

# **ELECTRONICS TEST CENTRE**

**MPB TECHNOLOGIES INC.**

Unit 100, 302 Legget Drive  
Ottawa, Ontario, K2K 1Y5  
Canada

## **FCC REPORT ON**

**IDBlue(tm) Wireless RFID Reader  
FCC ID: SW4IBRF001LBT**

**IN ACCORDANCE WITH**

**FCC Part 15 Subpart C Section 225 (July 12<sup>th</sup>, 2004)**

**MPBT Report No.: C84R1520**

**Customer P.O. No.: 28092004-01**

Test Personnel: Scott Drysale

Prepared for:  
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Client Acceptance  
Authorized Signatory

Date: May 18, 2005

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Electronic Test Centre  
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Reviewed By



## TABLE OF CONTENTS

<b>1.0 INTRODUCTION .....</b>	<b>3</b>
1.1 SCOPE .....	3
1.2 APPLICANT .....	3
1.3 APPLICABILITY .....	3
1.4 TEST SAMPLE DESCRIPTION .....	3
1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS .....	4
1.6 SCOPE OF TESTING .....	4
1.6.1 VARIATIONS IN TEST METHODS .....	4
1.6.2 TEST SAMPLE MODIFICATIONS .....	4
<b>2.0 TEST CONCLUSION .....</b>	<b>5</b>
2.1 CARRIER LEVEL / EMISSION MASK .....	8
2.1.1 EMISSION MASK - DATA .....	9
2.1.2 EMISSION MASK SETUP .....	11
2.2 UNWANTED EMISSIONS .....	14
2.2.1 UNWANTED EMISSIONS – DATA .....	15
2.2.2 UNWANTED EMISSIONS – SETUP .....	23
2.3 FREQUENCY STABILITY .....	28
2.3.1 FREQUENCY STABILITY DATA .....	29
2.3.2 FREQUENCY STABILITY SETUP .....	33
2.4 MAXIMUM PERMISSIBLE EXPOSURE .....	35
2.5 CONDUCTED EMISSIONS (AC MAINS) .....	36
2.5.1 POWER LINE CONDUCTED EMISSIONS DATA .....	37
2.5.1.1 Line 1 120 Vac, 60 Hz Data .....	37
2.5.1.2 Line 2 120 Vac, 60 Hz Data .....	38
2.5.2 POWER LINE CONDUCTED EMISSIONS SETUP .....	39
<b>3.0 TEST FACILITY .....</b>	<b>41</b>
3.1 LOCATION .....	41
3.2 GROUNDING PLAN .....	41
3.3 POWER .....	41
3.4 TEST CONFIGURATION .....	42
3.4.1 TABLE TOP EQUIPMENT .....	42
3.5 SAMPLE CALCULATIONS .....	43
<b>4.0 TEST EQUIPMENT .....</b>	<b>44</b>
4.1 RADIATED EMISSIONS .....	44
4.2 CONDUCTED EMISSIONS .....	44
4.3 EMI SPECTRUM ANALYZER AND RECEIVER .....	44
4.3.1 SPECTRUM ANALYZER RANGE 1 of 2 .....	44
4.3.2 SPECTRUM ANALYZER RANGE 2 of 2 .....	44
4.3.3 RECEIVER .....	44
APPENDIX A - CLIENT SAMPLE DESCRIPTION .....	45
APPENDIX B - TEST EQUIPMENT REPORT .....	47

## 1.0 **INTRODUCTION**

### 1.1 **SCOPE**

The purpose of this report is to present the findings and results of compliance testing performed, in accordance with FCC Part 15 Subpart C (July 12<sup>th</sup> 2004).

### 1.2 **APPLICANT**

This test report has been prepared for Cathexis Innovations Inc.

### 1.3 **APPLICABILITY**

All test procedures, limits, and results defined in this document apply to the which shall be referred to herein as the Equipment Under Test (**EUT**).

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by NVLAP or the Canadian or US governments.

### 1.4 **TEST SAMPLE DESCRIPTION**

The test sample provided for testing is as described below.

Product Type:	Prototype
Serial Number:	
Model Number:	IB-RF0011-BT
FCC ID:	SW4IBRF001LBT
Cables:	None – Wireless
Power Requirements:	Rechargeable battery
Peripheral Equipment:	HP2200 Ipaq PDA
	S/N: TWC4030BXQ
	FCCID#: NM8GREATWALLA
	IC #: 466Q-PE2050A
	CE #: CE0682

## **1.5 GENERAL TEST CONDITIONS AND ASSUMPTIONS**

The EUT was setup and exercised using the configurations, modes of operation and arrangements as defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

All testing, unless otherwise noted, was performed under the following environmental conditions:

Temperature: 17 to 23 °C

Humidity: 45 to 75 %

Barometric Pressure: 68 to 106 kPa

## **1.6 SCOPE OF TESTING**

Tests were performed in accordance with ANSI 63.4:2003.

### **1.6.1 VARIATIONS IN TEST METHODS**

There were no variations from the test procedures outlined above.

### **1.6.2 TEST SAMPLE MODIFICATIONS**

There were no test sample modifications.

**2.0 TEST CONCLUSION**

The EUT was subjected to the following tests. Compliance is designated by a **PASS**; non-compliance by a **FAIL**.

The following table summarizes the test results and details the tests performed in terms of the specification and class or level applied, the unique test sample identification, and the EUT modification state, the mode of operation, configuration and cable arrangement (if applicable).

Test Case	Test Type	Specification	Mod State	ENG./ QUAL	Result / Justification
2.1	Carrier level / Emission mask	FCC part 15.225(a),(b),(c)	Tx on	QUAL	<b>Pass</b>
2.2	Unwanted/ Spurious Emissions	FCC part 15.225(d)	Tx on	QUAL	<b>Pass</b>
2.3	Frequency stability	FCC part 15.225(e)	Tx on	QUAL	<b>Pass</b>
2.3	Unwanted Emissions	FCC part 15.209	Tx on	QUAL	<b>Pass</b>
2.4	MPE – Mobile Transmitters	FCC part 2.1091	N/R	N/R	Justification 1
2.5	Conducted Emissions	FCC part 15.207	Charging	N/R	Justification 2

**STATEMENT OF COMPLIANCE**

The client equipment referred to in this report was found to comply with the requirements as stated above.

**Justifications.**

1. This test is categorally excluded, or not required, as per 2.1091(c). As it is not any of the below:
  - a) authorized under subpart H of part 22 , part 24, part 25, part 26, part 27, part 80 or part 90 of the FCC regulations.
  - b) Operating at frequencies of 1.5 GHz or below and the effective radiated power (ERP) is 1.5 watts or more
  - c) Operating at frequencies above 1.5 GHz and their ERP is 3 watts or more.
  - d) Unlicensed personal communications service devices, unlicensed millimeter wave devices and unlicensed NII devices authorized under 15.253, 15.255, and subparts D and E of part 15 of the FCC regulations with ERP of 3 watts or more or if they meet the definition of a portable device as specified in FCC part 2.1093 (b) requiring evaluation under the provisions of that section.
  - e) Meeting provisions of 1.1307(c) or 1.1307(d) of the FCC regulations.
  
2. This test is not required as the EUT operates on a rechargeable battery. The EUT firwire is such that if the EUT senses the AC charger plugged in, the EUT while only allow a charging mode which has no transmit/receive functionality. The end-user documentation states the EUT can not operate while the adapter is plugged in. For information purposes only this test was performed with the EUT in charging mode with a representative AC adapter plugged in to the EUT.

**ABBREVIATIONS**

CE - Conducted Emissions	H-Field - Magnetic Field
CS-Conducted Susceptibility(Immunity)	N/T - Not Tested
ESD - Electrostatic Discharge	N/A - Not Applicable
EFT - Electrical Fast Transient Burst	RE - Radiated Emissions
E-Field - Electric Field	RS- Radiated Susceptibility(Immunity)

**MEASUREMENT UNCERTAINTY**

The following measurement uncertainty with 95% confidence level was calculated using the methods defined in NAMAS document NIS81: May 1994.

For Radiated E-Field Emissions

- Frequency =  $\pm$  1kHz
- Amplitude =  $\pm$  4.01 dB

For Conducted Emissions

- Frequency =  $\pm$   $1 \times 10^{-3}$  MHz
- Amplitude =  $\pm$  3.25 dB

For Frequency Stability /Temperature accuracy.

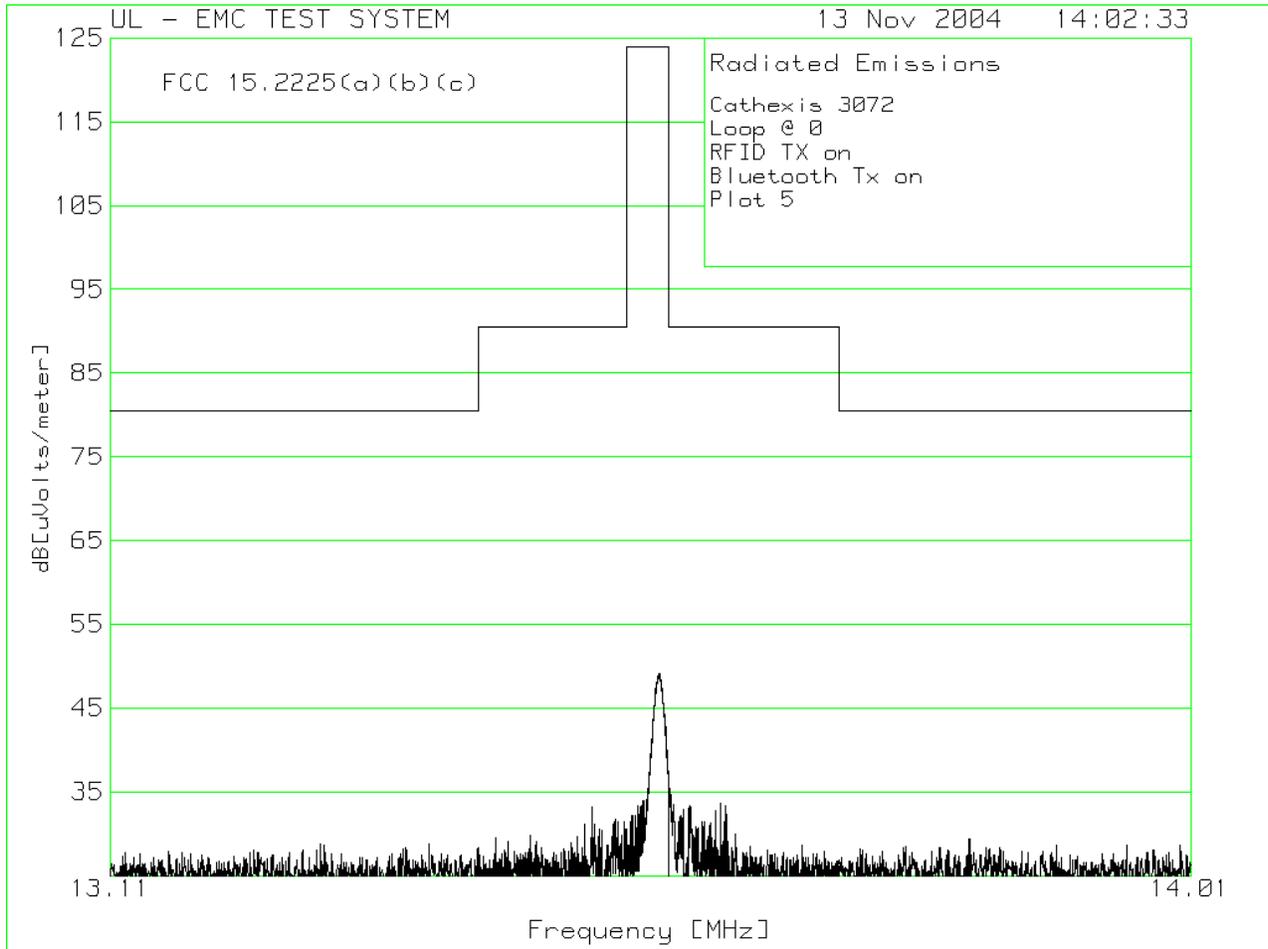
- Frequency = +/- 20 Hz (determined by Freq counter in STD mode)
- Temperature = +/- 0.5°C (For "K" type thermocouples)

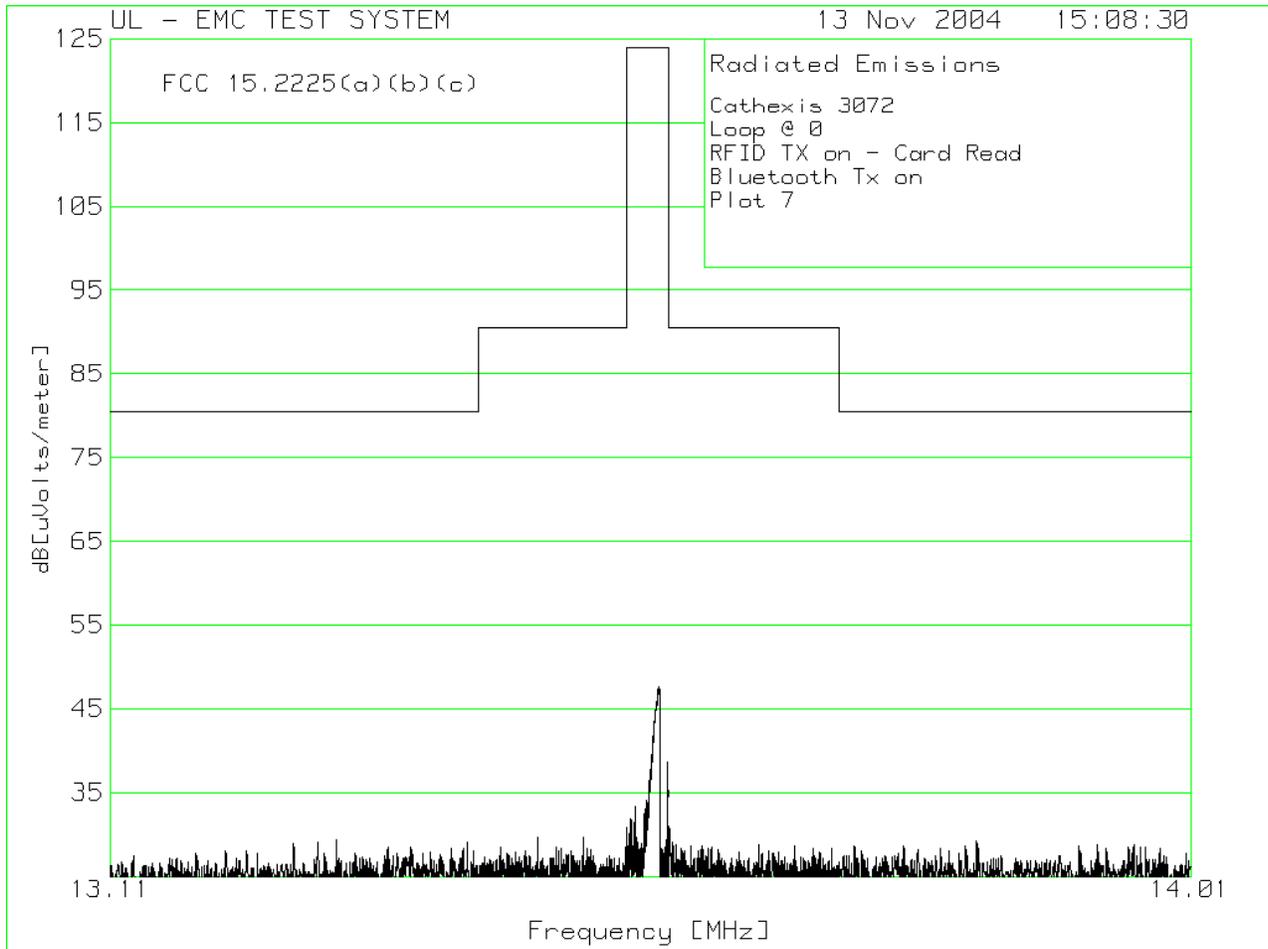
**2.1 CARRIER LEVEL / EMISSION MASK**

Test Summary	
Test Personnel: Scott Drysdale	Test Date: 13 November 2004

Test Description	
Objectives/Criteria	Specifications
<p>The electric/magnetic fields radiated by a system or sub-system, shall not exceed the limits for the specifications as stated.</p> <p><b>It is recommended that a margin of 10dB be allowed for manufacturing tolerances.</b></p> <p><b>Center Frequency Emission</b> was 51.36 dBuV/m @ 3m.</p> <p>This is 72.64 dB below the FCC Part 15.225(a) limit.</p> <p>All other frequencies were more then 20dB below their respective limits. The peak measuring instrument noise floor is reported over entire spectrum below.</p>	<p><b>FCC Part 15.225(a),(b)(c) Subpart C</b> (Intentional Transmission)</p> <p><b>Frequency (MHz)      QP Limits @30m*</b></p> <p>(a)</p> <p>13.553-13.567      15,848µV/m (84 dBuV/m)</p> <p>(b)</p> <p>13.410-13.533      334uV/m (50.47dBuV/m)</p> <p>13.567-13.710      334uV/m (50.47dBuV/m)</p> <p>(c)</p> <p>13.110-13.410      106uV/m (40.51dBuV/m)</p> <p>13.710-14.010      106uV/m (40.51dBuV/m)</p>
<b>Test Result: PASS</b>	
<i>*3 meter readings shown in table below, 30 meter limit adjusted by +40 dB in accordance with FCC Part 15(f)2</i>	

### 2.1.1 EMISSION MASK - DATA





Worst Case Table readings

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:
=====					
Range: 6 13.533 - 13.567MHz					
13.56	31.2 qp	-26.68	37.54	42.06	124
Azimuth: 252 Loop Azimuth:0					Margin [dB]: -81.94
13.56	40.5 pk	-26.68	37.54	51.36	124
Azimuth: 252 Loop Azimuth:0					Margin [dB]: -72.64

pk - Peak detector  
qp - Quasi-Peak detector

## 2.1.2 EMISSION MASK SETUP







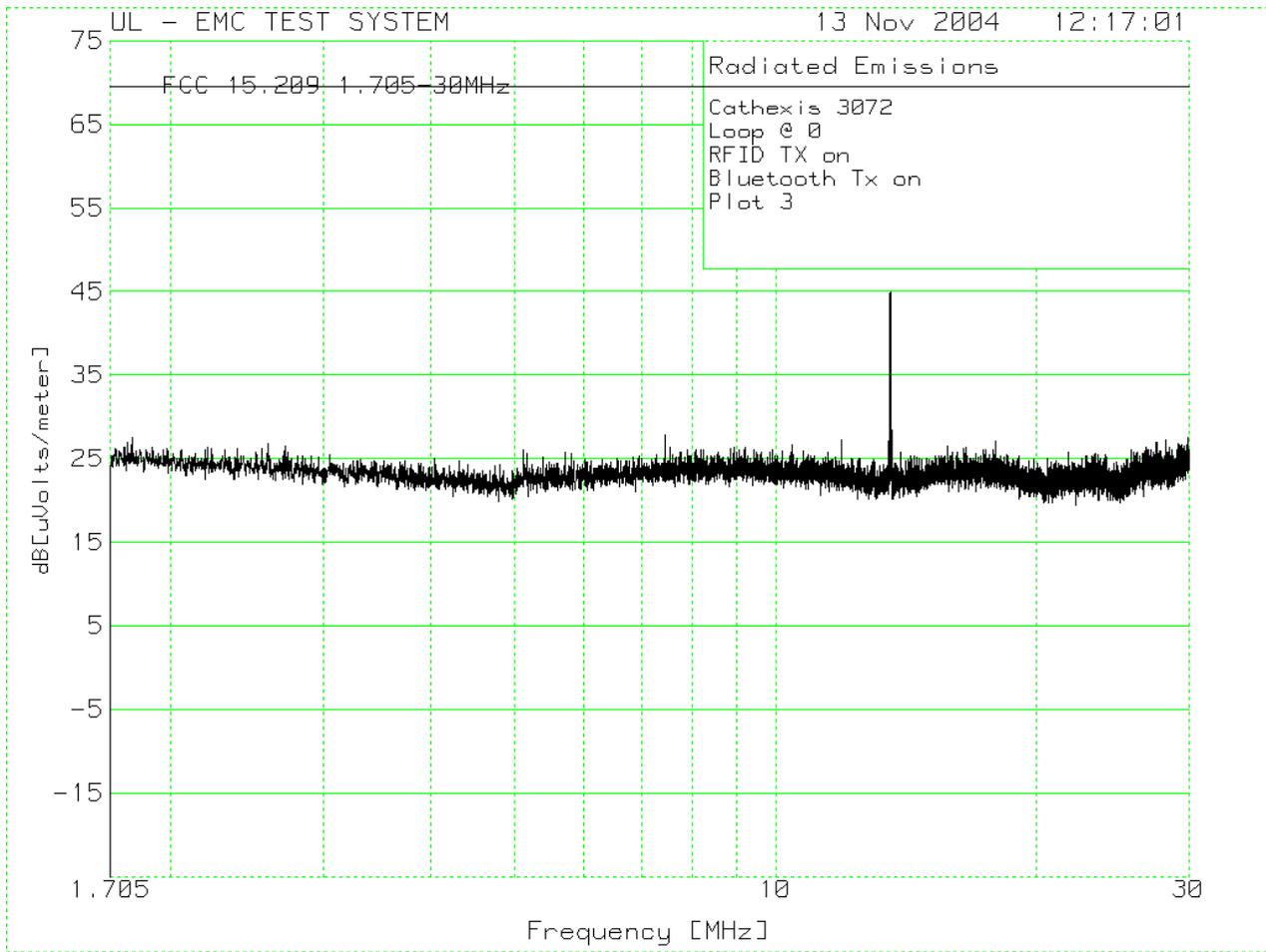
Note: This close-up is representative of another mode tested, but this is not the mode shown in the preceding two photographs.

## 2.2 UNWANTED EMISSIONS

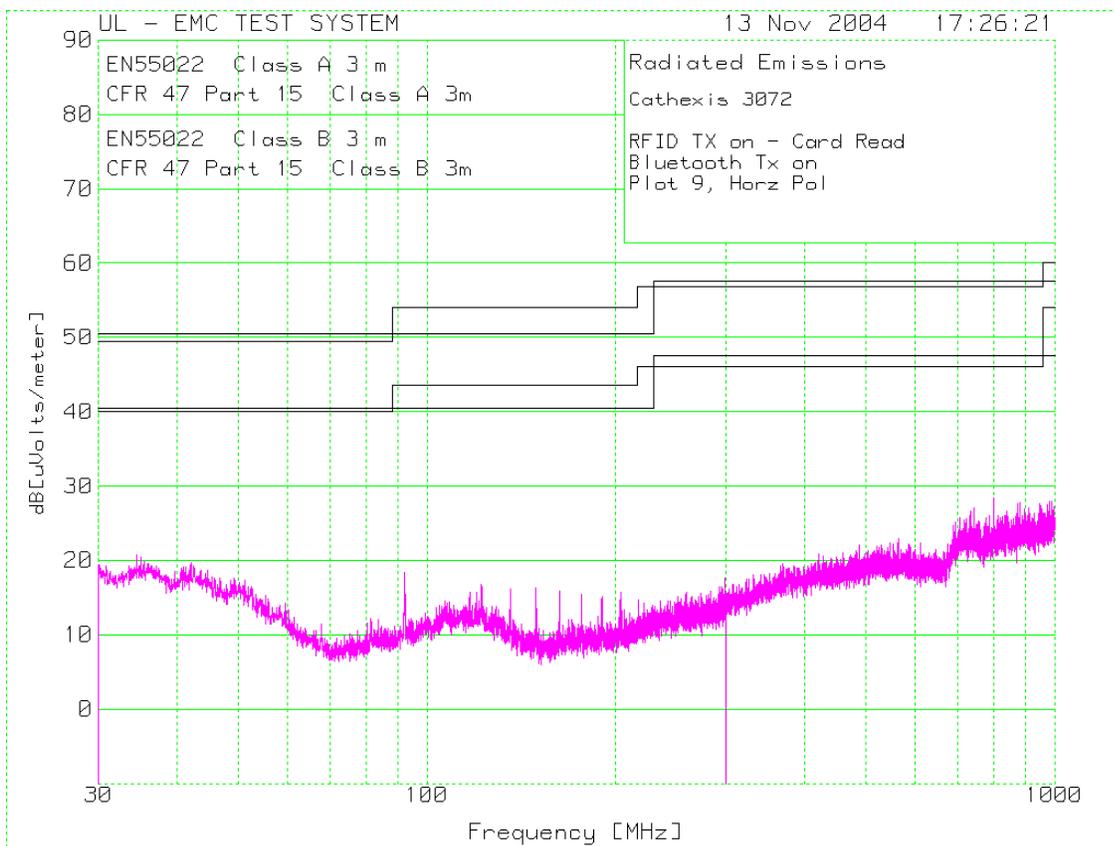
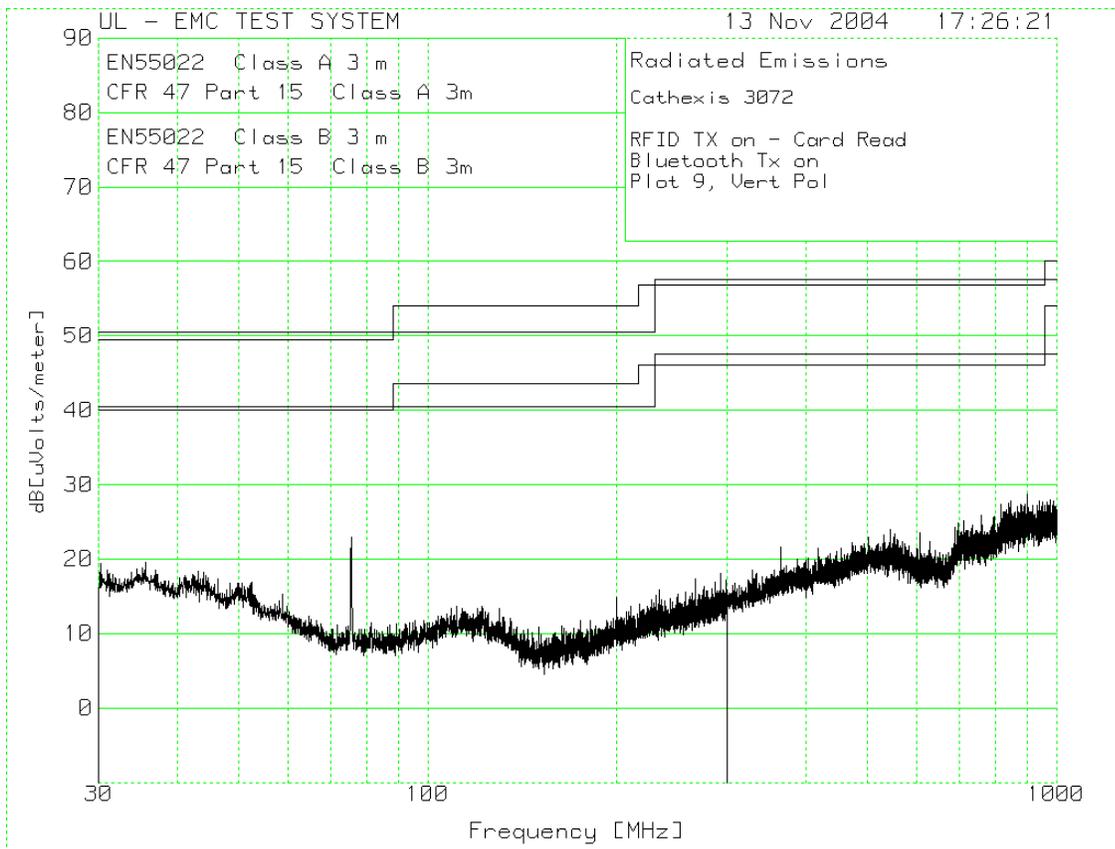
Test Summary	
Test Personnel: Scott Drysdale	Test Date: 13 November 2004

Test Description													
Objectives/Criteria	Specifications												
<p>The electric fields radiated by a system or sub-system, shall not exceed the limits for the specifications as stated.</p> <p><b>It is recommended that a margin of 6dB be allowed for manufacturing tolerances.</b></p> <p><b>Worst case Emission</b> was 38.6 dB<math>\mu</math>V/m @ 2458.021 MHz (peak).</p> <p>This is 15.4 dB below the FCC Part 15.225(d) limit.</p>	<p align="center"><b>FCC Part 15.225(d) Subpart C FCC Part 15.209</b></p> <p align="center">(Unwanted emissions)</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>dB<math>\mu</math>V/m Limits @3m</th> </tr> </thead> <tbody> <tr> <td>X1* - 30 MHz</td> <td>69.5</td> </tr> <tr> <td>30-88 MHz</td> <td>40.0</td> </tr> <tr> <td>88-216 MHz</td> <td>43.5</td> </tr> <tr> <td>216-964 MHz</td> <td>46.0</td> </tr> <tr> <td>964 MHz – X2</td> <td>54.0</td> </tr> </tbody> </table> <p>All limits below 1GHz are in Quasi Peak, and above 1 GHz are average.</p> <p>* - X1 represents lowest radio frequency signal generated in the device, as per FCC 15.33(a)</p> <p>* - X2 represents 5th harmonic of the highest frequency or 40 GHz, whichever is lower as per FCC 15.33(a).</p>	Frequency	dB $\mu$ V/m Limits @3m	X1* - 30 MHz	69.5	30-88 MHz	40.0	88-216 MHz	43.5	216-964 MHz	46.0	964 MHz – X2	54.0
Frequency	dB $\mu$ V/m Limits @3m												
X1* - 30 MHz	69.5												
30-88 MHz	40.0												
88-216 MHz	43.5												
216-964 MHz	46.0												
964 MHz – X2	54.0												
<b>Test Result: PASS</b>													
<i>For ease of testing, the graphs below state the FCC Part 15 Subpart B Class B limits above 30MHz. These limits are the same as the FCC 15.225(d) and 15.209 requirements.</i>													

### 2.2.1 UNWANTED EMISSIONS – DATA



Note: The emission shown in the above graph at is at 13.56 MHz is the intentional generated frequency as measured in section 2.1 of this report. No emissions below 30MHz were within 20dB of the limit and the peak instrument noise floor after factors is reported.



Cathexis 3072  
RFID TX on - Card Read  
Bluetooth Tx on  
Plot 9

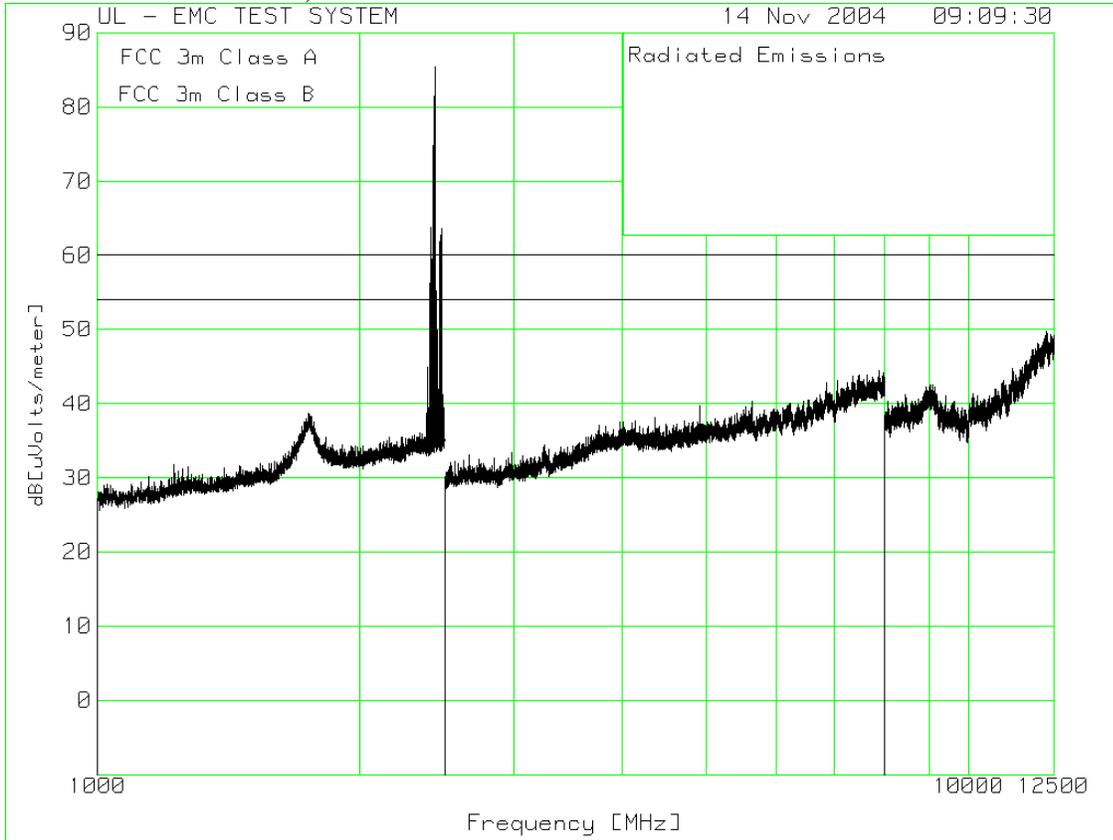
Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2	3	4
Range: 1 30 - 300MHz								
75.5042	21.42 qp	-27.67	8.89	2.64	40.5	49.5	40	50.5
Azimuth: 320		Height:104	Vert	Margin [dB]:	-37.86	-46.86	-37.36	-47.86
Range: 2 30 - 300MHz								
91.685	21.35 qp	-27.6	10.52	4.27	40.5	54	43.52	50.5
Azimuth: 138		Height:242	Horz	Margin [dB]:	-36.23	-49.73	-39.25	-46.23
136.1802	21.2 qp	-27.4	10.61	4.41	40.5	54	43.52	50.5
Azimuth: 103		Height:104	Horz	Margin [dB]:	-36.09	-49.59	-39.11	-46.09
149.142	30.34 qp	-27.2	9.18	12.32	40.5	54	43.52	50.5
Azimuth: 10		Height:178	Horz	Margin [dB]:	-28.18	-41.68	-31.2	-38.18
163.1883	21.27 qp	-27.2	9.19	3.26	40.5	54	43.52	50.5
Azimuth: 53		Height:103	Horz	Margin [dB]:	-37.24	-50.74	-40.26	-47.24
Range: 4 300 - 1000MHz								
892.4232	19.89 qp	-22.71	21.6	18.78	47.5	56.9	46.02	57.5
Azimuth: 61		Height:153	Horz	Margin [dB]:	-28.72	-38.12	-27.24	-38.72

LIMIT 1: EN55022 Class B 3 m  
LIMIT 2: CFR 47 Part 15 Class A 3m  
LIMIT 3: CFR 47 Part 15 Class B 3m  
LIMIT 4: EN55022 Class A 3 m  
LIMIT 5: NONE  
LIMIT 6: NONE

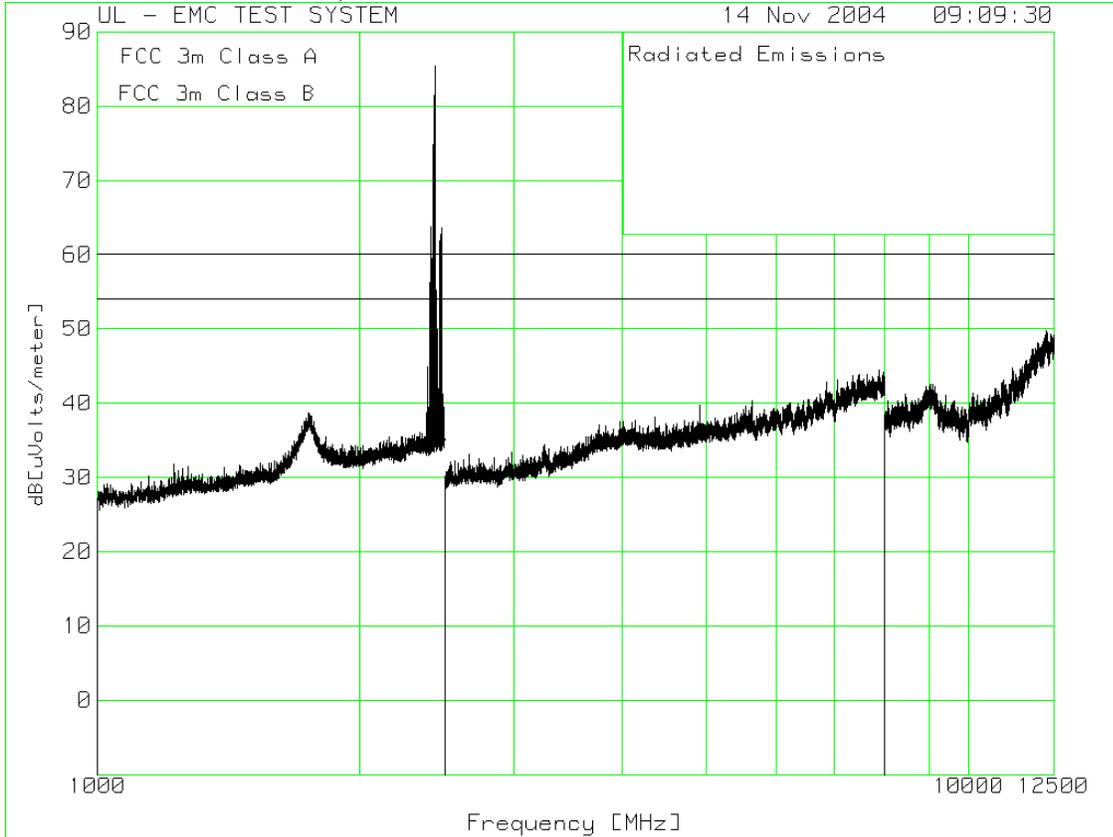
pk - Peak detector  
qp - Quasi-Peak detector  
av - Average detector  
avlg - Average log detector

File: Plot9\_30-1000MHz\_QPks.TXT

**Vertical – With PDA on, RFID Tx**



**Horizontal – With PDA on, RFID Tx**



FCC Part 15 Subpart C 15.247 edge data, with PDA On, RFID Tx

Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
Range: 1 1000 - 2500MHz						
2390	48.4 pk	-37.82	30.3	40.88	60	53.97
Azimuth: 309		Height:338	Vert	Margin [dB]:	-19.12	-13.09
2383.5	35.4 avlg	-37.83	30.28	27.85	60	53.97
Azimuth: 309		Height:338	Vert	Margin [dB]:	-32.15	-26.12
2483.5	55.2 pk	-37.4	30.64	48.44	60	53.97
Azimuth: 309		Height:338	Vert	Margin [dB]:	-11.56	-5.53
2483.5	35.4 avlg	-37.4	30.64	28.54	60	53.97
Azimuth: 309		Height:338	Vert	Margin [dB]:	-31.46	-25.43

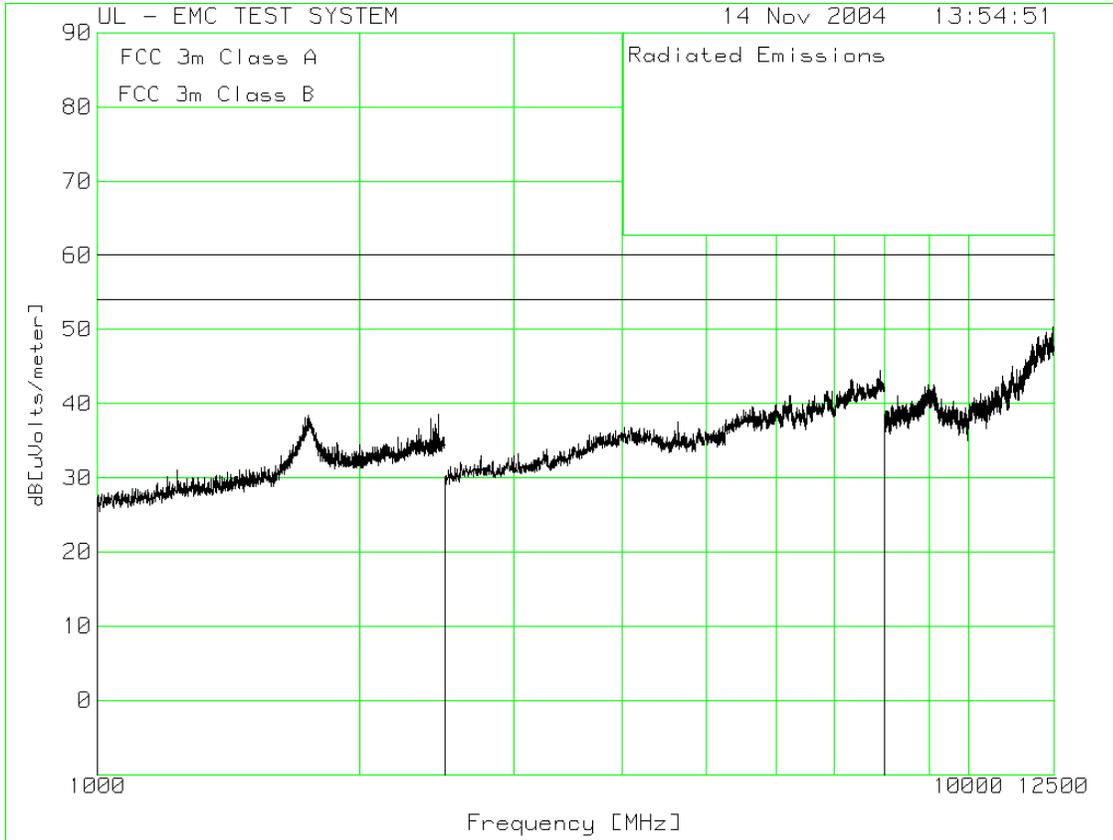
LIMIT 1: FCC 3m Class A  
 LIMIT 2: FCC 3m Class B  
 LIMIT 3: NONE  
 LIMIT 4: NONE  
 LIMIT 5: NONE  
 LIMIT 6: NONE

pk - Peak detector  
 qp - Quasi-Peak detector  
 av - Average detector  
 avlg - Average log detector

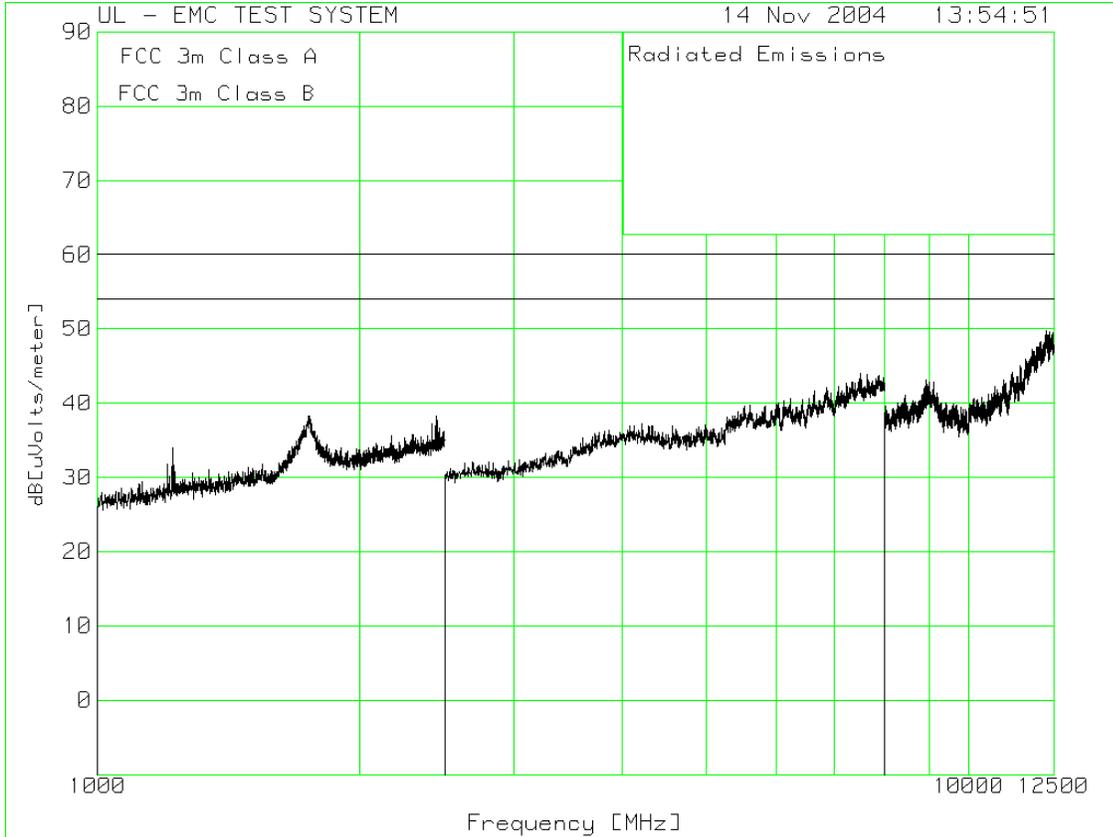
File: Plot13\_1G-10GHz\_AVG.TXT

Note: These emissions were determined to be originating from the Auxillary Equipment in the chamber. The supporting results is provided below. The Auxillary equipment is an FCC certified PDA as listed in section 1.4 of this report.

**Vertical – with PDA off**



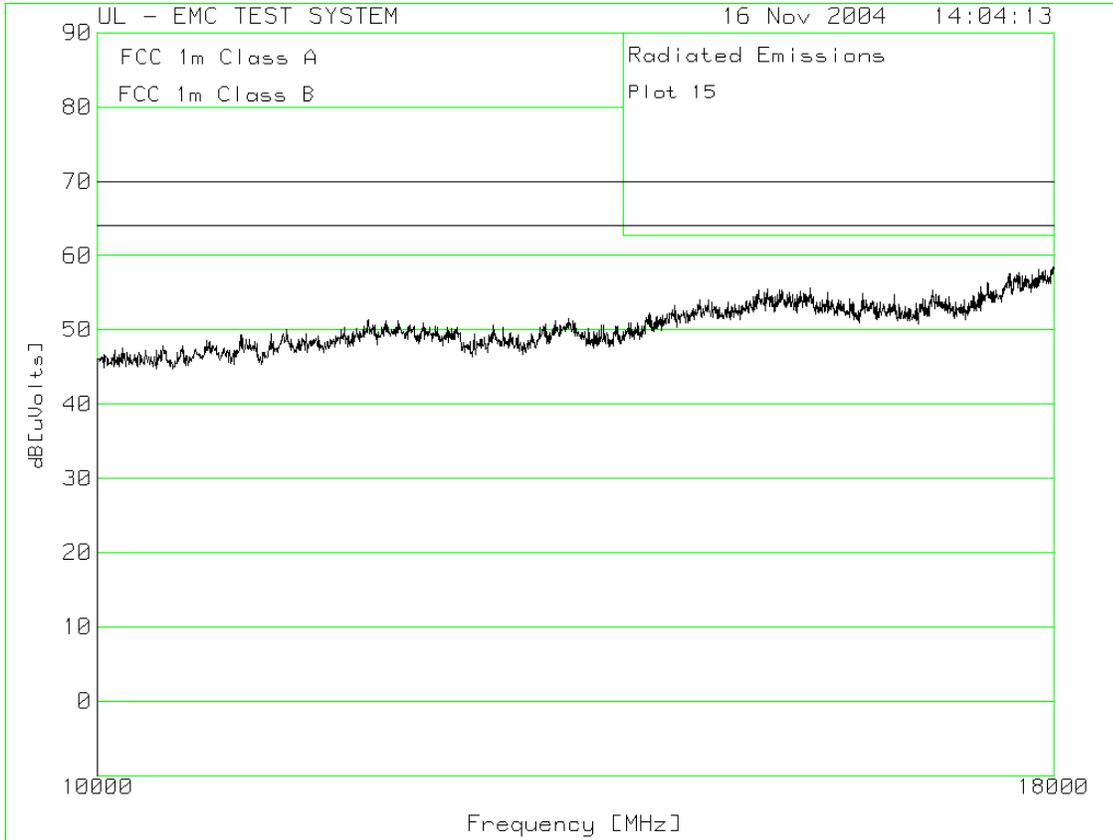
**Horizontal – with PDA off**



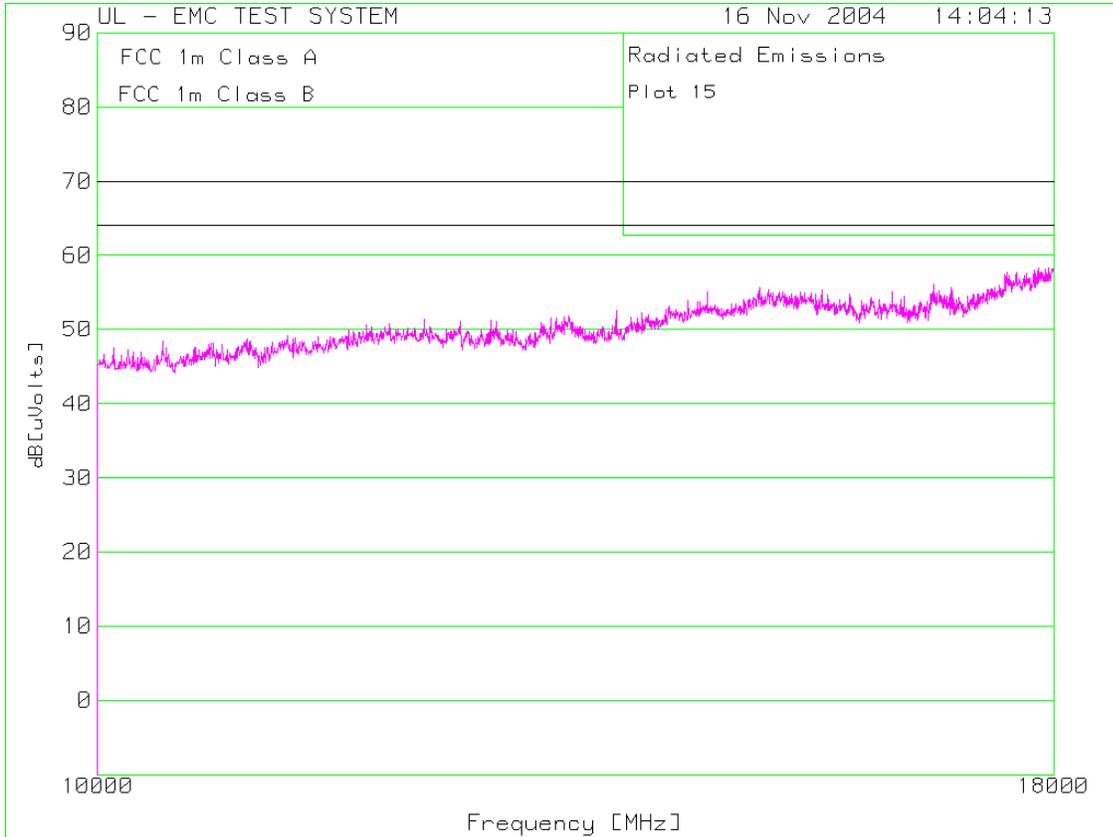
No.	Test Frequency [MHz]	Meter Reading [dB(uV)]	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit:1	2
=====							
Range: 1 1000 - 2500MHz -----							
1	2458.021	45.45 pk	-37.4	30.55	38.6	60	53.97
	Azimuth:310	Height:199	Vert	Margin [dB]		-21.4	-15.37
2	2410.795	45.33 pk	-37.71	30.38	38	60	53.97
	Azimuth:310	Height:199	Vert	Margin [dB]		-22	-15.97
-----							
Range: 2 1000 - 2500MHz -----							
3	2449.775	45.18 pk	-37.4	30.52	38.3	60	53.97
	Azimuth:349	Height:199	Horz	Margin [dB]		-21.7	-15.67
4	2453.523	44.57 pk	-37.4	30.53	37.7	60	53.97
	Azimuth:2	Height:199	Horz	Margin [dB]		-22.3	-16.27
5	2419.79	44.43 pk	-37.64	30.41	37.2	60	53.97
	Azimuth:13	Height:199	Horz	Margin [dB]		-22.8	-16.77
-----							
LIMIT 1: FCC 3m Class A							
LIMIT 2: FCC 3m Class B							
LIMIT 3: NONE							
LIMIT 4: NONE							
LIMIT 5: NONE							
LIMIT 6: NONE							
pk - Peak detector							
qp - Quasi-Peak detector							
av - Average detector							
avlg - denotes average log detection							
tm - Trace Math Result							

Note: With the PDA off, no appreciable average signal could be found between 2.39GHz and 2.4835 GHz when measured at 3m. However in this mode, the EUT is transmitting equal power then when a “bluetooth” link is established. Also note that the EUT does not provide the seperation link distance by the “bluetooth” protocol as allowed by the the FCC part 15 subpart C section 247 specification.

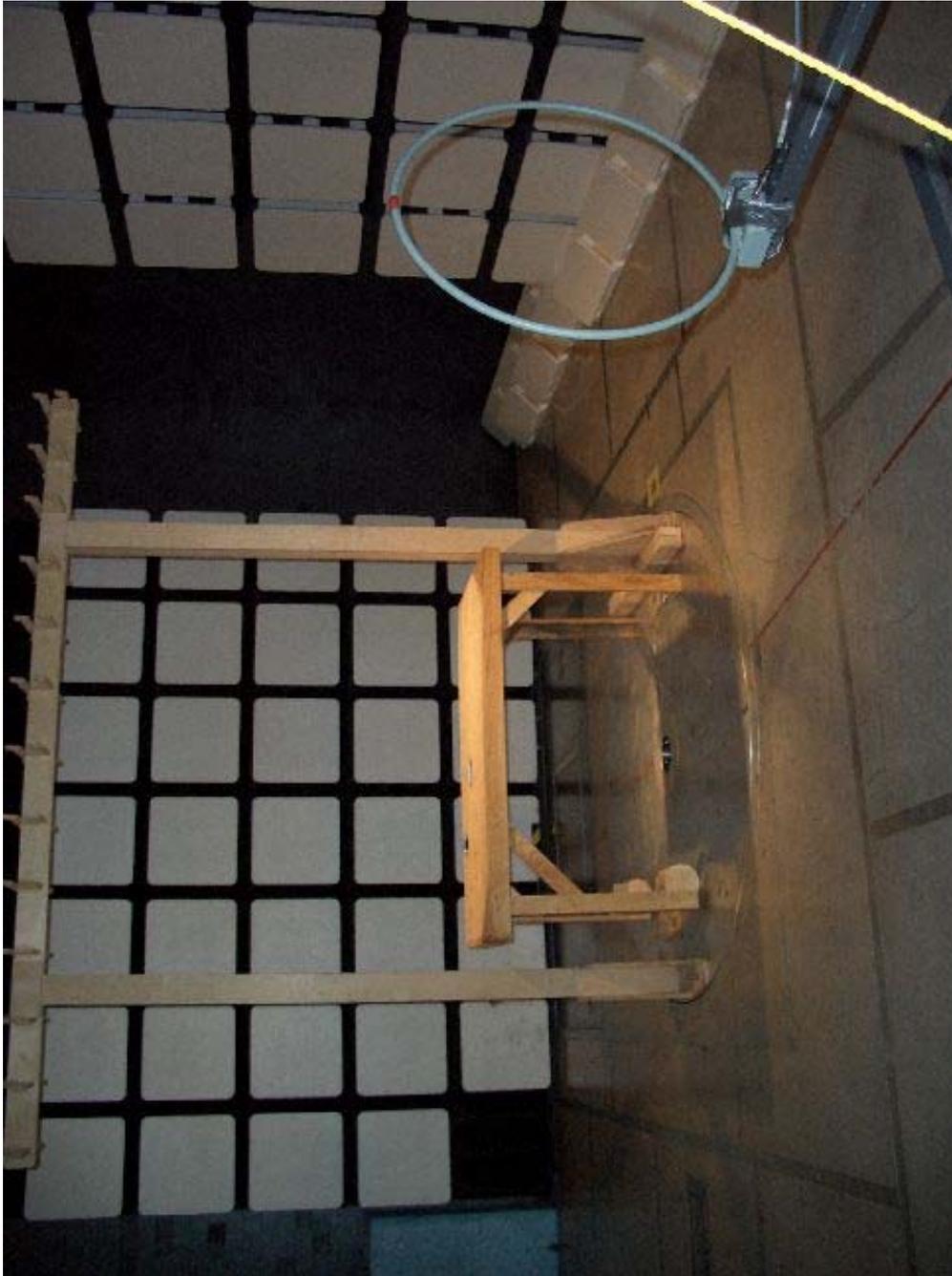
Vertical – With PDA on

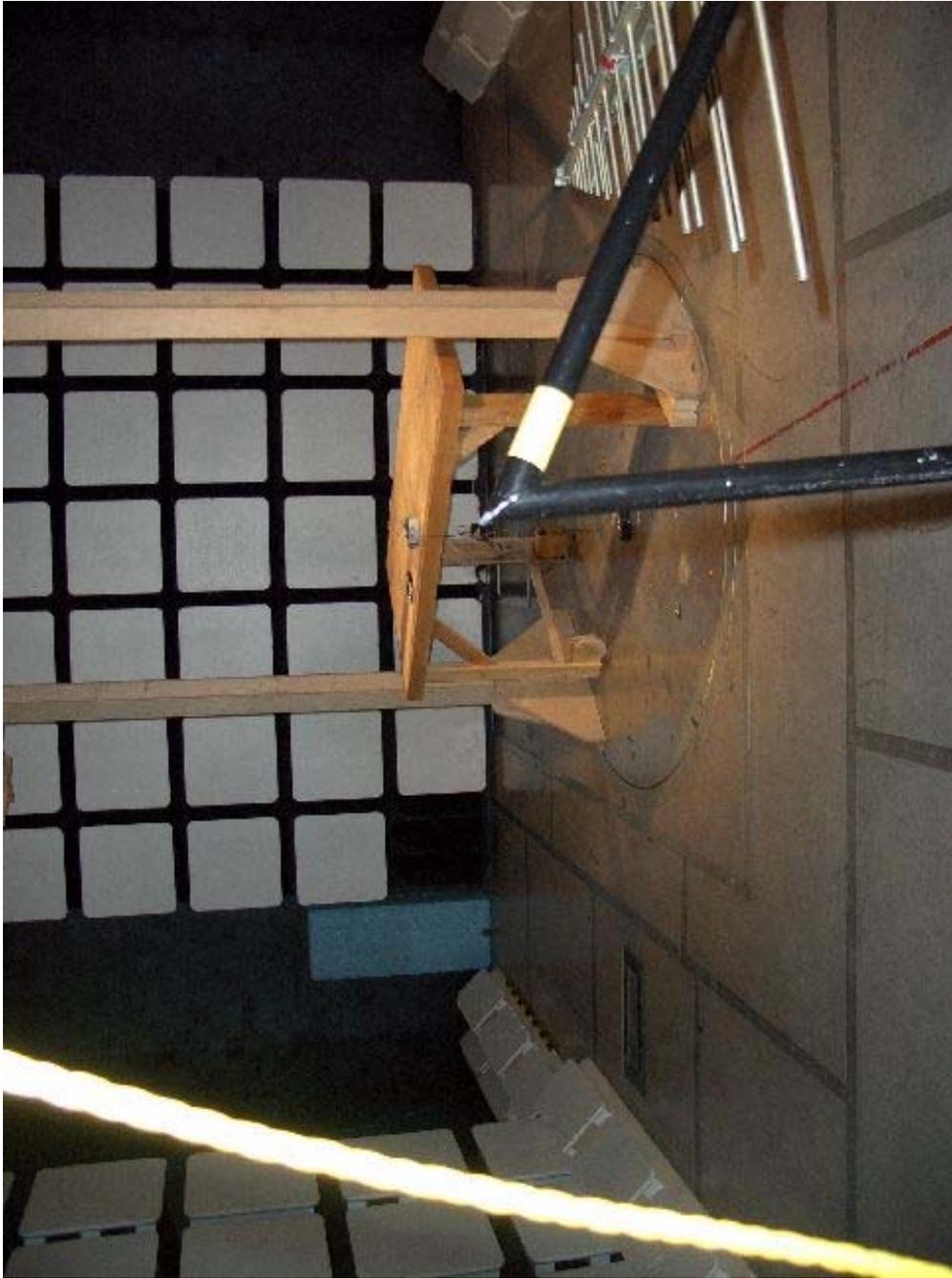


Horizontal with PDA on



## 2.2.2 UNWANTED EMISSIONS – SETUP











### 2.3 FREQUENCY STABILITY

Test Summary	
Test Personnel: Scott Drysdale	Test Date: November 14, 2004

Test Description																							
Objectives/Criteria	Specifications																						
<p>The electric fields radiated by a system or sub-system, shall not exceed the limits for the specifications as stated.</p> <p><b>It is recommended that a frequency stability of +/- 0.005% or better be maintained to allow for manufacturing tolerances.</b></p> <p><b>Worst case</b> tolerance was off of center frequency by -215Hz @ -20°C.</p> <p>This is 0.00159 %. This is 1.141 kHz greater stability than the FCC Part 15.225(e) limit.</p>	<p align="center"><b>FCC Part 15.225(e) Subpart C</b></p> <table border="0"> <thead> <tr> <th align="left">Temperature</th> <th align="left">Requirement</th> </tr> </thead> <tbody> <tr> <td>-30°C</td> <td>Advised to state in report (1)</td> </tr> <tr> <td>-20°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>-10°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>0°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>10°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>20°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>30°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>40°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>50°C</td> <td>+/- 0.01%</td> </tr> <tr> <td>60°C</td> <td>Advised to state in report (2)</td> </tr> </tbody> </table> <p>0.01 % of 13.56MHz is 1.356 kHz.</p>	Temperature	Requirement	-30°C	Advised to state in report (1)	-20°C	+/- 0.01%	-10°C	+/- 0.01%	0°C	+/- 0.01%	10°C	+/- 0.01%	20°C	+/- 0.01%	30°C	+/- 0.01%	40°C	+/- 0.01%	50°C	+/- 0.01%	60°C	Advised to state in report (2)
Temperature	Requirement																						
-30°C	Advised to state in report (1)																						
-20°C	+/- 0.01%																						
-10°C	+/- 0.01%																						
0°C	+/- 0.01%																						
10°C	+/- 0.01%																						
20°C	+/- 0.01%																						
30°C	+/- 0.01%																						
40°C	+/- 0.01%																						
50°C	+/- 0.01%																						
60°C	Advised to state in report (2)																						
<b>Test Result: PASS</b>																							

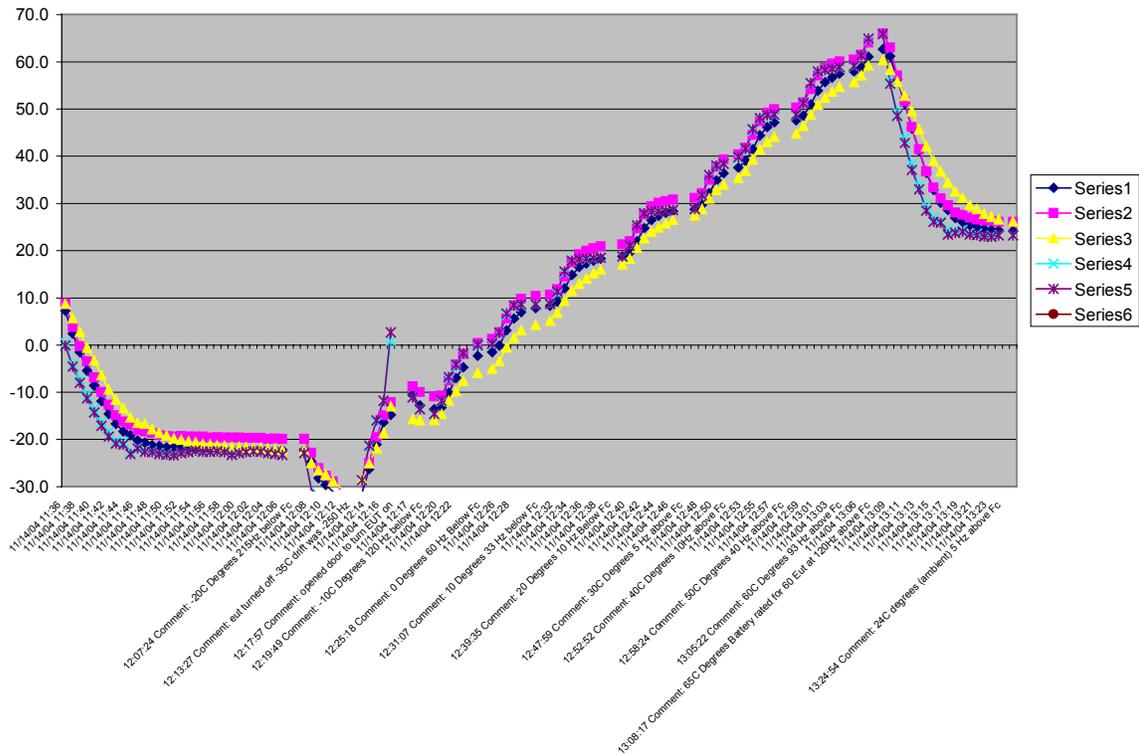
Note 1: FCC Part 2, section 2.1055a(1) states measurements from -30C to +50C are required, however this test only has frequency requirements from -20C to +50C as per Part 15.

Note 2: To ensure adequate temperature margin.

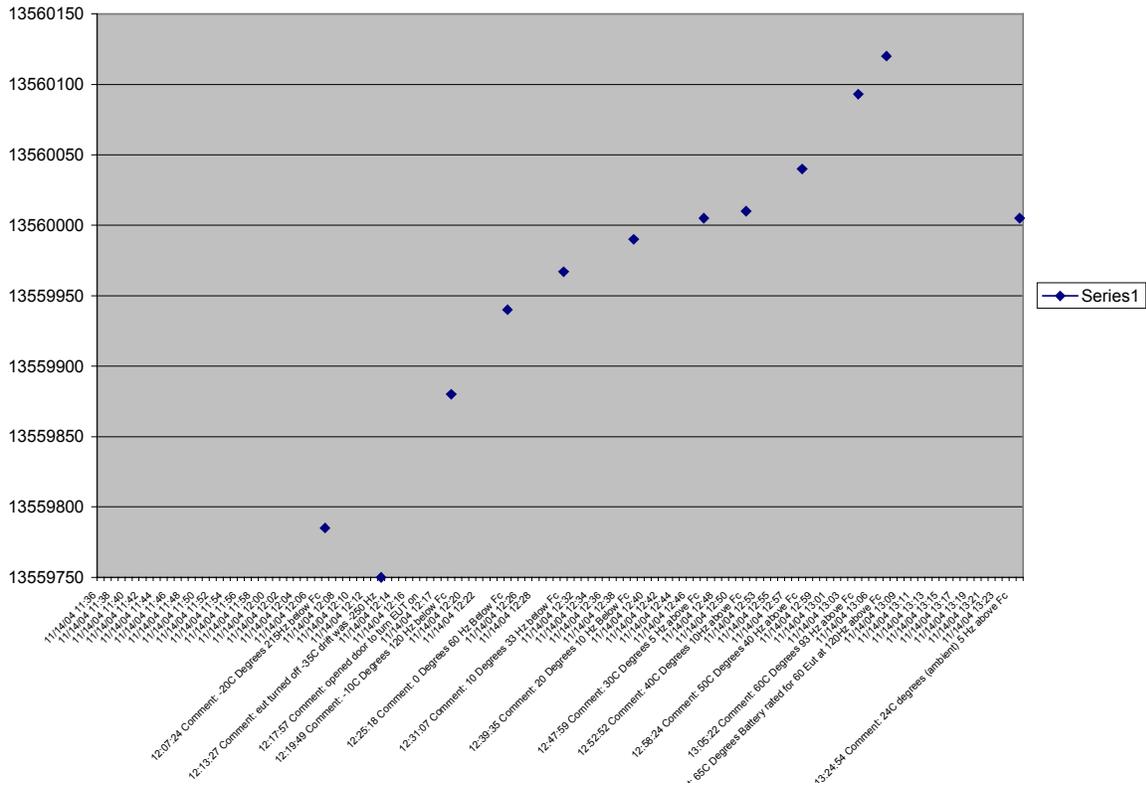
Note 3: Thermocouples were attached to monitor the internal temperature of various EUT components. As the thermal mass is small, the various temperatures were measured and frequency measurements were performed when these components reached the required temperature. In addition frequency stability measurements were performed at 10C above and below the requirements.

### 2.3.1 FREQUENCY STABILITY DATA

Thermocouple data



Frequency Data



Tabular Data

Time & Date	Antenna (1)	RF module (2)	Battery (4)	Ambient (5)	Ambient (6)	Frequency (measured in Hz)
11/14/04 11:35	12.9	14.6	12.1	6.3	5.7	
11/14/04 11:36	7.3	8.8	8.7	0.5	-0.1	
11/14/04 11:37	2.4	3.8	5.7	-4.0	-4.6	
11/14/04 11:38	-1.5	-0.3	2.8	-7.2	-8.0	
11/14/04 11:39	-5.4	-3.5	-0.6	-10.5	-11.3	
11/14/04 11:40	-8.6	-6.9	-3.3	-13.5	-14.3	
11/14/04 11:41	-11.9	-10.0	-6.4	-16.3	-17.1	
11/14/04 11:42	-14.6	-12.7	-9.4	-18.4	-19.4	
11/14/04 11:43	-16.7	-14.9	-11.6	-20.3	-20.9	
11/14/04 11:44	-18.3	-16.2	-13.4	-20.5	-21.1	
11/14/04 11:45	-19.1	-16.9	-15.4	-22.7	-23.1	
11/14/04 11:46	-20.2	-18.0	-16.5	-21.7	-21.9	
11/14/04 11:47	-20.7	-18.3	-16.7	-22.3	-22.6	
11/14/04 11:48	-21.2	-18.7	-17.8	-22.5	-22.7	
11/14/04 11:49	-21.4	-19.1	-18.7	-22.9	-23.1	
11/14/04 11:50	-21.7	-19.3	-19.2	-23.0	-23.2	
11/14/04 11:51	-21.7	-19.4	-19.8	-23.3	-23.4	
11/14/04 11:52	-21.7	-19.3	-20.1	-22.8	-22.9	
11/14/04 11:53	-21.8	-19.4	-20.4	-22.6	-22.7	
11/14/04 11:54	-21.9	-19.4	-20.6	-22.4	-22.4	
11/14/04 11:55	-21.9	-19.4	-21.0	-22.6	-22.6	
11/14/04 11:56	-21.9	-19.6	-21.1	-22.6	-22.6	
11/14/04 11:57	-21.9	-19.5	-21.3	-22.5	-22.5	
11/14/04 11:58	-22.0	-19.6	-21.4	-22.7	-22.7	
11/14/04 11:59	-22.0	-19.6	-21.6	-23.1	-23.3	
11/14/04 12:00	-22.0	-19.6	-21.6	-22.8	-22.9	
11/14/04 12:01	-22.1	-19.7	-21.7	-22.7	-22.7	
11/14/04 12:02	-22.1	-19.7	-21.8	-22.5	-22.5	
11/14/04 12:03	-22.1	-19.7	-21.8	-22.6	-22.6	
11/14/04 12:04	-22.2	-19.9	-22.0	-22.8	-22.9	
11/14/04 12:05	-22.2	-19.8	-22.1	-23.0	-23.1	
11/14/04 12:06	-22.2	-19.9	-22.2	-23.3	-23.3	

12:07:24 Comment: -20C Degrees

13559785

215Hz below Fc

11/14/04 12:07	-22.3	-19.9	-22.2	-22.8	-22.9	
11/14/04 12:08	-24.7	-22.8	-25.0	-30.2	-30.6	
11/14/04 12:09	-28.2	-26.1	-26.5	-31.7	-32.1	
11/14/04 12:10	-29.6	-27.7	-27.5	-31.9	-32.3	
11/14/04 12:11	-31.1	-28.9	-28.9	-33.5	-34.0	
11/14/04 12:12	-32.3	-30.5	-30.2	-34.8	-34.9	

12:13:27 Comment: eut shut down at -35C

13559750

Frequency was 250 Hz below Fc

11/14/04 12:13	-31.3	-30.1	-28.4	-28.7	-28.6	
11/14/04 12:14	-26.3	-24.9	-25.1	-21.5	-21.3	
11/14/04 12:15	-21.1	-19.5	-21.9	-16.3	-16.0	
11/14/04 12:16	-16.4	-14.9	-18.7	-11.8	-11.8	
11/14/04 12:17	-14.8	-12.1	-13.0	0.8	2.7	

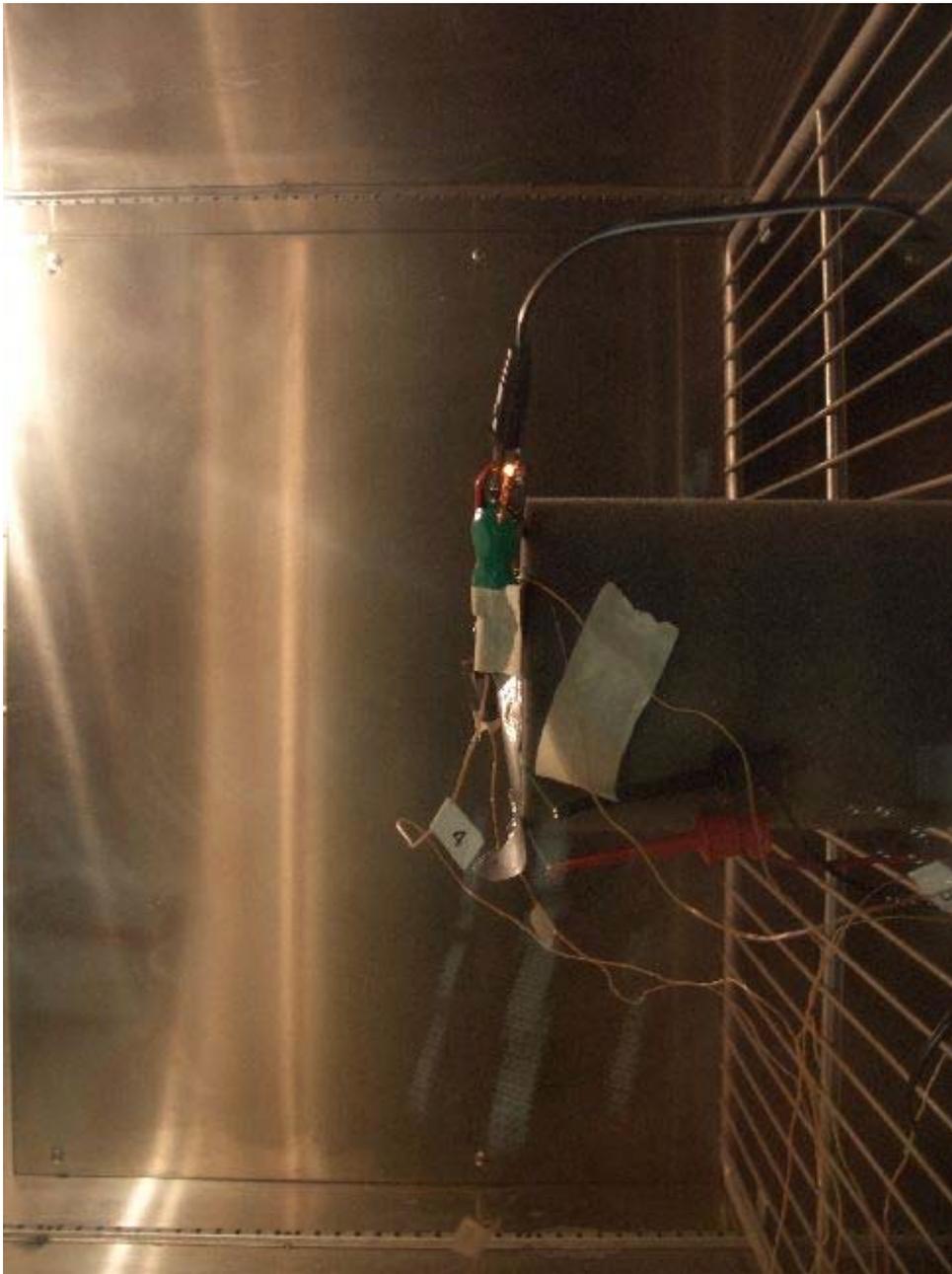
12:17:57 Comment: opened door to  
turn EUT on

11/14/04 12:17	-10.6	-8.7	-15.7	-11.1	-11.1	
11/14/04 12:18	-12.8	-10.0	-16.0	-13.5	-13.6	
12:19:49 Comment: -10C Degrees						13559880
120 Hz below Fc						
11/14/04 12:19	-13.6	-10.9	-15.9	-14.6	-14.6	
11/14/04 12:20	-13.2	-10.7	-14.6	-12.0	-11.8	
11/14/04 12:21	-10.1	-7.5	-11.8	-7.2	-6.8	
11/14/04 12:22	-7.0	-4.2	-9.8	-4.5	-4.2	
11/14/04 12:23	-4.7	-1.9	-7.6	-1.9	-1.8	
11/14/04 12:24	-2.3	0.4	-5.9	-0.3	0.0	
12:25:18 Comment: 0 Degrees						13559940
60 Hz Below Fc						
11/14/04 12:25	-1.5	1.3	-5.0	0.1	0.3	
11/14/04 12:26	-0.1	2.7	-3.4	2.4	2.6	
11/14/04 12:27	3.1	5.6	-0.5	6.4	6.7	
11/14/04 12:28	5.6	8.4	1.6	8.2	8.4	
11/14/04 12:29	7.0	9.8	3.1	8.4	8.6	
11/14/04 12:30	7.8	10.4	4.3	8.5	8.6	
12:31:07 Comment: 10 Degrees						13559967
33 Hz below Fc						
11/14/04 12:31	8.3	10.7	5.1	8.6	8.7	
11/14/04 12:32	9.2	11.8	6.8	11.0	11.3	
11/14/04 12:33	12.0	14.5	9.4	15.3	15.6	
11/14/04 12:34	14.8	17.5	11.5	18.0	17.9	
11/14/04 12:35	16.5	19.2	13.0	18.2	18.2	
11/14/04 12:36	17.3	20.0	14.1	18.1	18.3	
11/14/04 12:37	17.9	20.5	15.2	18.2	18.4	
11/14/04 12:38	18.3	20.9	16.0	18.5	18.5	
12:39:35 Comment: 20 Degrees						13559990
10 Hz Below Fc						
11/14/04 12:39	18.8	21.3	17.1	18.7	18.8	
11/14/04 12:40	19.5	22.0	18.3	21.1	21.1	
11/14/04 12:41	22.0	24.7	20.6	25.3	25.4	
11/14/04 12:42	24.8	27.7	22.6	28.0	27.9	
11/14/04 12:43	26.5	29.4	24.0	28.3	28.3	
11/14/04 12:44	27.4	30.2	24.9	28.2	28.3	
11/14/04 12:45	28.0	30.5	25.8	28.4	28.4	
11/14/04 12:46	28.4	30.8	26.5	28.6	28.6	
12:47:59 Comment: 30C Degrees						13560005
5 Hz above Fc						
11/14/04 12:47	28.8	31.2	27.5	28.8	28.8	
11/14/04 12:48	29.7	32.2	28.8	31.6	31.7	
11/14/04 12:49	32.2	35.0	31.0	35.9	36.0	
11/14/04 12:50	34.9	37.8	32.9	37.8	38.0	
11/14/04 12:51	36.4	39.3	34.0	38.4	38.4	
12:52:52 Comment: 40C Degrees						13560010
10Hz above Fc						
11/14/04 12:52	37.6	40.4	35.4	39.6	39.8	
11/14/04 12:53	39.0	41.8	36.9	41.4	41.6	
11/14/04 12:54	41.5	44.5	39.3	45.4	45.7	
11/14/04 12:55	44.4	47.4	41.5	48.0	48.1	
11/14/04 12:56	46.2	49.2	43.0	48.5	48.7	
11/14/04 12:57	47.2	50.0	44.1	48.6	48.8	

12:58:24 Comment: 50C Degrees						13560040
40 Hz above Fc						
11/14/04 12:58	47.6	50.3	44.8	48.7	48.8	
11/14/04 12:59	48.6	51.4	46.4	51.4	51.3	
11/14/04 13:00	51.0	54.2	48.8	55.4	55.5	
11/14/04 13:01	53.9	57.1	50.9	57.8	58.0	
11/14/04 13:02	55.7	58.7	52.4	58.4	58.3	
11/14/04 13:03	56.7	59.6	53.7	58.5	58.5	
11/14/04 13:04	57.5	60.1	54.7	58.7	58.9	
13:05:22 Comment: 60C Degrees						13560093
93 Hz above Fc						
11/14/04 13:05	58.0	60.5	55.7	59.0	59.1	
11/14/04 13:06	58.8	61.5	57.1	61.4	61.4	
11/14/04 13:07	61.1	64.1	59.2	64.7	64.9	
13:08:17 Comment: 65C Degrees (Battery only rated for 60C)						13560120
120Hz above Fc						
11/14/04 13:08	62.7	66.0	60.4	65.9	65.9	
11/14/04 13:09	61.2	63.1	58.3	56.2	55.4	
11/14/04 13:10	56.3	57.1	55.8	49.4	48.6	
11/14/04 13:11	51.2	51.6	52.8	43.8	42.8	
11/14/04 13:12	45.9	46.2	49.5	38.3	37.1	
11/14/04 13:13	41.2	41.5	45.7	33.9	33.0	
11/14/04 13:14	36.5	36.8	42.1	29.4	28.5	
11/14/04 13:15	32.9	33.4	39.0	26.9	26.1	
11/14/04 13:16	30.2	31.1	36.8	26.3	25.9	
11/14/04 13:17	28.6	29.6	34.4	24.3	23.4	
11/14/04 13:18	26.9	28.1	32.5	24.1	23.8	
11/14/04 13:19	26.1	27.6	31.2	24.4	24.0	
11/14/04 13:20	25.4	27.0	29.6	23.6	23.4	
11/14/04 13:21	24.9	26.6	28.8	23.6	23.3	
11/14/04 13:22	24.6	26.4	27.8	23.1	23.0	
11/14/04 13:23	24.4	26.3	27.1	23.2	22.9	
11/14/04 13:24	24.3	26.1	26.6	23.3	23.2	
13:24:54 Comment: 24C degrees (ambient) 5 Hz above Fc						
11/14/04 13:24	24.2	26.1	26.2	23.3	23.2	13560005

### 2.3.2 FREQUENCY STABILITY SETUP





## 2.4 MAXIMUM PERMISSIBLE EXPOSURE

Test Summary	
Test Personnel:	Test Date:

Test Description	
Objectives/Criteria	Specifications
	<b>FCC Part §1.1310</b>
<b>Test Result: Not required as per justification 1, see section 2.0</b>	

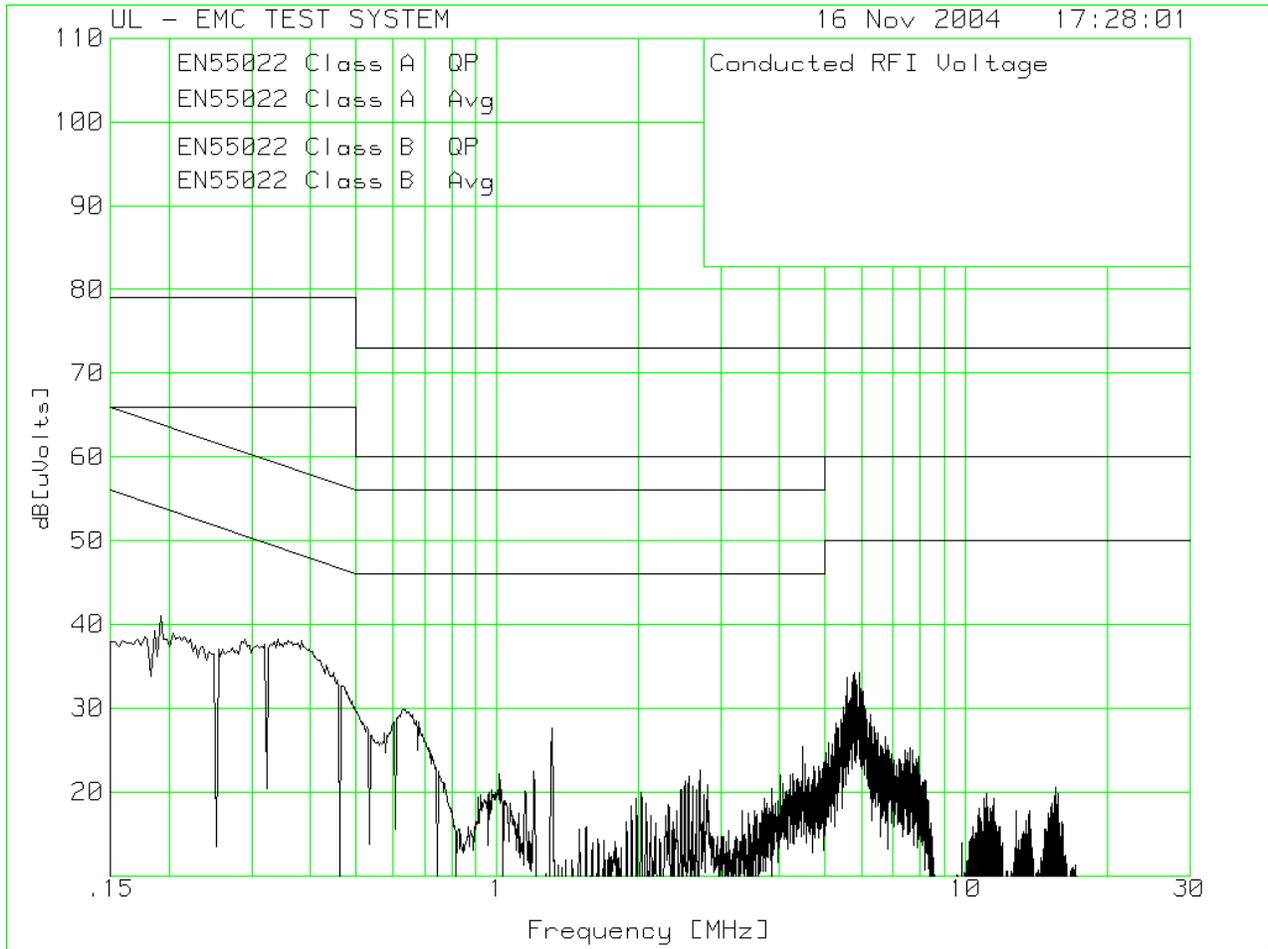
**2.5 CONDUCTED EMISSIONS (AC MAINS)**

Test Summary	
Test Personnel: Scott Drysdale	Test Date: November 16, 2004

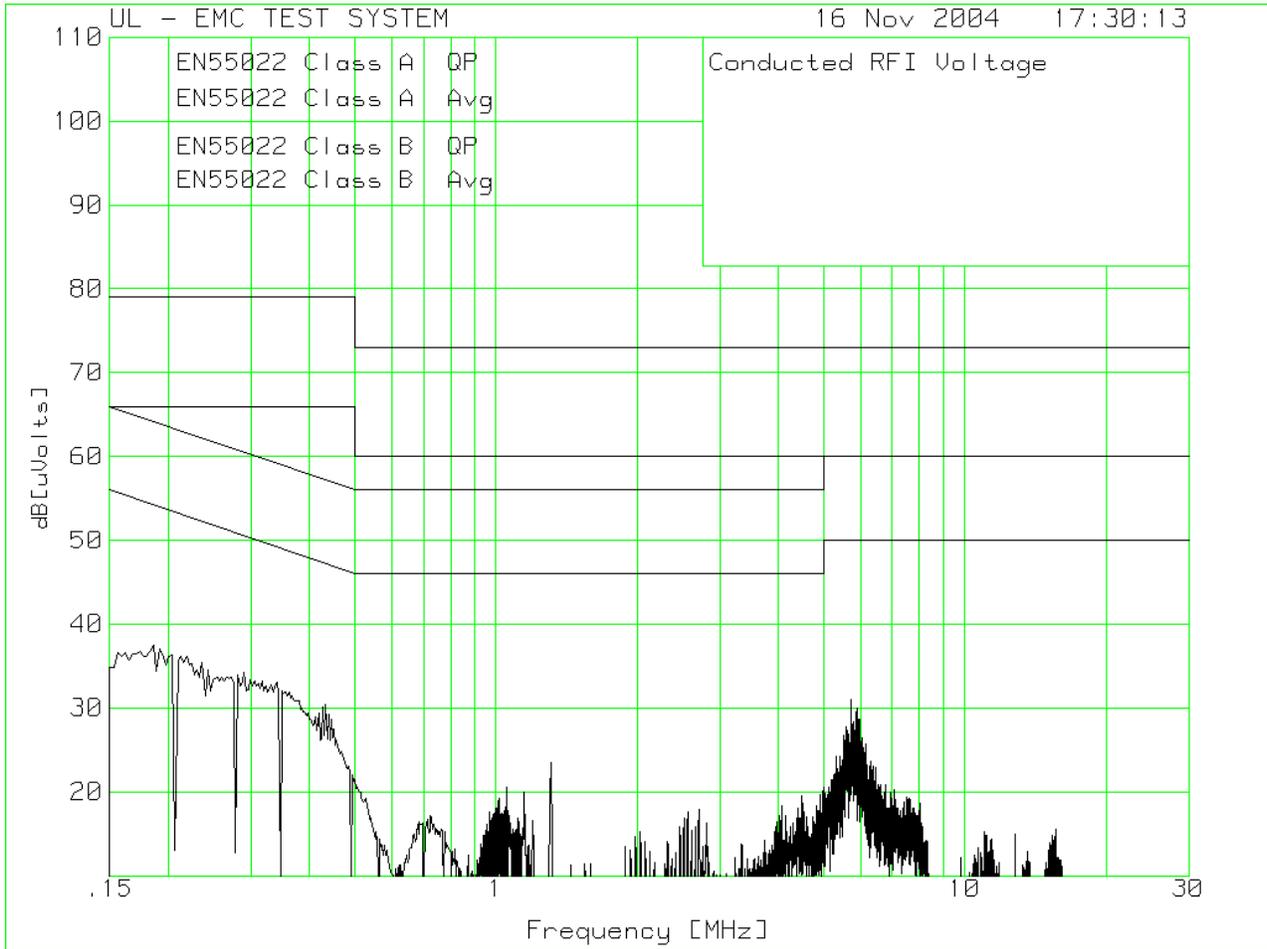
Test Description													
Objectives/Criteria	Specifications												
The Conducted emissions from a system or sub-system shall not exceed the limits for the specifications as stated.  <b>It is recommended that a margin of 6dB be allowed for manufacturing tolerances.</b>	<b>FCC Part 15.207</b>  <table border="1"> <thead> <tr> <th>Frequency</th> <th>QP<sup>1</sup></th> <th>AVG</th> </tr> </thead> <tbody> <tr> <td>.15 - .5 MHz</td> <td>66-56</td> <td>56-46</td> </tr> <tr> <td>.5 - 5 MHz</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 - 30 MHz</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency	QP <sup>1</sup>	AVG	.15 - .5 MHz	66-56	56-46	.5 - 5 MHz	56	46	5 - 30 MHz	60	50
	Frequency	QP <sup>1</sup>	AVG										
.15 - .5 MHz	66-56	56-46											
.5 - 5 MHz	56	46											
5 - 30 MHz	60	50											
<b>Test Result</b>	<b>Pass – This test was performed for information purposes only. This sample was tested in charging mode, as per justification in section 2.1</b>												

## 2.5.1 POWER LINE CONDUCTED EMISSIONS DATA

### 2.5.1.1 Line 1 120 Vac, 60 Hz Data



2.5.1.2 Line 2 120 Vac, 60 Hz Data



## 2.5.2 POWER LINE CONDUCTED EMISSIONS SETUP





### **3.0 TEST FACILITY**

#### **3.1 LOCATION**

The EUT was tested for Electromagnetic Compatibility at the Electronics Test Centre, located in Kanata, Ontario, Canada with the address as shown on page 1 or this report.

#### **3.2 GROUNDING PLAN**

The EUT was tested on table top, but is a handheld battery operated unit. No grounding was required according to the Clients specifications.

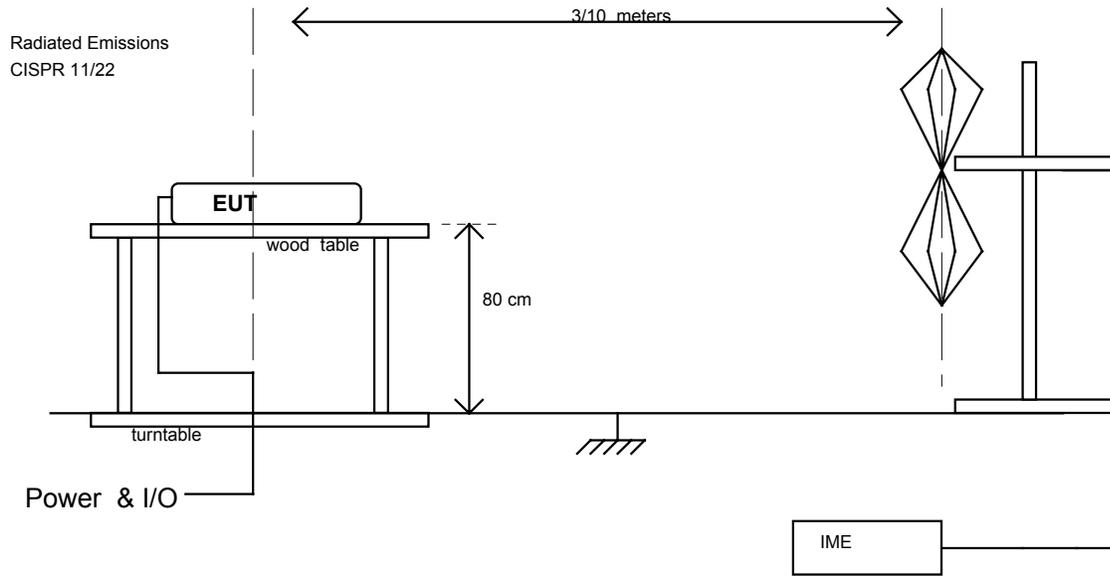
#### **3.3 POWER**

The EUT was self-powered by a rechargeable battery, all tests were commenced with a fully charged battery.

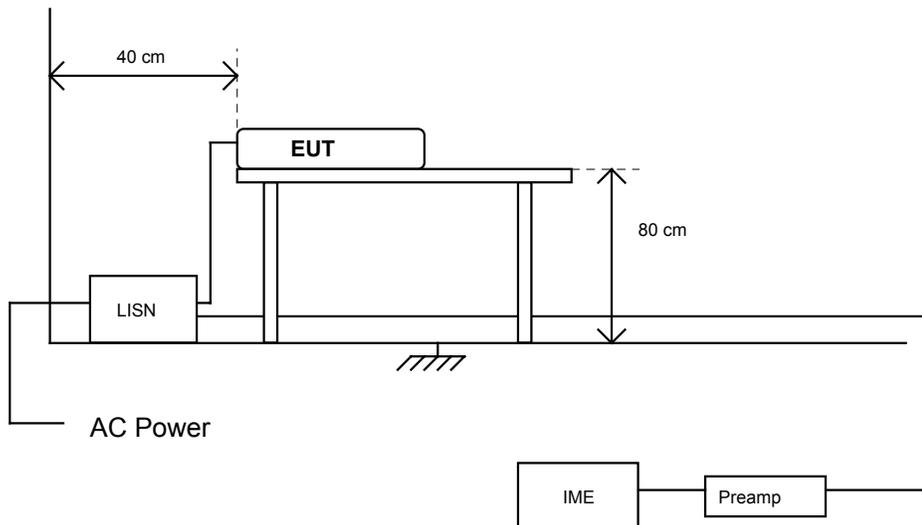
### 3.4 TEST CONFIGURATION

#### 3.4.1 TABLE TOP EQUIPMENT

The following diagrams illustrate the configuration of the EUT test and measurement equipment used for Radiated and Conducted Emissions Testing.



Conducted Emissions CISPR 11 / 22



### 3.5 SAMPLE CALCULATIONS

Emissions:

Meter reading: 31.0 dBuV

Amplifier and Cable factors (Gain/Loss): -26.0 dB

Antenna factor (Transducer): 37.0 dB

Level = Meter + Gain/Loss + Transducer

Level = 31.0 + (-26.0) + 37 = 31 - 26 + 37 = 42.0 dBuV

Margin = Limit - Level

Margin = 124 - 42 = 82.0 dB

Frequency Stability:

Ideal Fc: 13560000 Hz

Worst case Fc: 13559785 Hz

Worst case Delta Fc (Hz): Reading - Fc = 215 Hz

Frequency stability = Delta Fc / Ideal Fc = 215 / 13560000 = 0.0159%

Limit(%): 0.01

Limit (Hz): 13560000 \* (Limit(%)) / 100 = 1356 Hz

Delta from limit = Limit(Hz) - (Delta Fc)

Fc denotes center frequency.

**4.0 TEST EQUIPMENT**

The following equipment was utilized for this procedure. Measurement devices except for some select devices, as listed, are calibrated annually traceable to NIST. Those devices not performed annually are performed on a two year cycle.

**4.1 RADIATED EMISSIONS**

- a) Spectrum Analyzer
- b) Receiver with CISPR Quasi-peak Adapter
- c) Power Isolation Transformers
- d) Biconilog antenna (25 MHz to 2 GHz)
- e) DRG Horn (1 GHz to 18 GHz)
- f) Antenna mast positioner, and controller
- g) Flush-mounted turntable, and controller

**4.2 CONDUCTED EMISSIONS**

- a) Spectrum Analyzer
- b) Line Impedance Stabilization Network, 50  $\mu$ H
- c) CISPR Quasi-peak Adapter
- d) Power Isolation Transformer
- e) Personal Computer and EMI/EMC Software

**4.3 EMI SPECTRUM ANALYZER AND RECEIVER**

**4.3.1 SPECTRUM ANALYZER RANGE 1 of 2**

Start Frequency	0.15 MHz
Stop Frequency	30 MHz
Transducer	LISN per CISPR 16
CISPR Bandwidths	200 Hz Average/9 kHz
Spectrum Analyzer BW	10 kHz
Video Bandwidth	100 kHz
Reference Level	100 dB $\mu$ V

**4.3.2 SPECTRUM ANALYZER RANGE 2 of 2**

Start Frequency	30 MHz
Stop Frequency	1000 MHz
Transducer	Biconilog Antenna
CISPR Bandwidth	120 kHz Quasi-peak
Spectrum Analyzer BW	120 kHz
Video Bandwidth	1 MHz
Reference Level	100 dB $\mu$ V

**4.3.3 RECEIVER**

Transducer	Biconilog Antenna
CISPR Bandwidth	120 kHz Quasi-peak
Measurement Window	20 dB $\mu$ V

## **APPENDIX A - CLIENT SAMPLE DESCRIPTION**

**Description provided by:**



## APPENDIX B - TEST EQUIPMENT REPORT

Asset #	Device	Manufacturer	Model	Serial #	Cal. Date	Cal. Due date
2319	DRG Horn Antenna	Electrometrics	RGA60	2966	27-Dec-03	27-Dec-04
4297	Spectrum Analyzer	Hewlett Packard	HP8566B	2747A05484	23-Jul-04	23-Jul-05
4594	Function Generator	Wavetek	187	F6930311	20-Jul-04	20-Jul-05
4989	Spectrum Analyzer	Hewlett Packard	HP8566B	2747A05263	27-Dec-03	27-Dec-04
4990	Quasi Peak Adapter	Hewlett Packard	85650A	2521A00815	5-Jan-04	5-Jan-05
5076	EMC Software	Underwriters Laboratories	V3.02	MC106399NK07147	Monitored	Monitored
5078	Biconilog Antenna	Amplifier Research	LPB-2520/A	1173	5-Aug-03	5-Aug-05
5275	Monopole Antenna	EMCO	3301B	4378	24-Jul-03	24-Jul-04
5438	Spectrum Analyzer	Hewlett Packard	HP8566B	2747A05703	12-Jan-04	12-Jan-05
5445	Signal Generator	Marconi Instruments	2022A	119055/010	31-Dec-03	31-Dec-04
2316 (High Freq)	Amplifier	Miteq	AMF-60-010200-35-10P	699155	Monitored	Monitored
2316 (Low Freq)	Preamplifier	Electrometrics	BPA-1000	900710	Monitored	Monitored
4998	Hydra Data Logger	Fluke	2625A	5228604	6-Aug-03	6-Aug-05
5318	Temp Humidity Chamber	Burnsco	RTHC 16P-2-2	12-Jan	16-Dec-02	16-Dec-04
3702	Loop Antenna	Electrometrics	ALP 11	285	27-Dec-02	27-Dec-04
3703	Loop Antenna	Electrometrics	ALP 70	169	26-Dec-02	26-Dec-04
4872	Frequency Counter	Systron Donner	6243/A	22049-9	20-Jul-04	20-Jul-05