

Nemko Test Report: 111264-1TRFWL

Applicant: Amphitech Systems
3440 Francis-Hughes, Suite 120
Laval, Quebec
H7L 5A9

Apparatus: STS-1400

FCC ID: UMN-PSR-1400C

In Accordance With: FCC Part 90 Subpart F
Radiolocation Service

Authorized By:

A handwritten signature in blue ink, appearing to read 'Andrey Adelberg', is positioned above the name.

Andrey Adelberg, EMC/Wireless Specialist

Date: September 24, 2008

Total Number of Pages: 27

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	STS-1400
Specification:	FCC Part 90 Subpart F
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3m Semi-Anechoic Chamber)
Tests Performed By:	Jason Nixon, Wireless/Telecom Specialist
Test Dates:	August 25 to September 5, 2008

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	Perimeter radar system
Brand Name:	STS-1400
Model Name or Number:	921-0011-05-R0A
Serial Number:	SN08070001
Nemko Sample Number:	1
FCC ID:	UMN-PSR-1400C
Date of Receipt:	August 25, 2008

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	Laptop
Brand Name:	HP
Model Name or Number:	Pavilion zv5000
Part Number:	PR450UA#ABL
Serial Number:	CND5110R82
Nemko Sample Number:	2
Connection Port:	Ethernet
Cable Length:	3m

Description:	DC Power Supply
Brand Name:	Tektronix
Model Name or Number:	PS280
Serial Number:	PS280TW60769
Nemko Asset Number:	FA001528

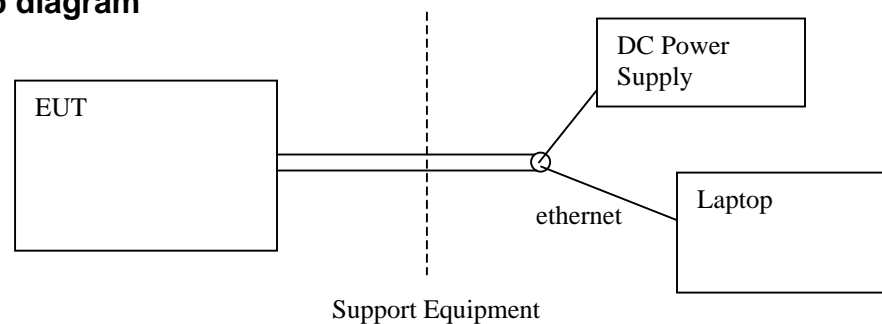
2.3 EUT Description

The EUT is a perimeter radar system, which rotates through 360° to indicate any objects within its scan range.

2.4 Technical Specifications of the EUT

Operating Band:	33.4-36.0GHz
Operating Frequency:	35GHz +/- 250MHz
LO Frequency:	17.5GHz
Modulation:	Swept frequency
Emission Designator:	N0N
Antenna Data:	32dBi bi-static antenna
Power Supply Requirements:	28VDC

2.5 EUT Setup diagram



2.6 Operation of the EUT during testing

During testing the sweeping modulation was stopped using software commands.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 2 Subpart J, Equipment Authorization Procedures
FCC Part 90 Private Land Mobile Radio Services

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 °C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

3.4 Measurement Uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95% and can be found in Nemko Canada document MU-003.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
3m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/08	May 06/09
Bilog	Sunol	JB3	FA002108	Jan. 21/08	Jan. 21/09
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR	NCR
Controller	Sunol	SC104V	FA002060	NCR	NCR
Mast	Sunol	TLT2	FA002061	NCR	NCR
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 07/07	Dec. 07/08
50 Coax cable	HUBER + SUHNER	None	FA002015	Aug. 05/08	Aug. 05/09
50 Coax cable	HUBER + SUHNER	None	FA002022	July 07/08	July 07/09
50 Coax cable	HUBER + SUHNER	None	FA002074	July 07/08	July 07/09
Horn Antenna #2	EMCO	3115	FA000825	Jan. 15/08	Jan. 15/09
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 2/07	Oct 2/08
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU	COU
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	May 12/08	May 12/09
Mixer/Antenna (40-60GHz)	Olsen	M19HWA	FA001523	VOU	VOU
Mixer/Antenna (60-90GHz)	Olsen	M12HWA	FA001524	VOU	VOU
Mixer/Antenna (90-140GHz)	Olsen	M08HWA	FA001525	VOU	VOU
Mixer/Antenna (140-220GHz)	Olsen	M05HWA	FA001526	VOU	VOU
Harmonic Generator	Olsen	40200WGS	FA001546	VOU	VOU
Frequency Counter	HP	5352B	FA001915	Dec 3/07	Dec 3/08
Temperature Chamber	Thermotron	SM-16C	FA001030	NCR	NCR
Multimeter	Fluke	16	FA001831	Jan 14/08	Jan 14/09
Air probe	Fluke	None	FA001248	NCR	NCR
Spectrum Analyzer	Rohde & Schwarz	FSP40	FA001920	April 14/08	April 14/09
Signal Generator	Rohde & Schwarz	SMR40	FA001879	Aug 13/08	Aug 13/09
Spectrum Analyzer	Hewlett-Packard	8564E	FA001367	May 09/07	Nov 9/08

COU – Calibrate on Use

NCR – No Calibration Required

VOU – Verify On Used

Section 4 : Results Summary

This section contains the following:

FCC Part 90 Subpart F : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No : not applicable / not relevant.

Y Yes : Mandatory i.e. the apparatus shall conform to these tests.

N/T Not Tested, mandatory but not assessed. (See Report Summary)

4.1 FCC Part 90 Subpart F : Test Results

Clause	Test Description	Required	Result
1.1310(a)	Limits for Occupational/Controlled Exposure	N	
1.1310(b)	Limits for General Population/Uncontrolled Exposure	Y	PASS
2.1046	Output Power	Y	PASS
2.1047	Modulation Characteristics	N	
2.1049	Occupied Bandwidth	Y	PASS
2.1051	Spurious Emissions at the antenna terminal	Y	PASS
2.1053	Field strength of spurious radiations	Y	PASS
2.1055	Frequency stability	Y	PASS

Appendix A : Part 90 Subpart F Test Results

Clause 1.1310(b) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	-	-	f/1500	30
1500–100,000	-	-	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Test Results: See Attached tabular data.

Additional Observations:

Measurements were performed with rotation stopped and the swept frequency modulation enabled.

Measurements were performed at the radome of the EUT and back up to 30cm from the radome.

The isotropic probe was rotated 360° and only the highest measurement was reported. The EUT was also investigated by tilting the transmit antenna up and down to maximize the power density.



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Transmit power was measured before and after the RF exposure evaluation. It was performed with a spectrum analyzer set to Peak Max-Hold and a 1MHz RBW/3MHz VBW. The results can be found in Clause 2.1046.

Power density:

Distance from Radome	Measured Power density	Rotation Correction factor	Average power density	Limit
0cm	1.885mW/cm ²	0.283	0.533mW/cm ²	1mW/cm ²
5cm	1.687mW/cm ²	0.226	0.381mW/cm ²	1mW/cm ²
10cm	1.525mW/cm ²	0.189	0.288mW/cm ²	1mW/cm ²
20cm	1.123mW/cm ²	0.141	0.158mW/cm ²	1mW/cm ²
30cm	0.843mW/cm ²	0.113	0.095mW/cm ²	1mW/cm ²

Rotation Correction Factor:

$$\left(\frac{a}{2\pi d} \right) \times \frac{360}{\theta}$$

where a = length of antenna = 0.3556m

d = distance from antenna = 0.2m at the edge of the Radome

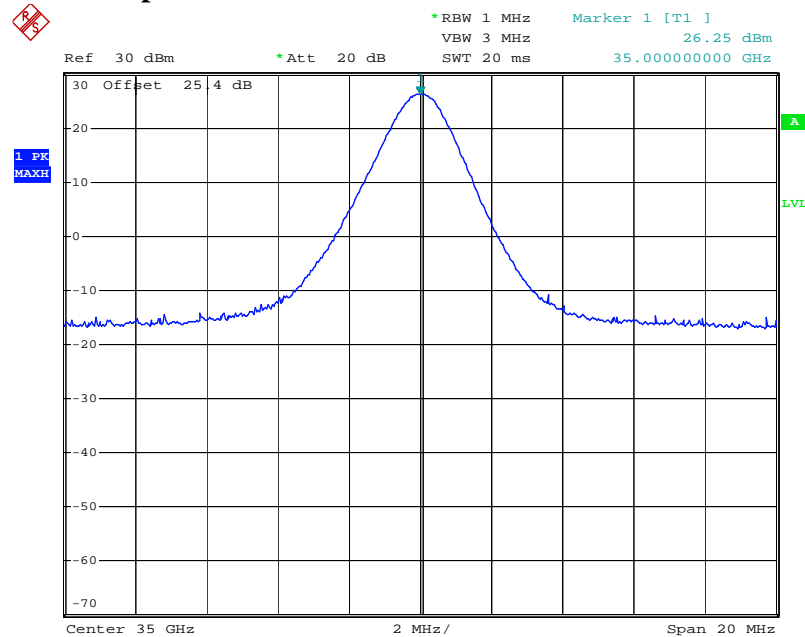
θ = scan angle = 360° for full turn

Clause 2.1046 Output Power

Test Results: Pass

Before exposure measurements	26.25dBm
After exposure measurements	27.01dBm

Before exposure measurements:



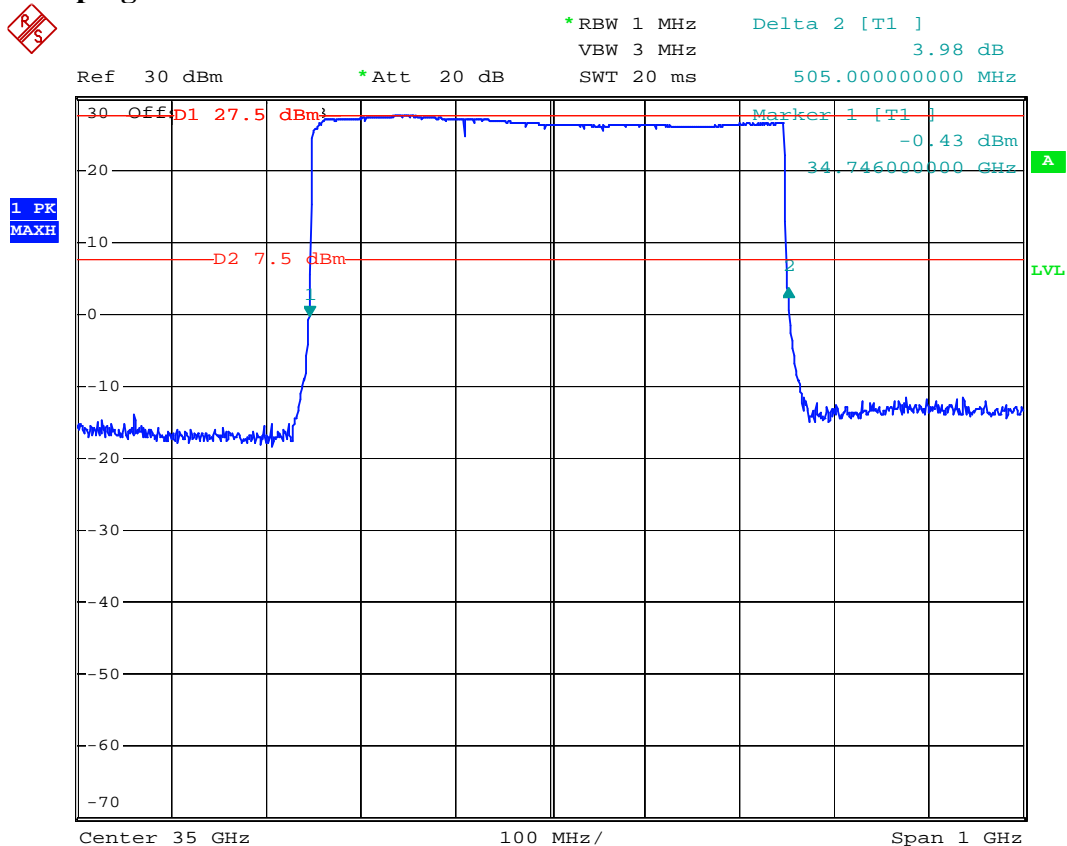
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Note: Output power was tested with the sweeping turn off.

Clause 2.1049 Occupied Bandwidth

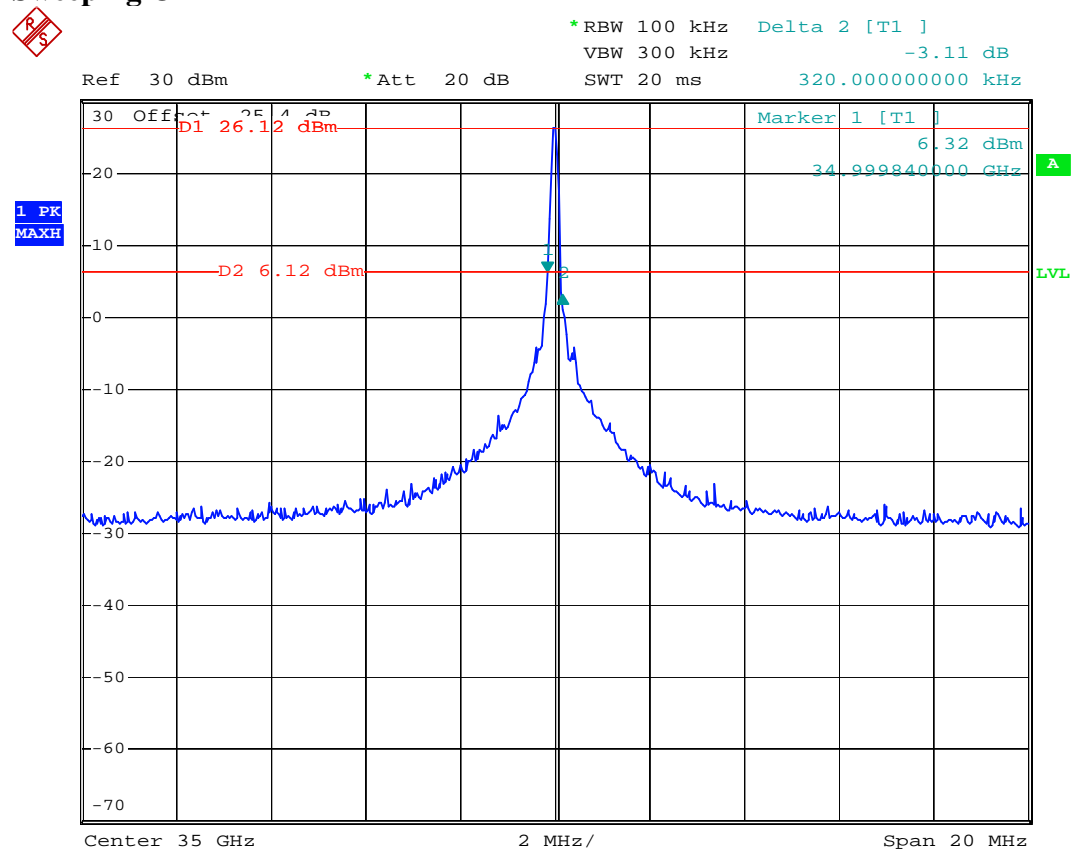
Test Results: Pass

Sweeping On



Date: 25.AUG.2008 10:05:14

Sweeping Off



Date: 27.AUG.2008 09:04:08



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Clause 2.1051 Spurious emissions at the antenna terminal

Attenuated by $43+10\log P$

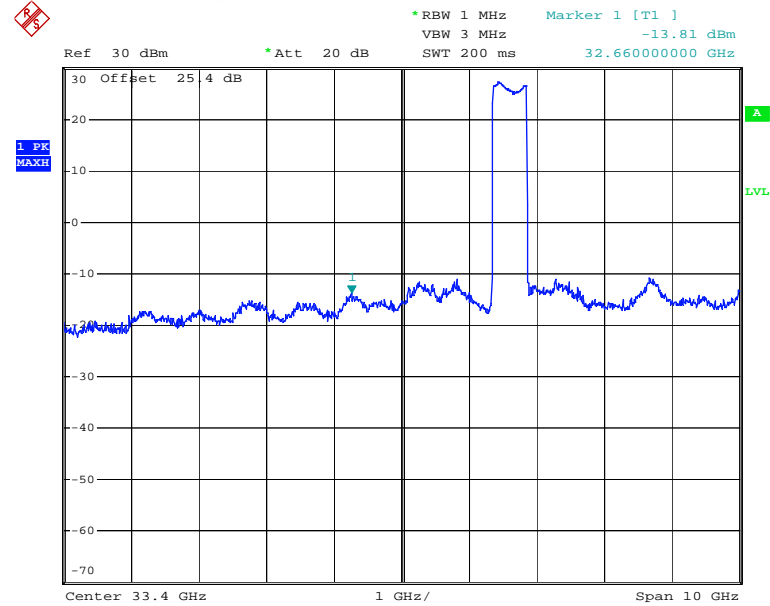
Test Results: Pass

Additional Observations:

The spectrum was searched from 30MHz to 220GHz.

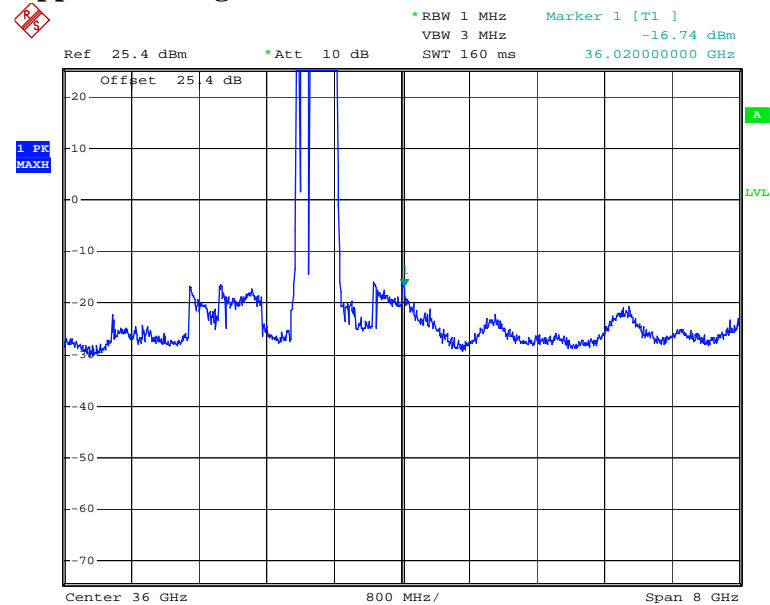
Except for the bandedge requirements the frequency sweeping was turned off.

Lower Bandedge

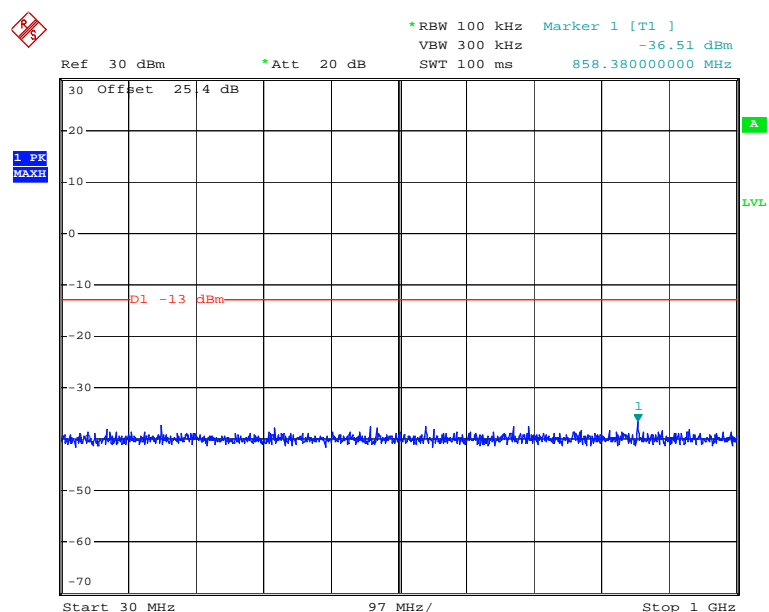


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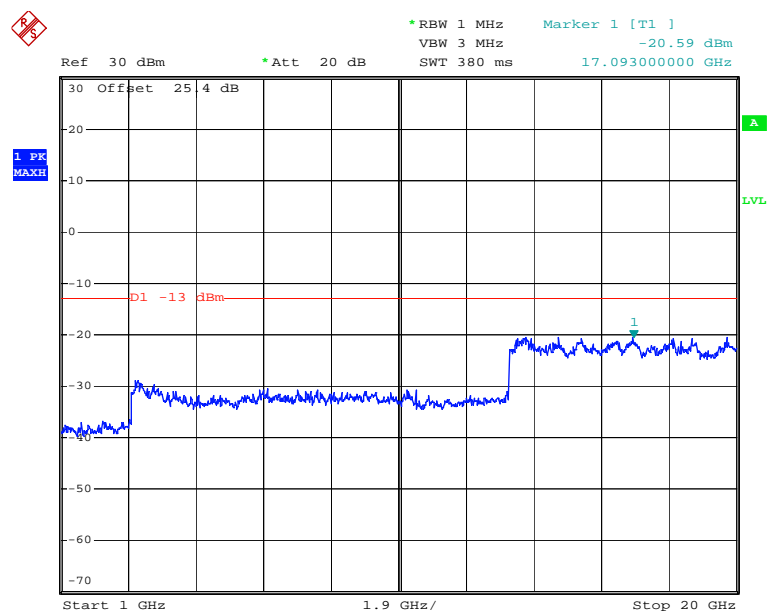
Upper Bandedge



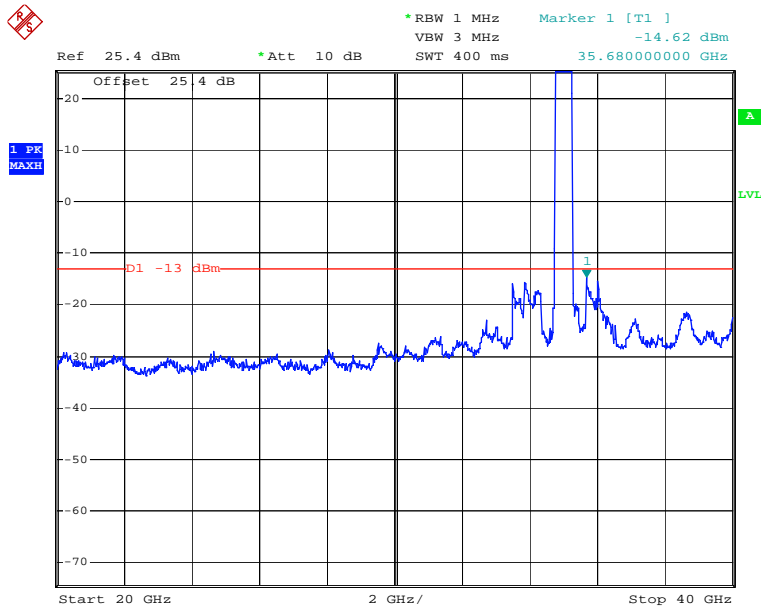
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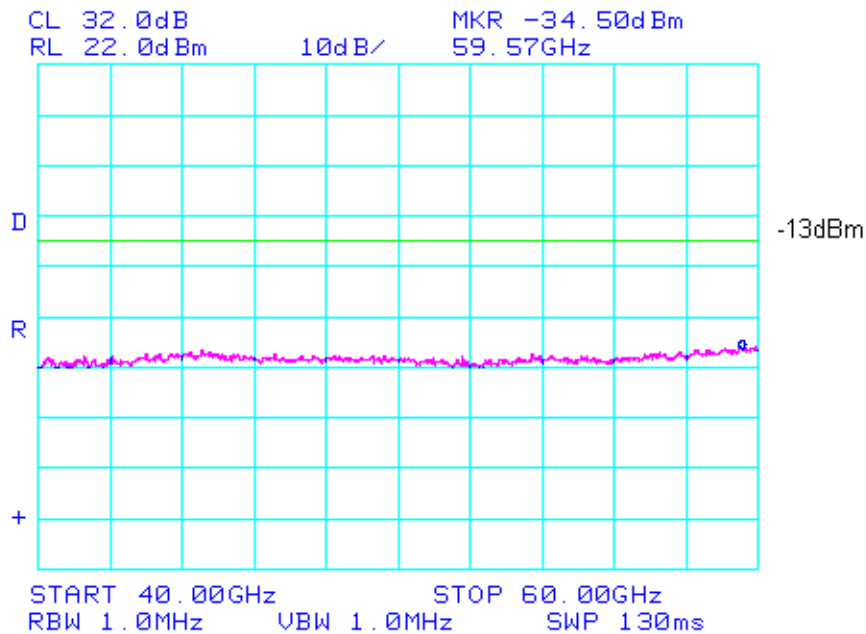
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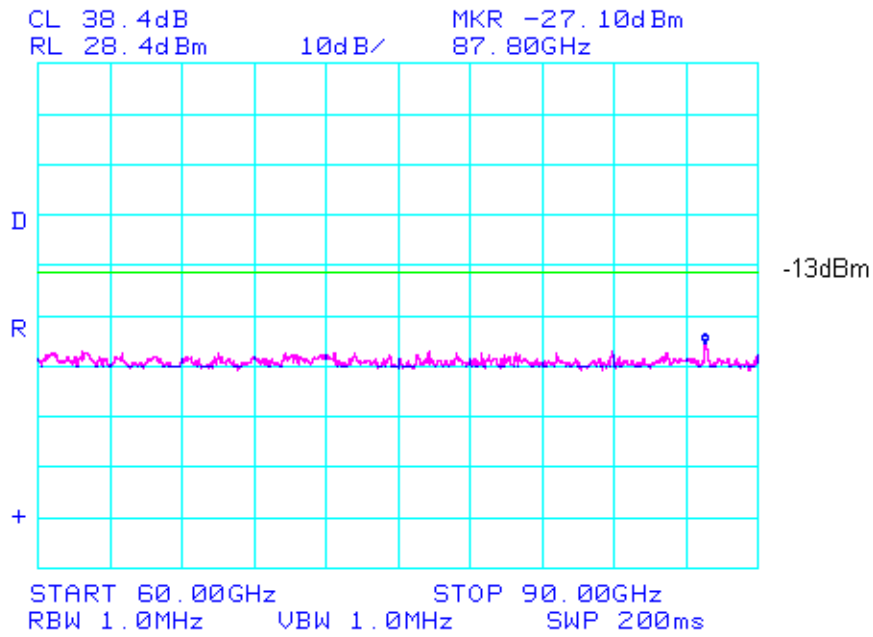


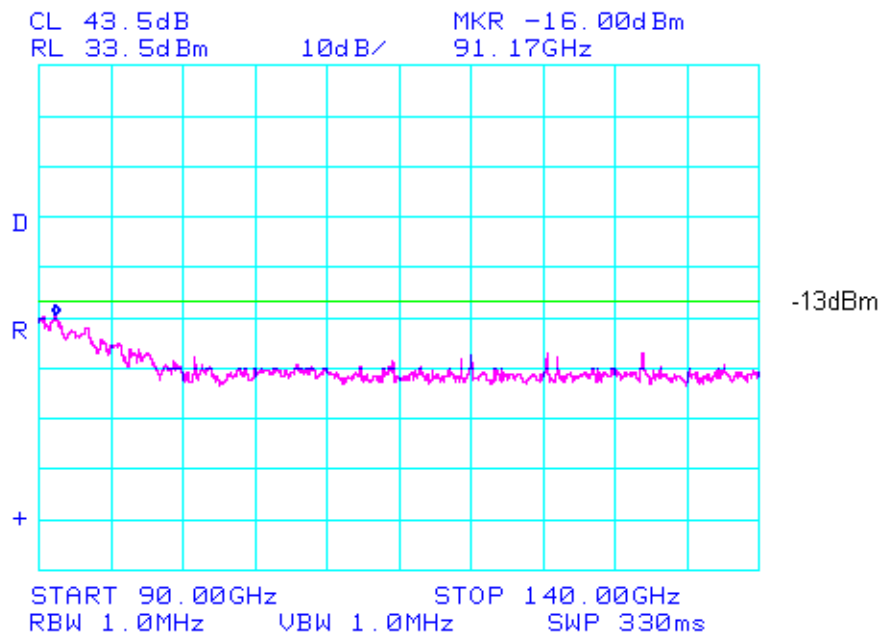
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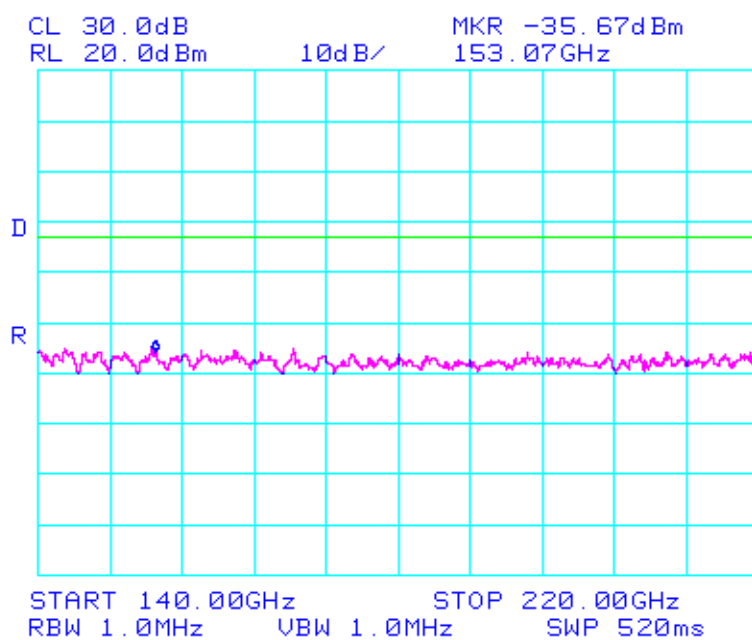


Date: 28.AUG.2008 06:48:18











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Clause 2.1053 Field Strength of spurious radiation

Attenuated by $43+10\log P$

Test Results: Pass

Additional Observations:

The Spectrum was searched from 30MHz to 200GHz.

All measurements were performed using a Peak Detector with 100kHz RBW/VBW below 1GHz and a 1MHz RBW/VBW above 1GHz at a distance of 3 meters.

Measurements above 1GHz were performed at 1m. Measurements above 18GHz were performed at 30cm.

All measurements were performed with frequency sweeping turned off.



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Frequency (GHz)	Pol.	Measured value	Signal Substitution	Antenna Gain	Emission level (EIRP)	Emission level (ERP)
5.60125	V	-48.96dBm	-59.75dBm	11.3dBi	-48.45dBm	-50.60dBm
5.60125	H	-49.91dBm	-59.75dBm	11.3dBi	-48.45dBm	-50.60dBm
17.5	V	-40.34dBm	-36.38dBm	11.6dBi	-24.78dBm	-26.93dBm
17.5	H	-43.31dBm	-38.41dBm	11.5dBi	-26.91dBm	-29.06dBm

Measurement method:

- 1) Detect emissions using Spectrum analyzer, amplifier and horn.
- 2) Replace EUT with a calibrated antenna and signal generator.
- 3) Recreate the emission detected.
- 4) Measure level being injected to the antenna.
- 5) Add the antenna gain at the detected frequency to the level injected.

Clause 2.1055 Frequency Stability

Test Results: Pass

Condition	Frequency (Hz)	Offset (ppm)
+50°C, Nominal	35000023837	1.20
+40°C, Nominal	34999991066	0.26
+30°C, Nominal	34999974715	-0.20
+20°C, +15%	34999979114	-0.08
+20°C, Nominal	34999981836	—
+20°C, -15%	34999978646	-0.09
+10°C, Nominal	34999977294	-0.13
0°C, Nominal	34999978729	-0.09
-10°C, Nominal	34999985779	0.11
-20°C, Nominal	34999995638	0.39
-30°C, Nominal	34999989591	0.22

Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:

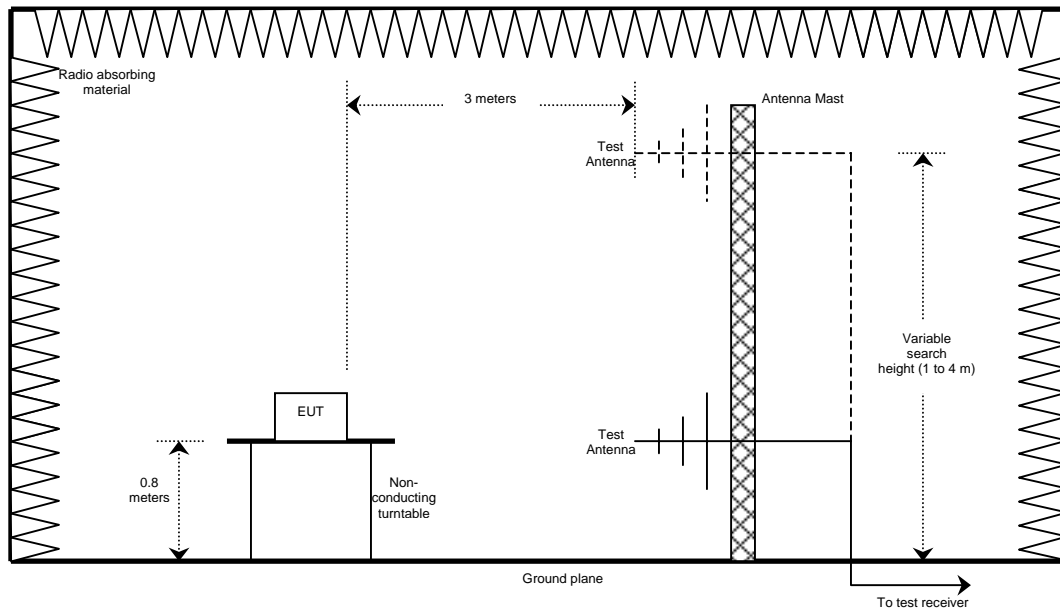


RF Exposure Setup:

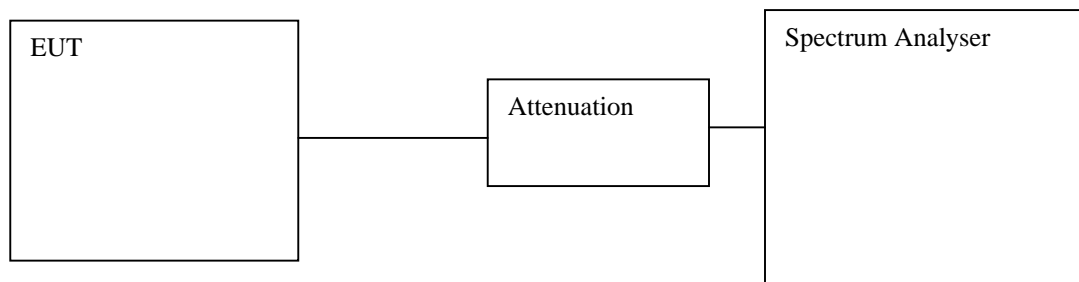


Appendix C : Block Diagram of Test Setups

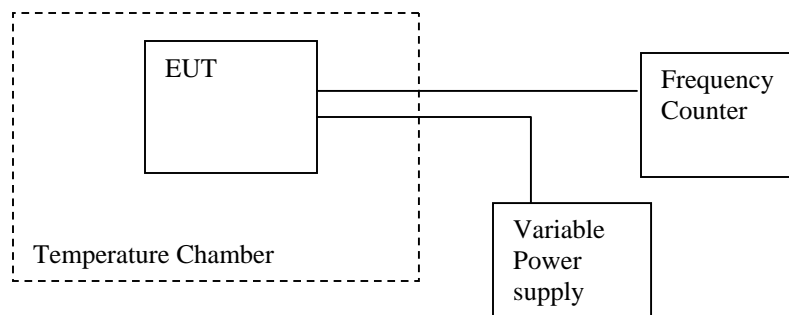
Test Site For Radiated Emissions



Conducted Emissions, Output power, Occupied Bandwidth



Frequency Stability



Appendix D : Extrapolation Demonstration

The following plot is a demonstration of the extrapolation factors when the measurement results are plotted against inverse linear and square law.

This plot is for demonstrational purposes only.

