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

Table of Contents

Section 1. Summary of Test Results 3

Section 2. General Equipment Specification 5

Section 3. RF Power Output 7

Section 4. Occupied Bandwidth 8

Section 5. Spurious Emissions at Antenna Terminals 10

Section 6. Field Strength of Spurious 24

Section 7. Frequency Stability 27

Section 8. Test Equipment List 28

ANNEX A - TEST METHODOLOGIES 29

ANNEX B - TEST DIAGRAMS 35

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 Berry_____ DATE: _26 Aug., 2003_

Nemko Dallas Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Dallas Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report applies only to the items tested.

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:

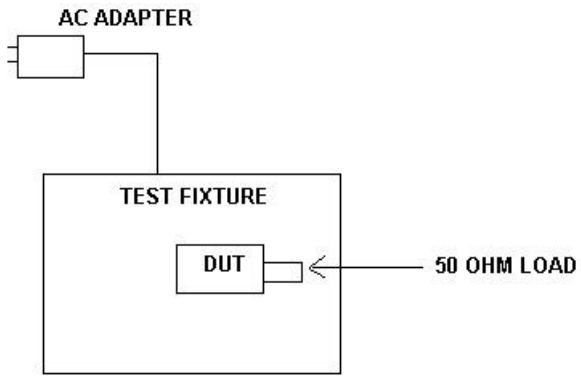
Section 2. General Equipment Specification

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

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



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).

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.

Test Plot – Occupied Bandwidth

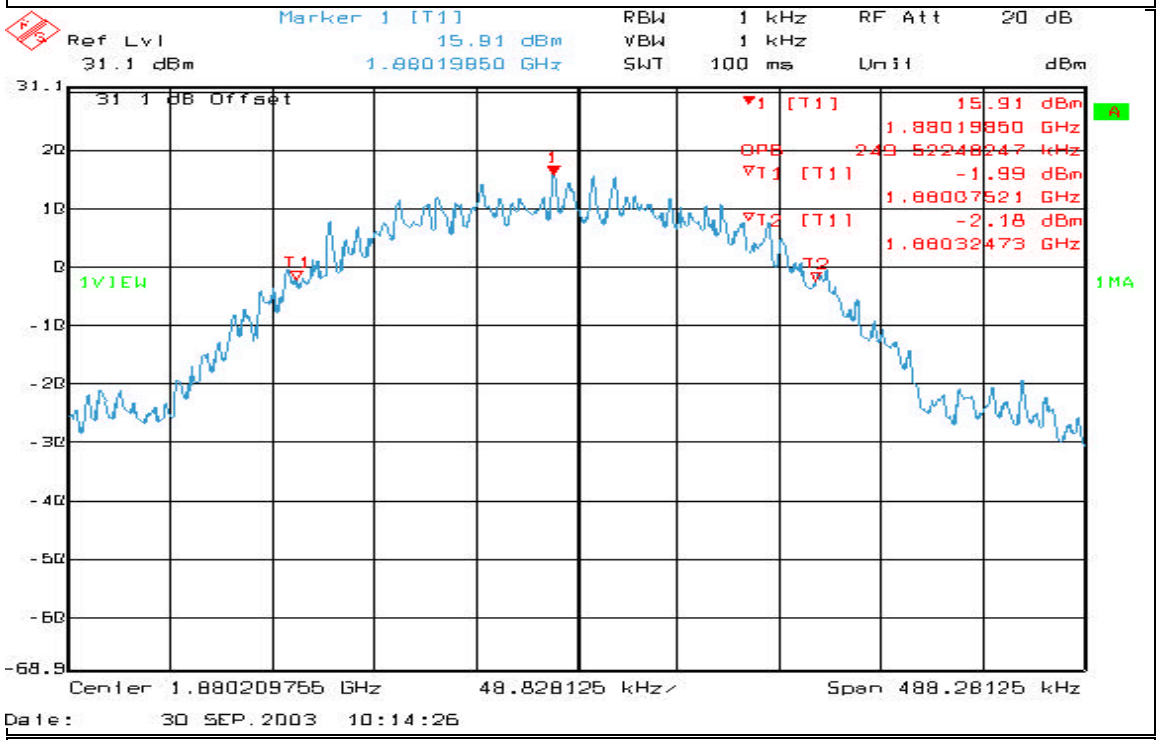
Nemko Dallas, Inc.

Data Plot **99% Occupied Bandwidth**

Page 1 of 1 Complete X
Job No.: 3L0477R Date: 8/22/03 Preliminary:
Specification: Temperature(°C): 22
Tested By: Eldon Berry Relative Humidity(%) 50
E.U.T.: GSM0108
Configuration: EUT on test fixture.
Sample Number: 1
Location: Lab 1 RBW: Refer to plots Measurement
Detector Type: Peak VBW: Refer to plots Distance: N/A 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 662**

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.

Test Plots – Spurious Emissions at Antenna Terminals

Nemko Dallas, Inc.

Data Plot **Spurious Emissions at Antenna Terminals**

Page 1 of 3 Complete x

Job No.: 3L0477R Date: 8/22/03 Preliminary:

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 Measurement

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

Test Equipment Used

Antenna: Directional Coupler:

Pre-Amp: Cable #1: 1083

Filter: Cable #2:

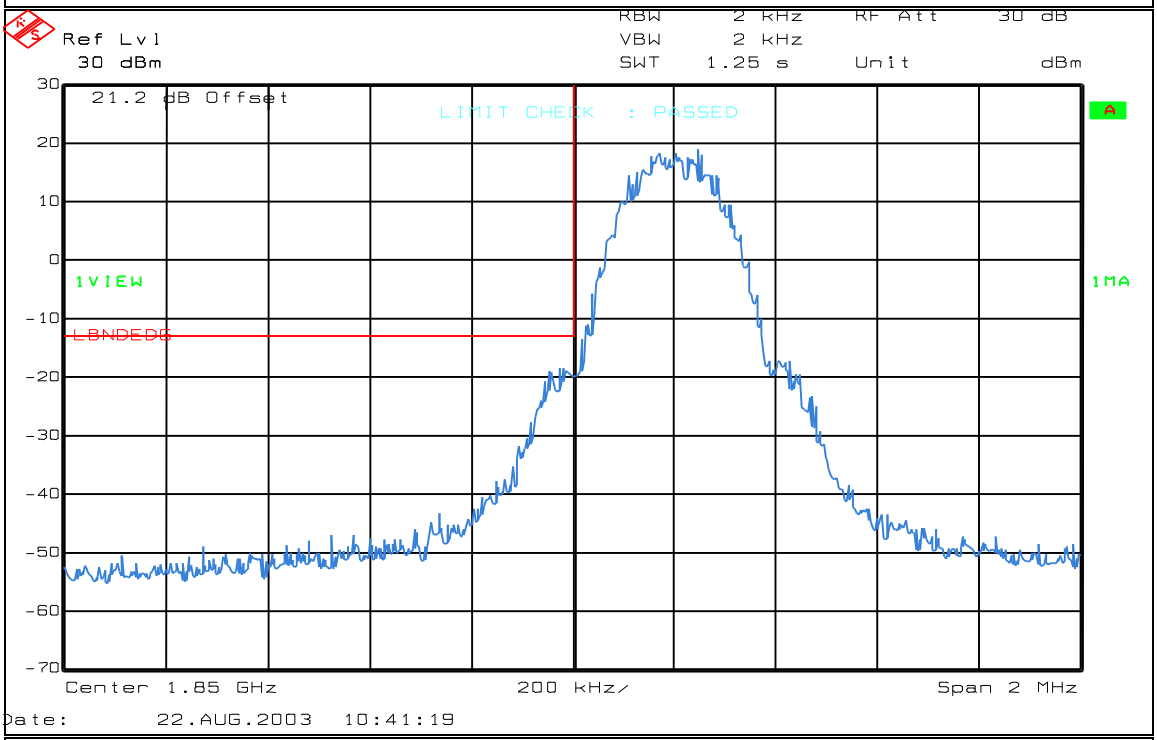
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



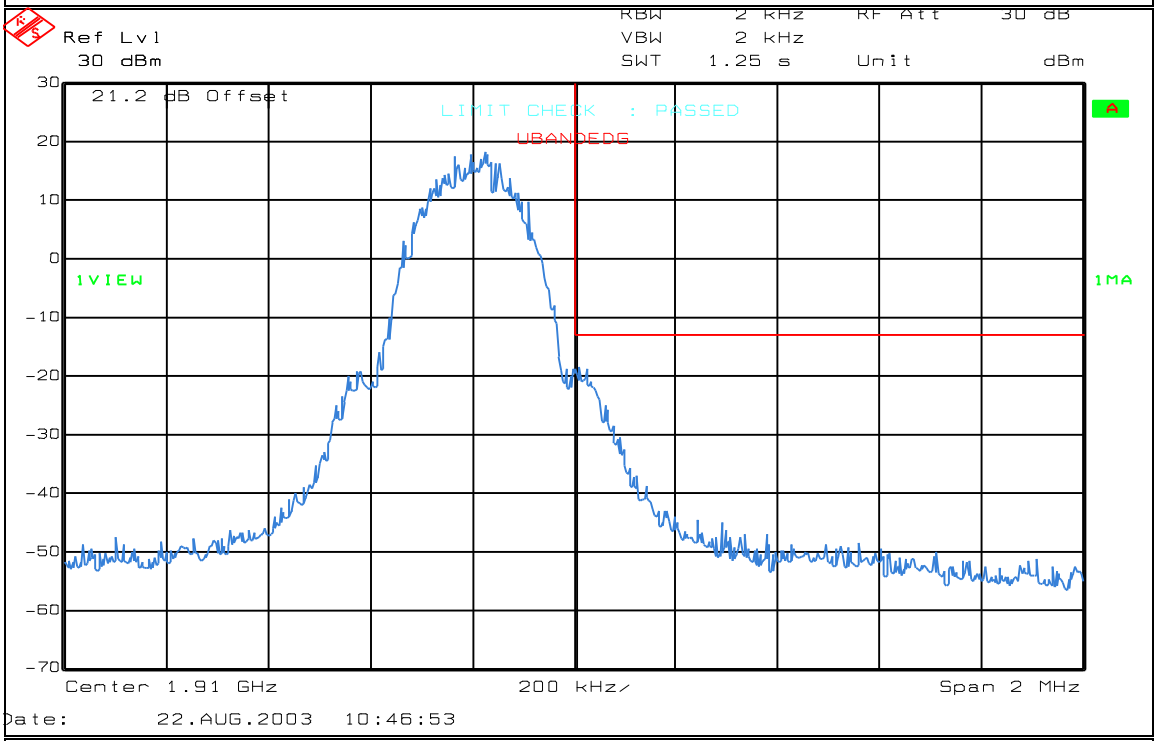
Notes: **Channel 512. Lower band edge.**

Test Plots – Spurious Emissions at Antenna Terminals

Data Plot **Spurious Emissions at Antenna Terminals**

Page 2 of 3

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.



Notes: **Channel 810. Upper band edge.**

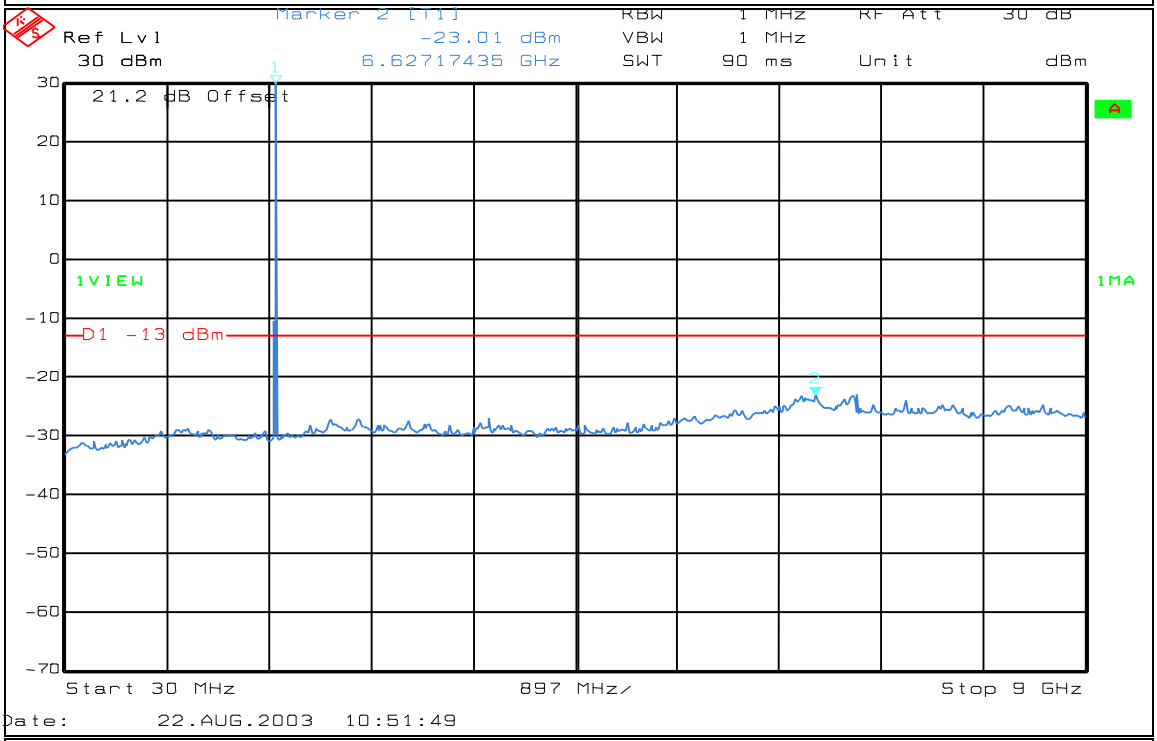
Test Plots – Spurious Emissions at Antenna Terminals

Nemko Dallas, Inc.

Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 3

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.		



Notes:
Channel 662
Marker 1 = Carrier
Marker 2 = Highest emission

Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.

Data Plot **Bandedges**

Page 1 of 15 Complete X

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

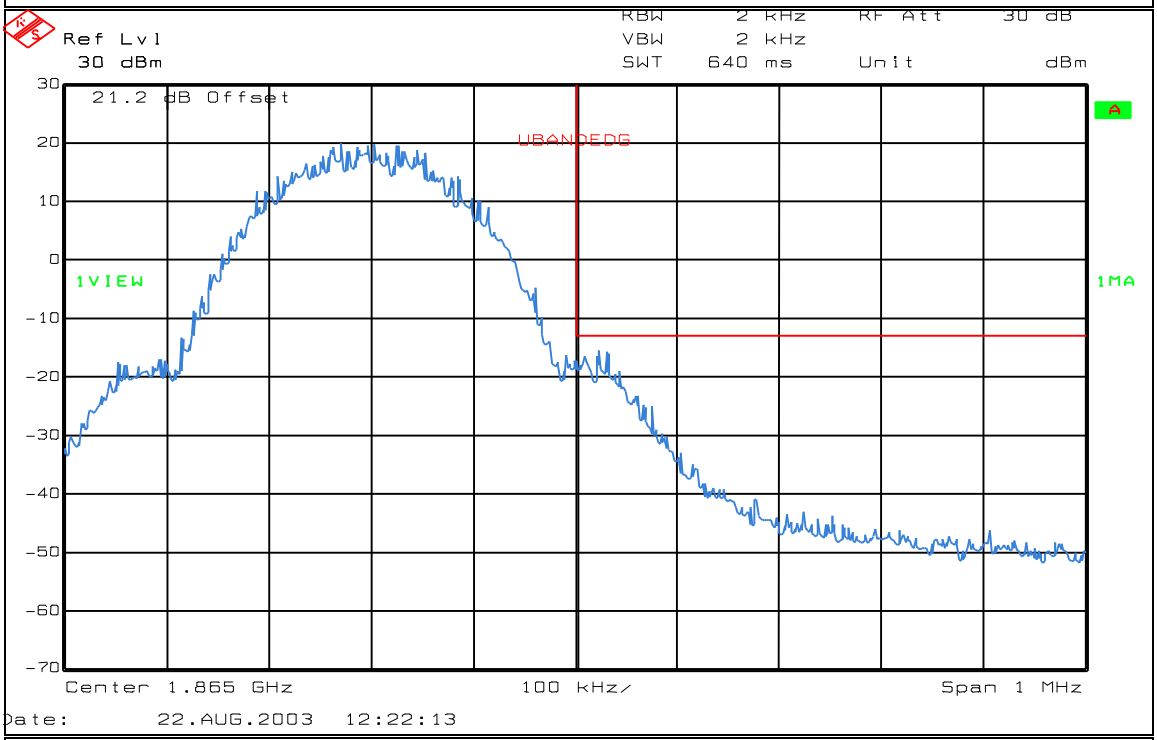
Detector Type: Peak VBW: Refer to plots

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



Notes: **A upper band edge**
Channel 585

Test Plots – Spurious Emissions at Antenna Terminals

Data Plot **Bandedges**

Page 2 of 15

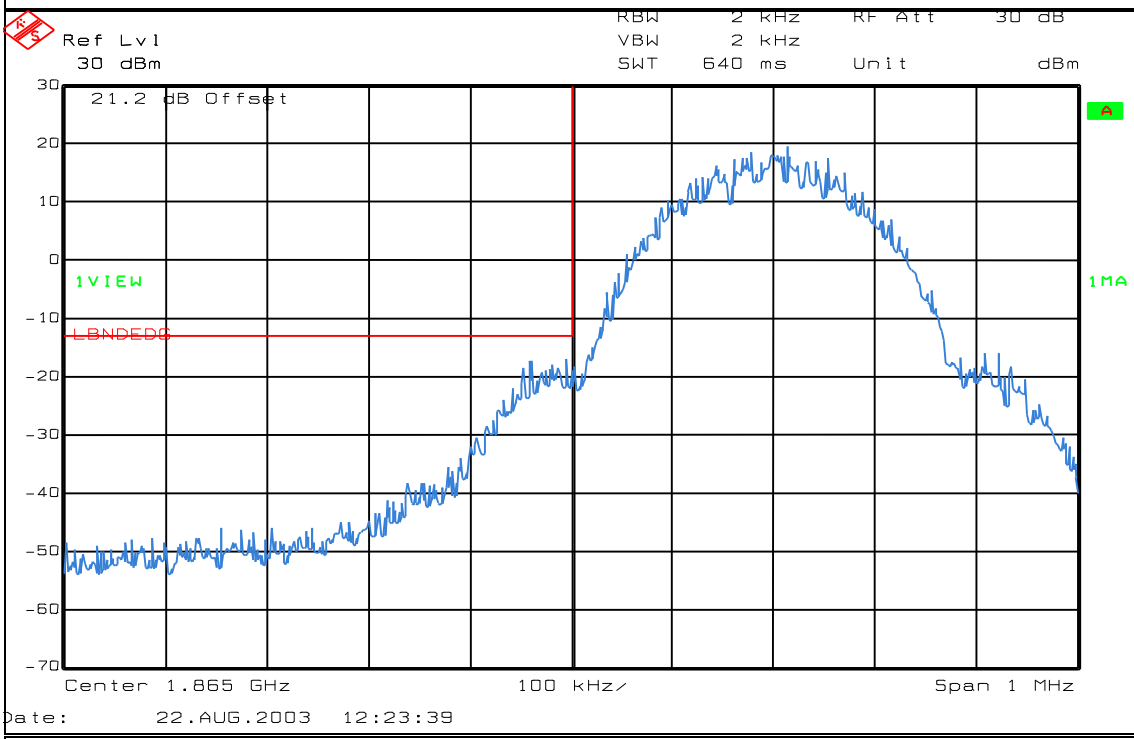
Job No.: 2L0477R Date: 8/22/03

Specification: FCC Part 24 Temperature(°C): 21

Tested By: Eldon Berry Relative Humidity(%) 50

E.U.T.: GSM0108

Configuration: EUT on test fixture.



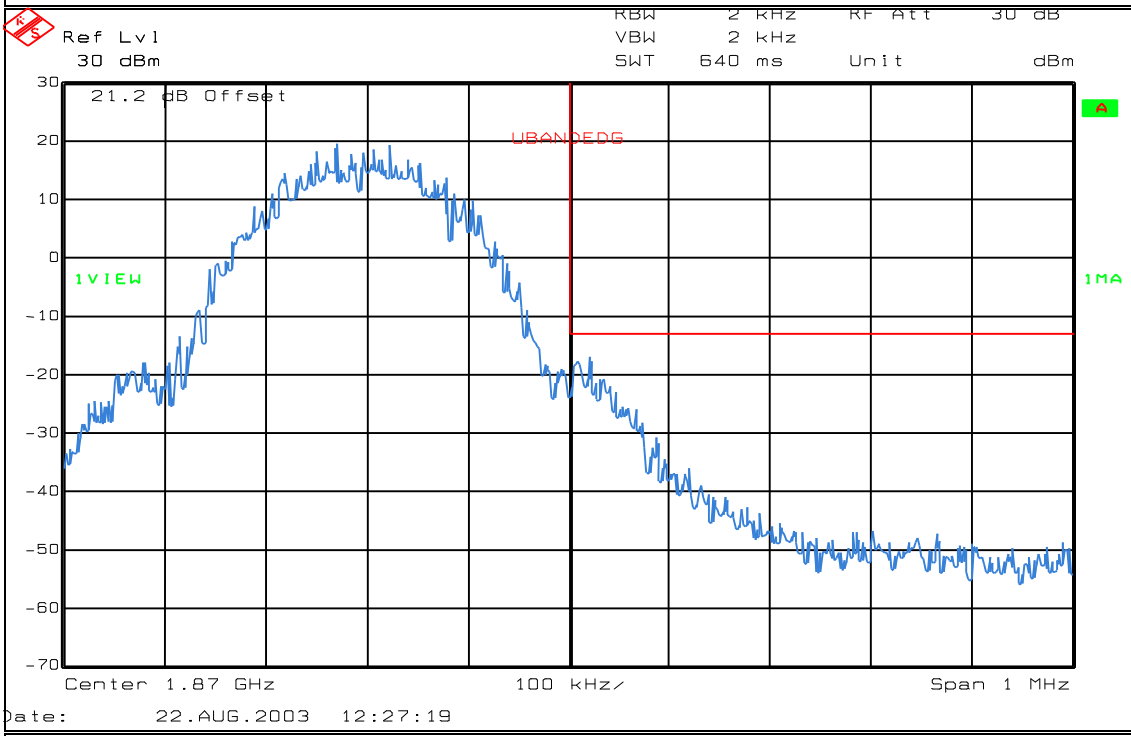
Notes: **D lower band edge**
Channel 587

Test Plots – Spurious Emissions at Antenna Terminals

Data Plot **Bandedges**

Page 3 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



Notes: **D upper band edge**
Channel 610

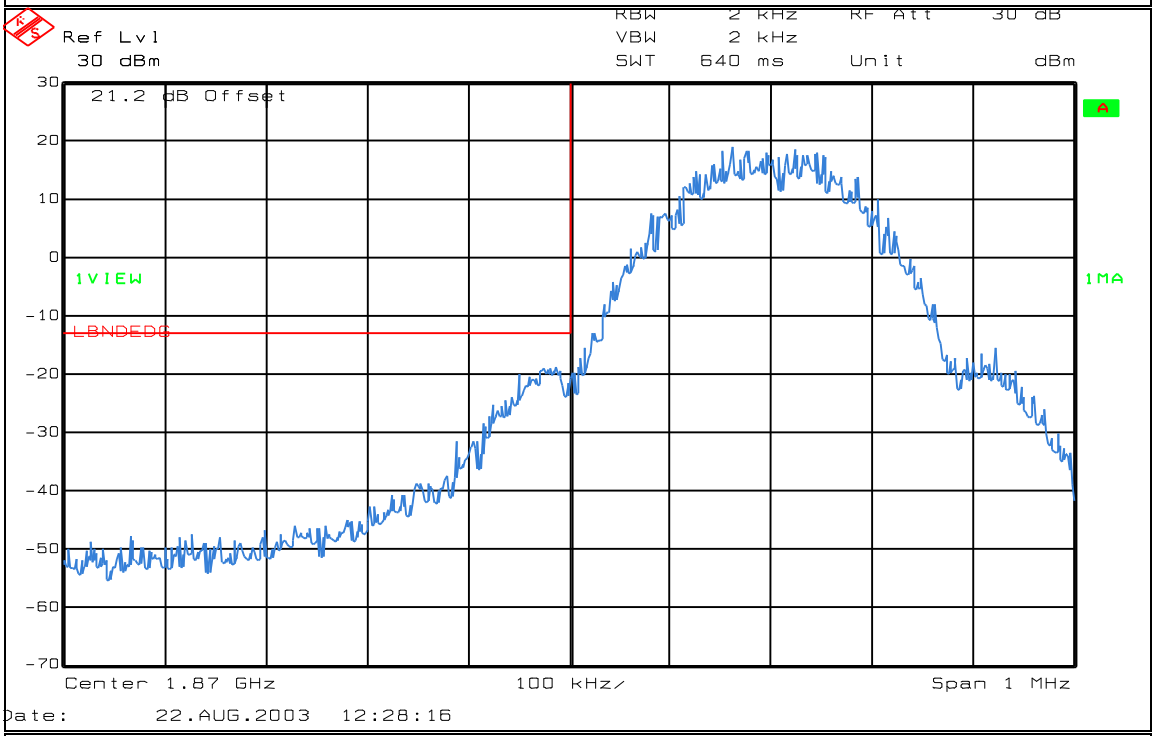
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.

Test Plot: **Bandedges**

Page 4 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



Notes: **B lower band edge**
Channel 612

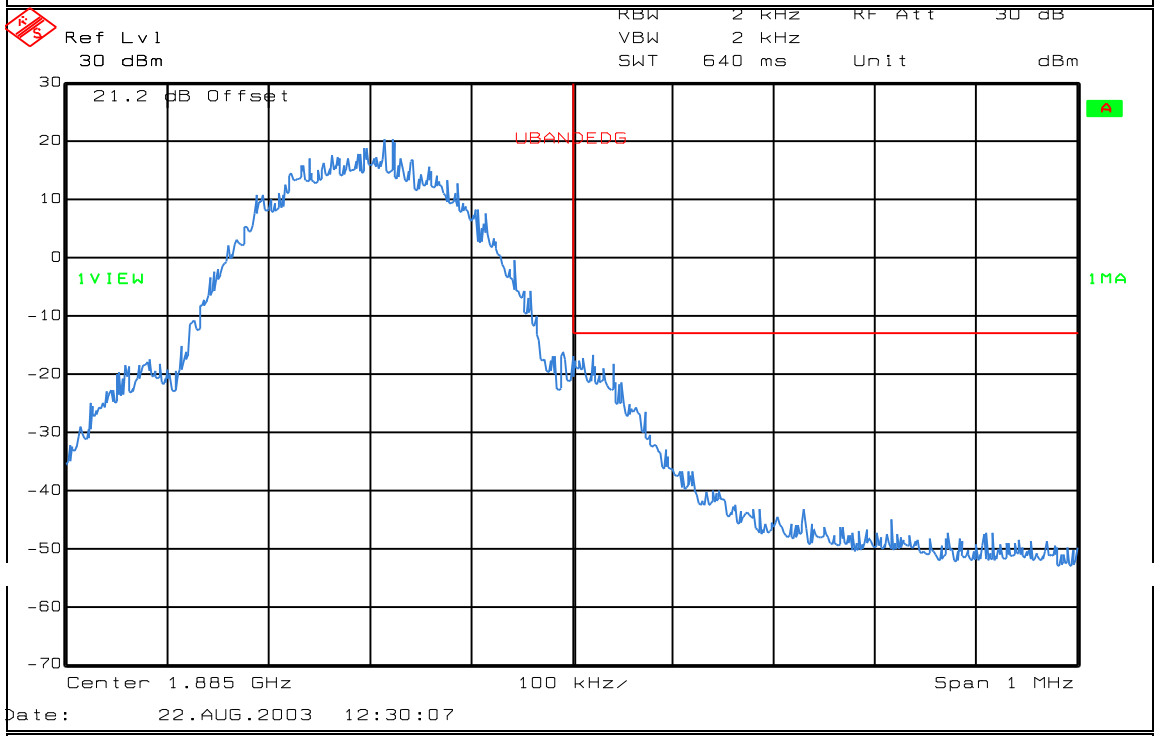
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.

Test Plot: **Bandedges**

Page 5 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



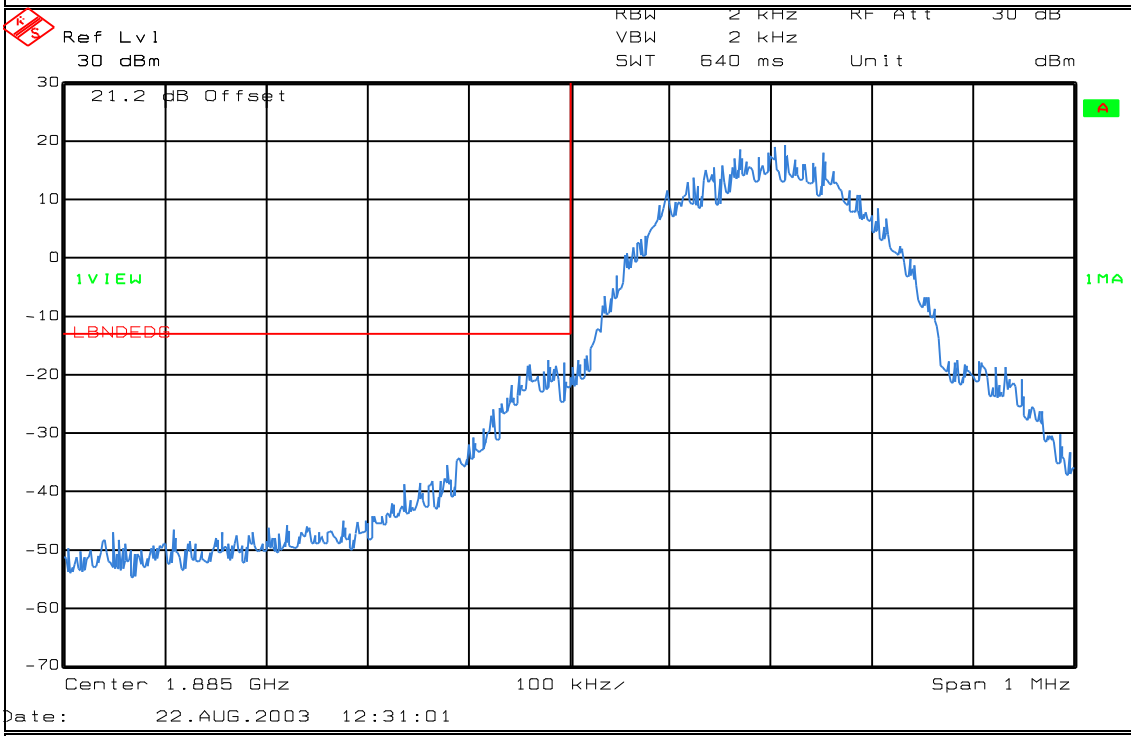
Notes: **B upper band edge**
Channel 685

Test Plots – Spurious Emissions at Antenna Terminals

Test Plot: **Bandedges**

Page 6 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



Notes: **E lower band edge**
Channel 687

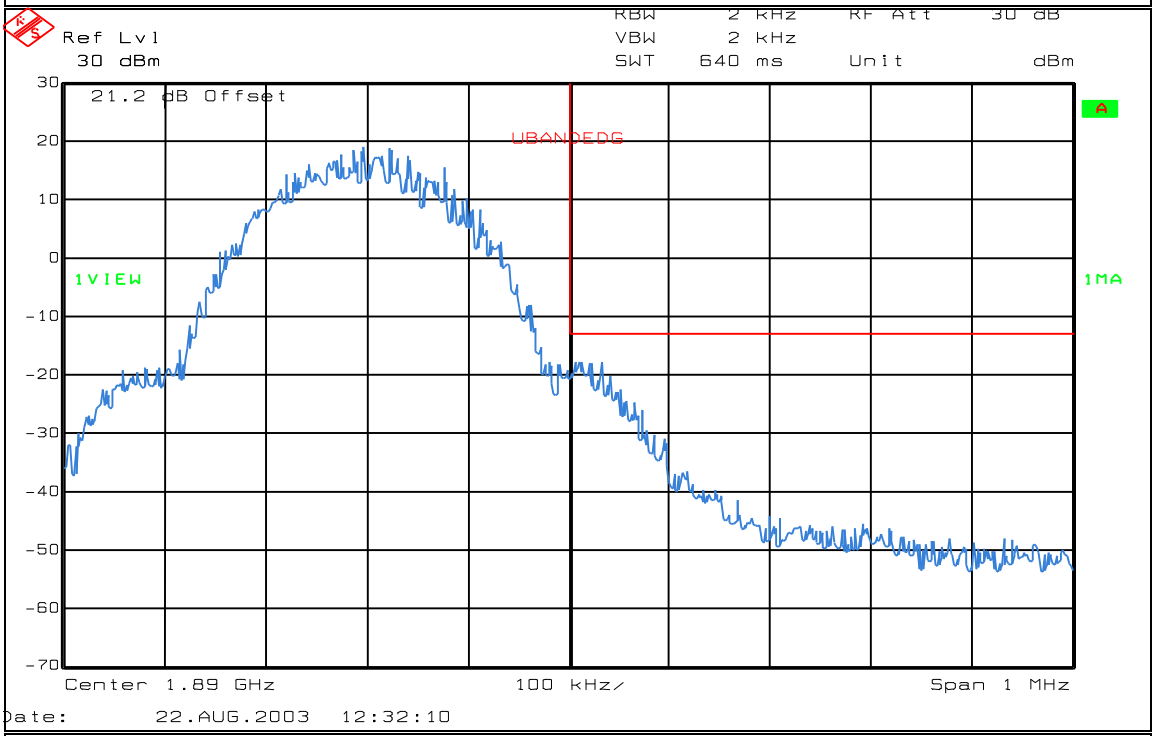
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.

Test Plot: **Bandedges**

Page 7 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



Notes: **E upper band edge.**
Channel 710

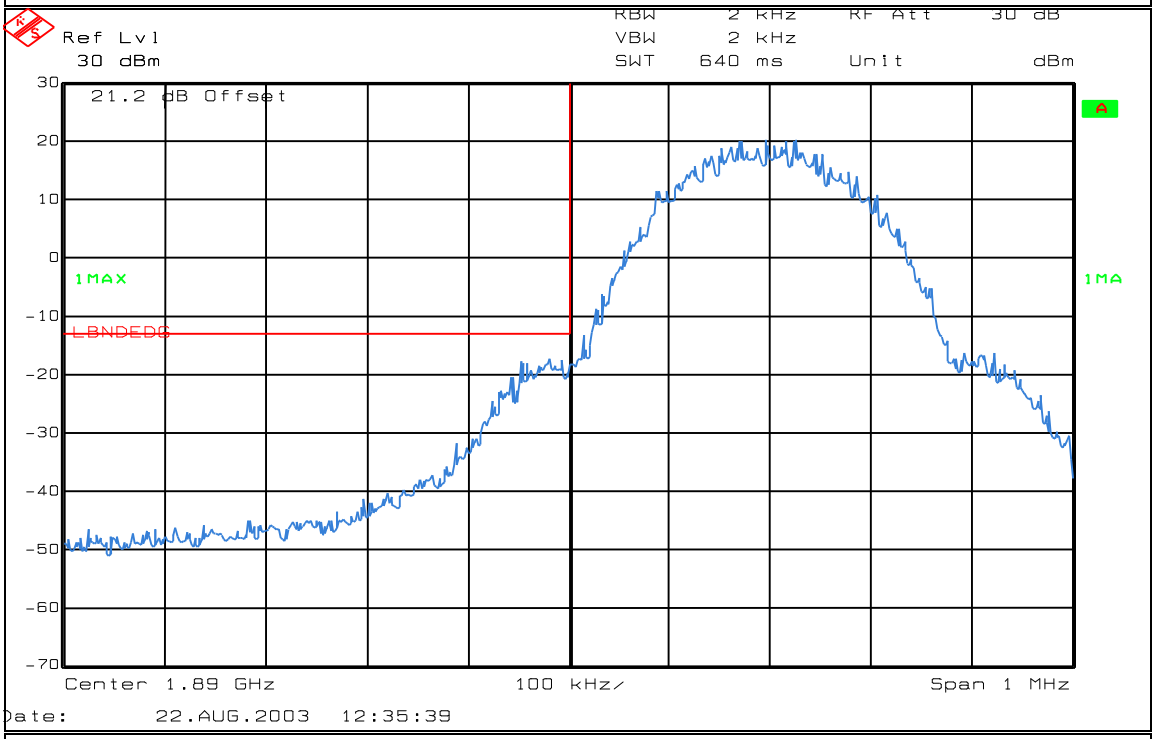
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.

Test Plot: **Bandedges**

Page 8 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



Notes: **F lower band edge.**
Channel 712

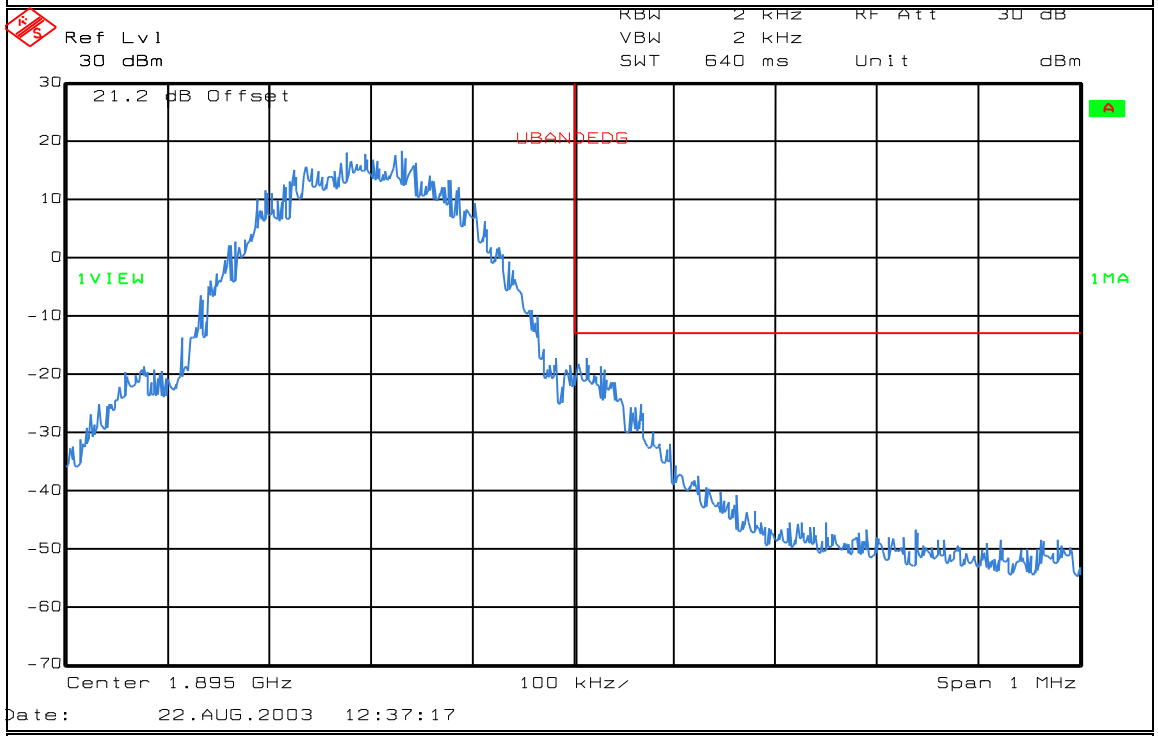
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.

Test Plot: **Bandedges**

Page 9 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



Notes: **F upper band edge**
Channel 735

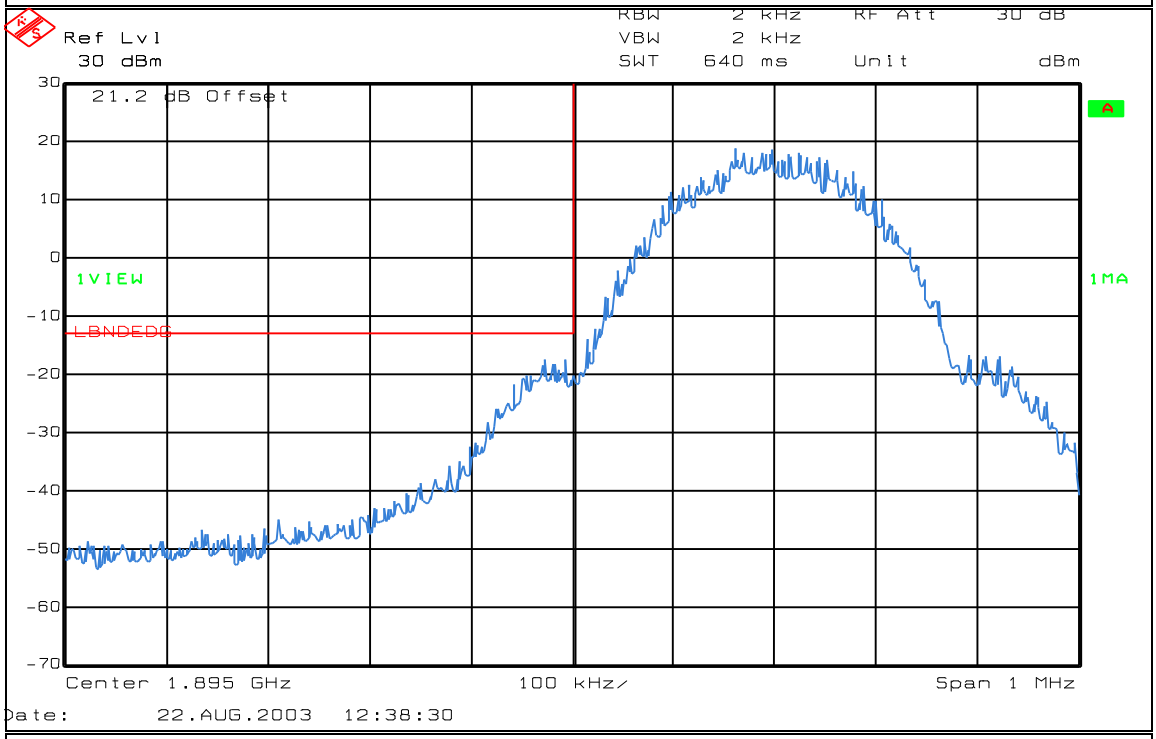
Test Plots – Spurious Emissions at Antenna Terminals

Nemko USA, Inc.

Test Plot: **Bandedges**

Page 10 of 15

Job No.:	2L0477R	Date:	8/22/03
Specification:	FCC Part 24	Temperature(°C):	21
Tested By:	Eldon Berry	Relative Humidity(%)	50
E.U.T.:	GSM0108		
Configuration:	EUT on test fixture.		



Notes: **C lower band edge.**
Channel 737

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.

Test Data - Radiated Emissions

Nemko Dallas, Inc.

EIRP Substitution Method

Page 1 of 1 Complete X

Job No.: 3L0477R Date: 8/22/03 Preliminary

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 Measurement

Detector Type: Peak VBW: 1 MHz 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:

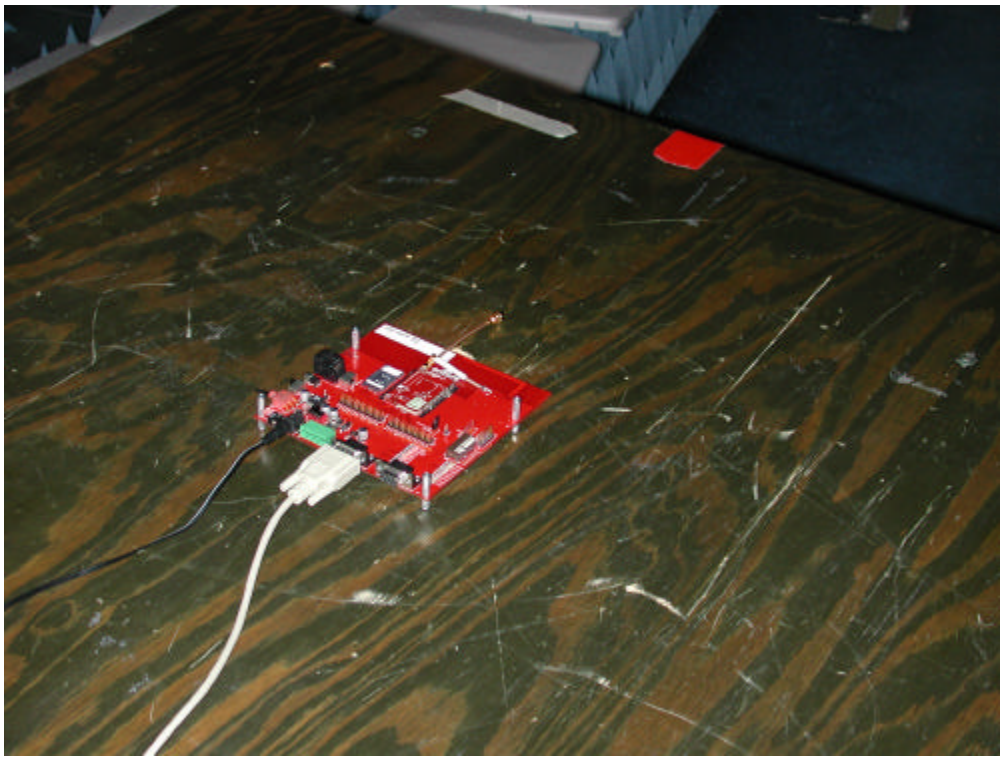
Measurement Uncertainty: +/-1.7 dB

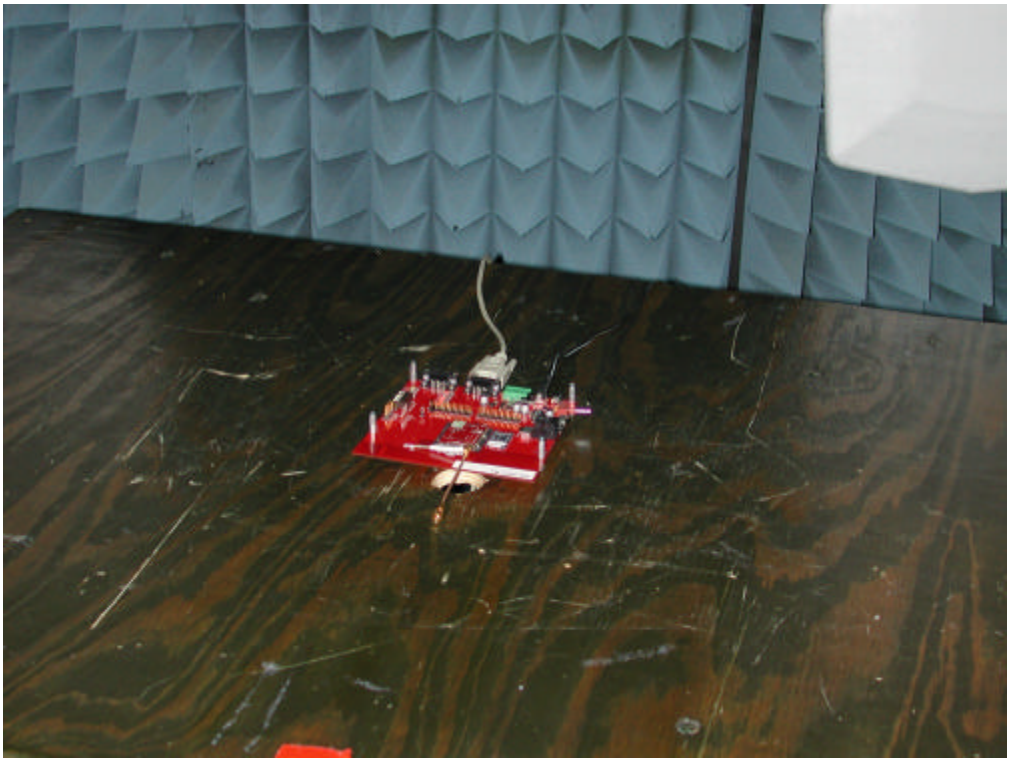
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)		EIRP (dBm)	EIRP (mW)	Polarity	Comments
3760.4	-71.3	43.3		0	10.7		-17.3	0.0188	V	Channel 662
5640.6	-61.0	39.8		28.5	11.4		-38.3	0.0001	V	
7520.8	-62.5	41.8		34.1	11.3		-43.5	0.0000	V	
9401	-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.

Photographs of Test Setup





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

Section 8. Test Equipment List

Nemko ID	Descriptio	Manufacture Model	Serial Number	Calibratio Date	Calibratio 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	ATTENUATO	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

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.

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: ≥ RBW
Span: 5 MHz
Sweep: Auto

GSM Per ANSI/J-STD-007

RBW: 3 kHz
VBW: ≥ RBW
Span: 2 MHz
Sweep: Auto

NADC Per IS-136

RBW: 1 kHz
VBW: ≥ RBW
Span: 1 MHz
Sweep: Auto

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: ≥ 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: ≥ 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: ≥ 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.

NAME OF TEST: Field Strength of Spurious Radiation 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.

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.

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

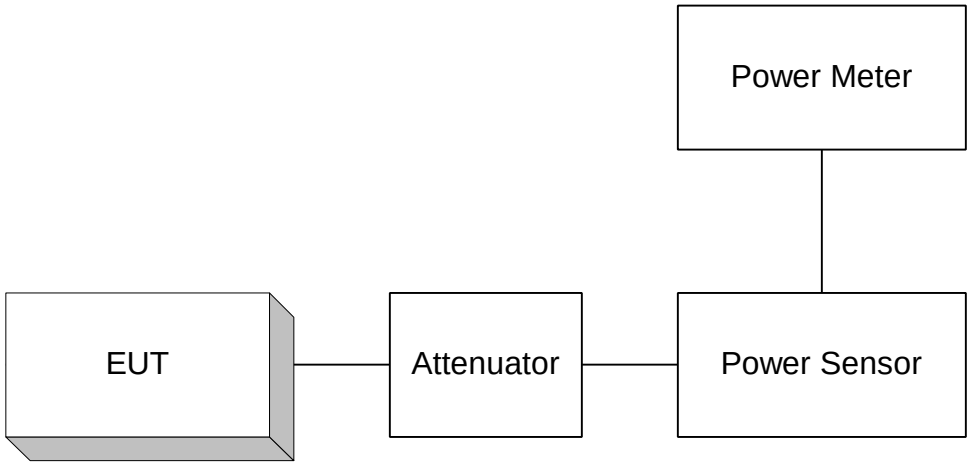
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115%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

Frequency Stability With Temperature Variation

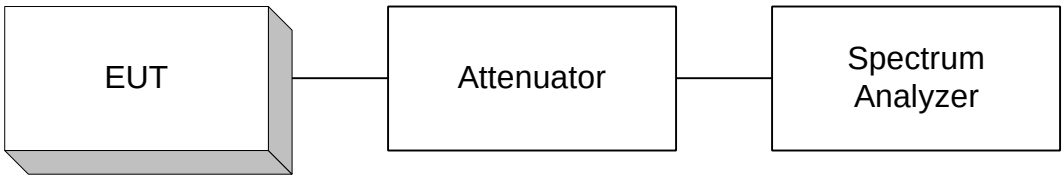
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

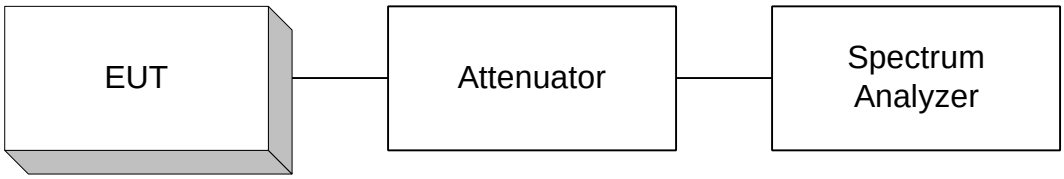
Para. No. 2.1046 - R.F. Power Output



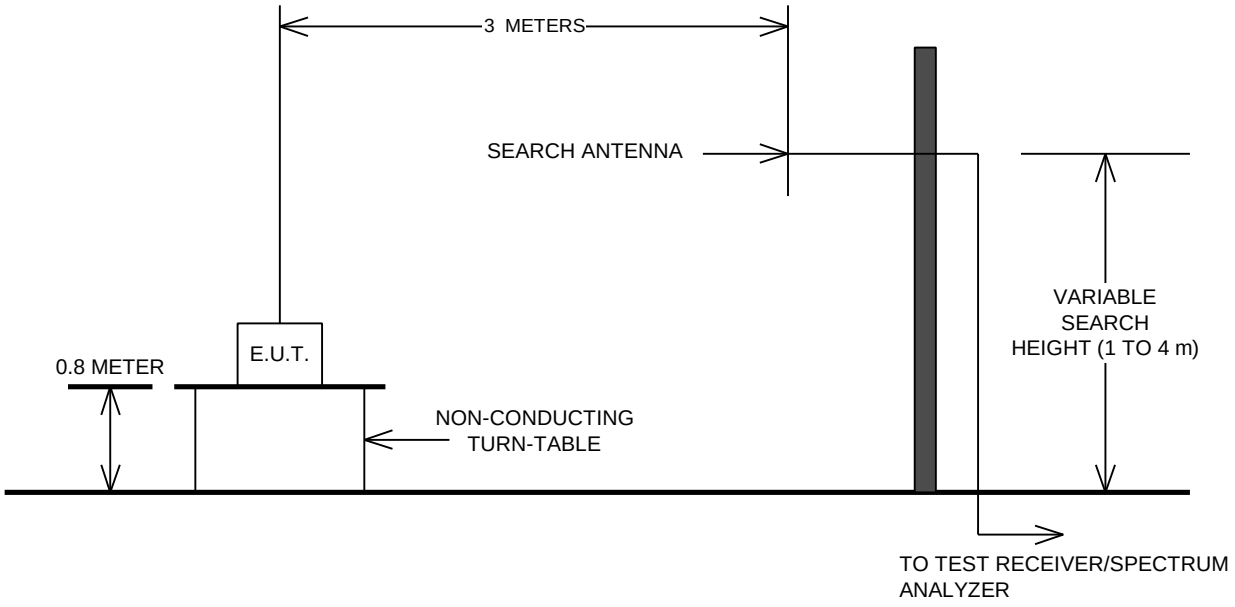
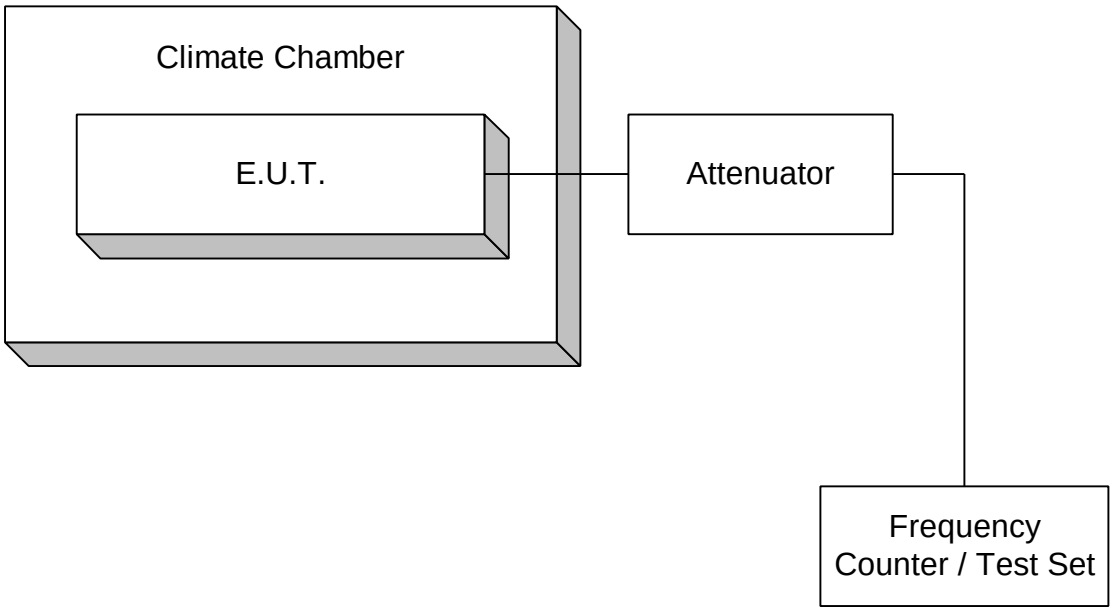
Para. No. 2.1049 - Occupied Bandwidth



Para. No. 2.1053 Spurious Emissions at Antenna Terminals



Para. No. 2.1053- Field Strength of Spurious Radiation



Para. No. 2.1055 - Frequency Stability