 283**Temperature:** 23 °C**Relative Humidity:** 36 %**Measurement Data:**

Band of Operation PCS
Mode GPRS
Channel 662
Standard Test Frequency: 1880.264638 MHz
Standard Test Voltage: 3.8 Vdc

Test Equipment: 283-1464-425-1031

Temperature	Voltage (Vdc)	Frequency (MHz)	Change (Hz)	Change (PPM)
50	3.8	1880.264820	182	0.10
40	3.8	1880.264517	-121	-0.06
30	3.8	1880.264551	-87	-0.05
20	3.8	1880.264638	0	0.00
10	3.8	1880.264762	124	0.07
0	3.8	1880.264805	167	0.09
-10	3.8	1880.264798	160	0.09
-20	3.8	1880.264710	72	0.04
-30	3.8	1880.264717	79	0.04
20	4.8	1880.264630	-8	0.00
20	3.3	1880.264748	110	0.06

EQUIPMENT: GSM0108

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model	Serial Number	Calibration Date	Calibration Due
1083	Cable	Astrola 32027-2-29094-	N/A	CBU	N/A
	Power	E4418B	GB39401848	12/11/02	12/11/04
	Power	E9304A	MY41494308	9/9/02	9/9/03
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/24/03	07/24/04
1482	Band Pass	K & L 11SH10-4000/T12000-	2	Cal B4	N/A
1464	Spectrum	Hewlett 8563E	3551A04428	02/11/03	02/11/05
1484	Cable 2.0-18.0	Storm PR90-010-072	N/A	07/24/03	07/23/04
1485	Cable 2.0-18.0	Storm PR90-010-216	N/A	07/24/03	07/23/04
283	Environmental Chamber with controller #	ENVIROTRONICS SH27 & 2030-22844	129010083	04/22/03	04/21/04
425	DIGITAL MULTIMETER	FLUKE 45-01	5930073	10/03/02	10/03/03
1031	D C power	Hewlett 6002A	2930A-12218	Not Req	N/A

ANNEX A - TEST METHODOLOGIES

EQUIPMENT: GSM0108

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
-------------------------------	-------------------

Minimum Standard: Para. No.24.232. Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

Method Of Measurement: CDMA Per ANSI/J-STD-008
TDMA Per ANSI/J-STD-010
PCS 1900 Per ANSI/J-STD-007

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or a spectrum analyzer.

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.

EQUIPMENT: GSM0108

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

Minimum Standard: Para. No. 24.238(b). 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.

Method Of Measurement:CDMA Per ANSI/J-STD-008

Spectrum analyzer settings:

RBW: 30 kHz

VBW: $\geq$ RBW

Span: 5 MHz

Sweep: Auto

GSM Per ANSI/J-STD-007

RBW: 3 kHz

VBW: $\geq$ RBW

Span: 2 MHz

Sweep: Auto

NADC Per IS-136

RBW: 1 kHz

VBW: $\geq$ RBW

Span: 1 MHz

Sweep: Auto

EQUIPMENT: GSM0108

NAME OF TEST: Spurious Emission at Antenna
Terminals

PARA. NO.: 2.1053

Minimum Standard:

Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA Per ANSI/J-STD-008

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 20 kHz (< 1MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM Per ANSI/J-STD-007

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

NADC Per IS-136

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 1 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

EQUIPMENT: GSM0108

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053
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Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Calculation Of Field Strength Limit

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.

EQUIPMENT: GSM0108

NAME OF TEST: Frequency Stability

PARA. NO.: 2.1055

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement: CDMA Per ANSI/J-STD-008
TDMA Per ANSI/J-STD-007
NADC Per IS-136

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.

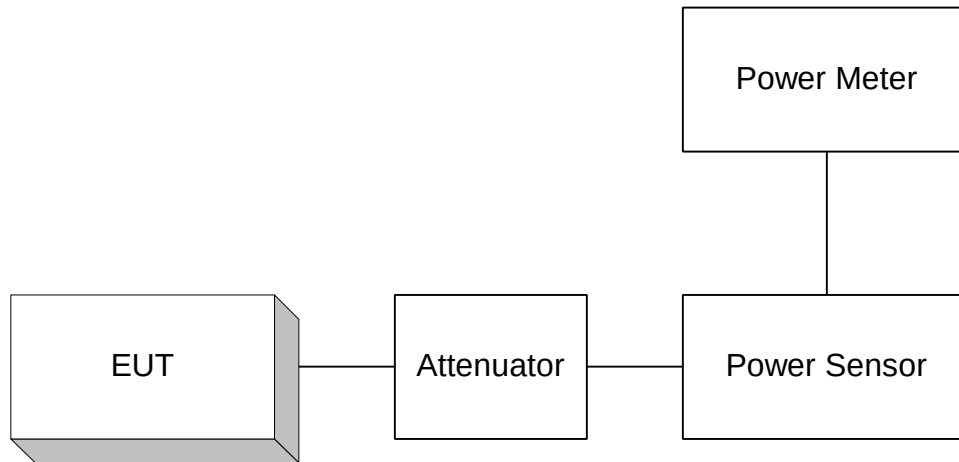
Frequency Stability With Temperature Variation

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.

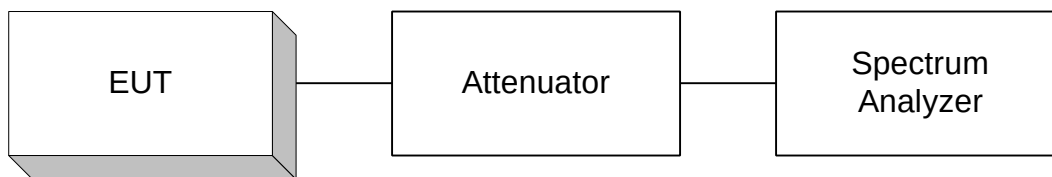
ANNEX B - TEST DIAGRAMS

EQUIPMENT: GSM0108

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

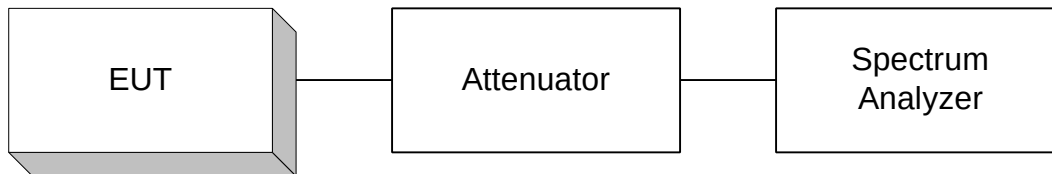


Para. No. 2.1049 - Occupied Bandwidth

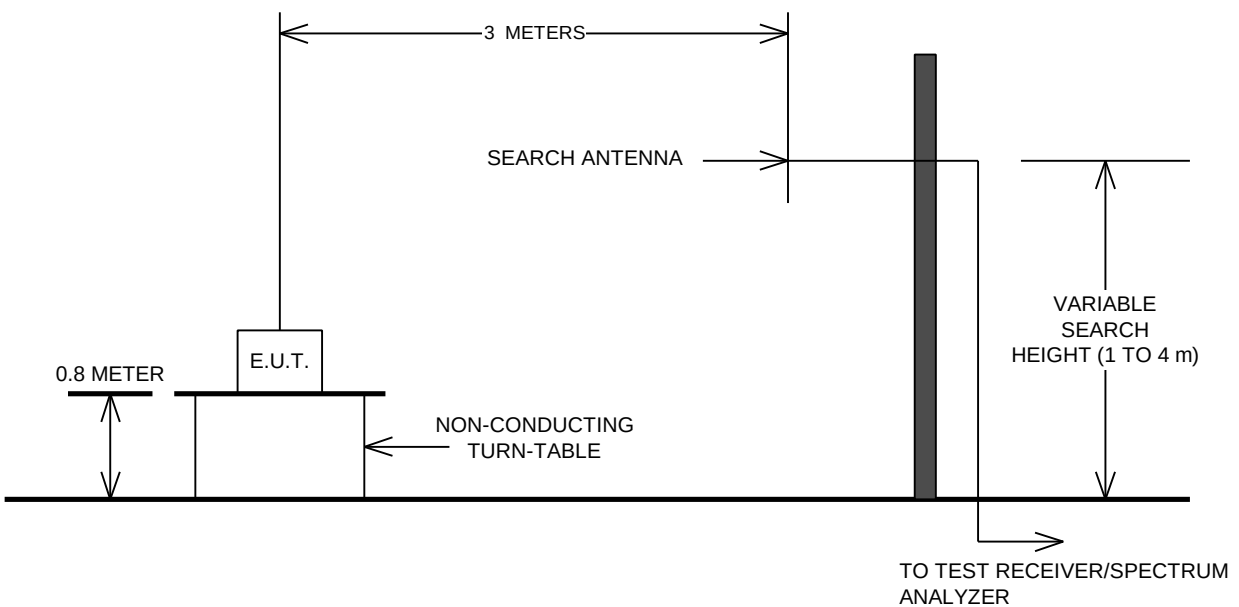


EQUIPMENT: GSM0108

Para. No. 2.1053 Spurious Emissions at Antenna Terminals



Para. No. 2.1053- Field Strength of Spurious Radiation



EQUIPMENT: GSM0108

Para. No. 2.1055 - Frequency Stability

