

# **TEST REPORT**

of

## **FCC Part 15 Subpart C**

Product : **Wireless Mouse**

Model(s): **LM20R-M; 26-985-M**

Applicant: **Darfon Electronics Corporation.**

Address: **6, Feng-Shu Tsuen, Gueishan,  
Taoyuan 33347,  
Taiwan, R.O.C.**

Test Performed by:

### **International Standards Laboratory**

<Lung-Tan LAB>

\*Site Registration No.

BSMI: SL2-IN-E-0013; TAF: 0997; IC: IC4164-1;

VCCI: R-1435, C-1440, T-299, R-2598, C-2845; NEMKO: ELA 113B

\*Address:

No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.

Lung-Tan Hsiang, Tao Yuan County 325, Taiwan

\*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: **ISL-08LR014FC**

Issue Date : **2008/05/26**

## Contents of Report

1.	General .....	1
1.1	Certification of Accuracy of Test Data .....	1
2.	Test Results Summary .....	2
3.	Description of Equipment Under Test (EUT) .....	3
4.	Description of Support Equipment.....	4
4.1	Description of Support Equipment .....	4
4.1.1	I/O Cable Condition of EUT and Support Units.....	4
5.	TEST RESULTS .....	5
5.1	Field Strength of fundamental Measurement [Section 15.227(a)] .....	5
5.1.1	EUT Configuration .....	5
5.1.2	Test Procedure .....	5
5.1.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested).....	5
5.1.4	Test Data:.....	6
5.2	Bandwidth of fundamental Measurement.....	10
5.2.1	EUT Configuration .....	10
5.2.2	Test Procedure .....	10
5.2.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested).....	10
5.2.4	Test Data:.....	11
5.3	Radiated Emission Measurement [Section 15.209 & 15.227(b)].....	12
5.3.1	EUT Configuration .....	12
5.3.2	Test Procedure .....	12
5.3.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested).....	12
5.3.4	Test Data:.....	13
5.4.1	EUT Configuration .....	15
5.4.2	Test Procedure (Radiated) .....	15
5.4.3	Test Setup (Radiated) .....	15
5.4.4	Test Data.....	16
6.	Appendix .....	17
6.1	Appendix A: Test Procedure for Radiated Emissions .....	17
6.2	Appendix B: Test Equipment .....	18
6.2.1	Test Equipment List.....	18
6.2.2	Software for Controlling Spectrum/Receiver and Calculating Test Data .....	18
6.3	Appendix C: Layout of EUT and Support Equipment .....	19
6.3.1	General Radiation Test Configuration .....	19
6.4	Appendix D: Accuracy of Measurement.....	21
6.5	Appendix E: Photographs of EUT Configuration Test Set Up .....	22

## 1. General

### 1.1 Certification of Accuracy of Test Data

**Standards:** CFR 47 Part 15 Subpart C (Section 15.227)

**Test Procedure:** ANSI C63.4:2003

**Equipment Tested:** Wireless Mouse

**Model:** LM20R-M; 26-985-M

**Applied by:** Darfon Electronics Corporation.

**Sample received Date:** 2008/05/13

**Final test Date :** 2008/05/15-2008/05/26

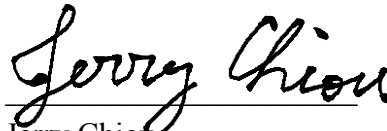
**Test Result** PASS

**Test Site:** Chamber 02, Conduction 03

**Temperature** Refer to each site test data

**Humidity:** Refer to each site test data

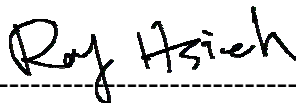
**Test Engineer:**

  
Jerry Chiou

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Approve & Signature

  
-----

Roy Hsieh / Manager

<p>Test results given in this report apply only to the specific sample(s) tested under stated test conditions. This report shall not be reproduced other than in full without the explicit written consent of ISL. This report totally contains 25 pages, including 1 cover page, 1 contents page, and 23 pages for the test description.</p>
---

## 2. Test Results Summary

The device functions of EUT has been tested according to the FCC regulations listed below:

Tested Standards: 47 CFR Part 15 Subpart C			
Standard Section	Test Type	Result	Remarks
15.205	Restricted bands of operation	Pass	
15.207	AC Power Line Emissions	NA	
15.209	Radiated Emissions 30KHz – 1 GHz	Pass	
15.227(a)(b)	Operation within the band 26.96 – 27.28MHz	Pass	

### 3. Description of Equipment Under Test (EUT)

Description: Wireless Mouse  
Model No.: LM20R-M; 26-985-M  
Brand: BenQ; Gigaware  
Frequency Range: 27.045 MHz  
Support channel: 1 Channel  
Modulation Skill: FSK  
Power Type : DC 3V (Power from Battery)

Note:

1. This device is a 27MHz Mouse included a 27.045MHz transmitter function.
2. This different of the each model is shown as below:

Model	Brand
LM20R-M	BenQ
26-985-M	Gigaware

## **4. Description of Support Equipment**

### **4.1 Description of Support Equipment**

NA

#### **4.1.1 I/O Cable Condition of EUT and Support Units**

NA

## 5. TEST RESULTS

### 5.1 Field Strength of fundamental Measurement [Section 15.227(a)]

#### 5.1.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

#### 5.1.2 Test Procedure

1. The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.
2. Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.
3. The maximum readings were taken using loop antenna at a fixed one meter height and then rotating the turntable. EUT's X, Y Z axis, were measured.

#### 5.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Test Mode	Peak / Average Mode
Detector Function:	Maximum Peak / Average
Resolution Bandwidth (RBW):	10KHz
Video Bandwidth (VBW)	30KHz
Measurement Distance	3 m

**5.1.4 Test Data:**

Temp. (° C): 25

Test Engr: Jerry

Humidity (%): 55

Mode	Detector	Frequency (MHz)	Analyzer Reading (dBμV)	Correction Factor (dB)	Emission (dBμV)	Limit (dBμV)	Pass/Fail
X-axis	Peak	27.045	36.14	10.08	46.22	100	Pass
X-axis	Average	27.045	36.08	10.08	46.16	80	Pass
Y-axis	Peak	27.045	40.85	10.08	50.93	100	Pass
Y-axis	Average	27.045	40.7	10.08	50.78	80	Pass
Z-axis	Peak	27.045	41.32	10.08	51.4	100	Pass
Z-axis	Average	27.045	41.27	10.08	51.35	80	Pass

Note:

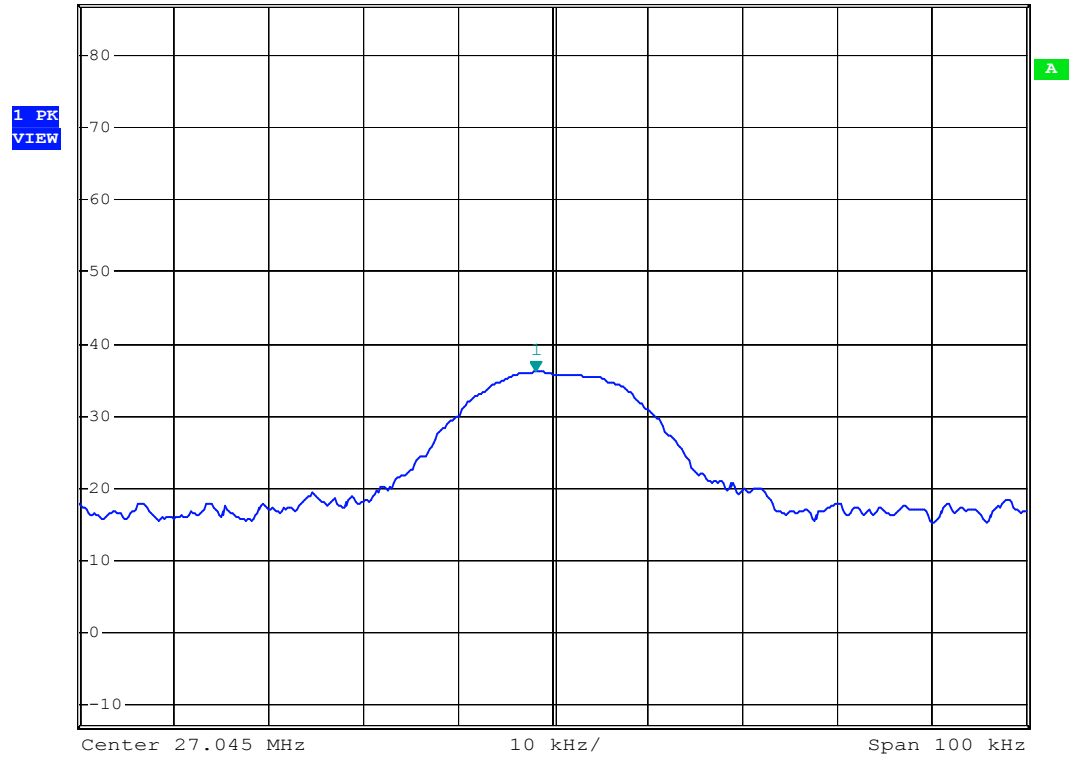
- Both Horizontal and Vertical polarization have been tested and the worst data is listed above when the loop antenna rotated at Vertical polarization.



X-axis (Peak Detector)



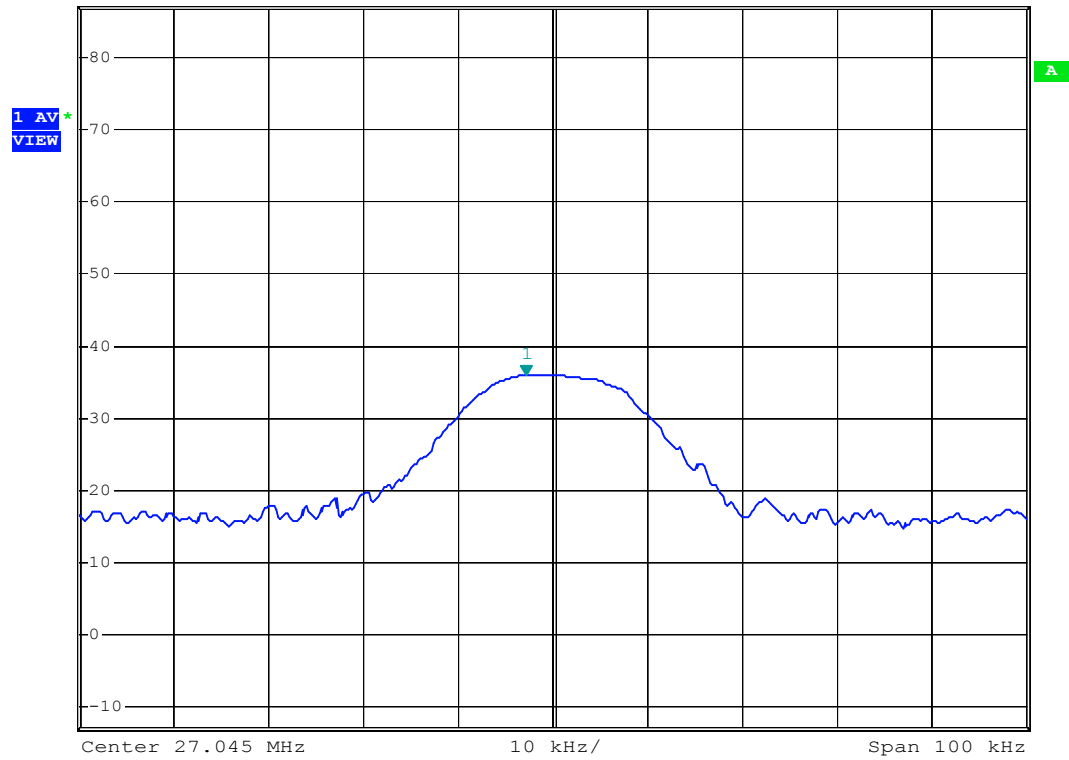
Ref 87 dB $\mu$ V      \*Att 0 dB      \*RBW 10 kHz      Marker 1 [T1]      \*VBW 30 kHz      36.14 dB $\mu$ V  
SWT 2.5 ms      27.043200000 MHz



X-axis (Average Detector)



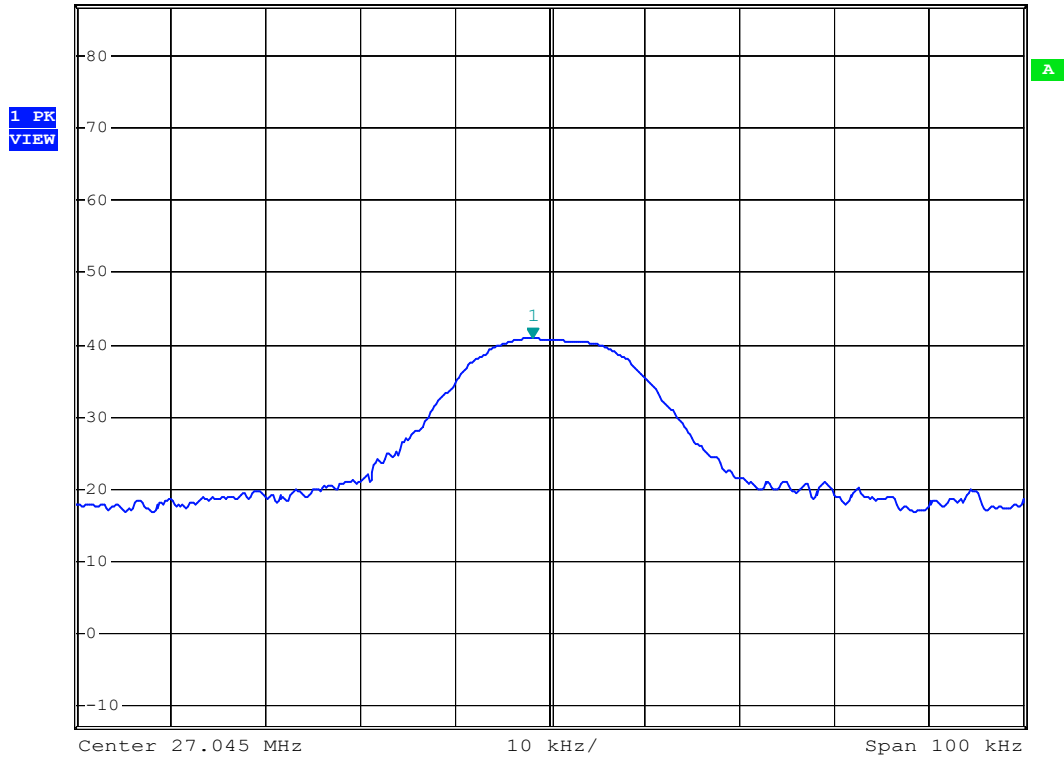
Ref 87 dB $\mu$ V      \*Att 0 dB      \*RBW 10 kHz      Marker 1 [T1]      \*VBW 30 kHz      36.08 dB $\mu$ V  
SWT 2.5 ms      27.042200000 MHz



Y-axis (Peak Detector)



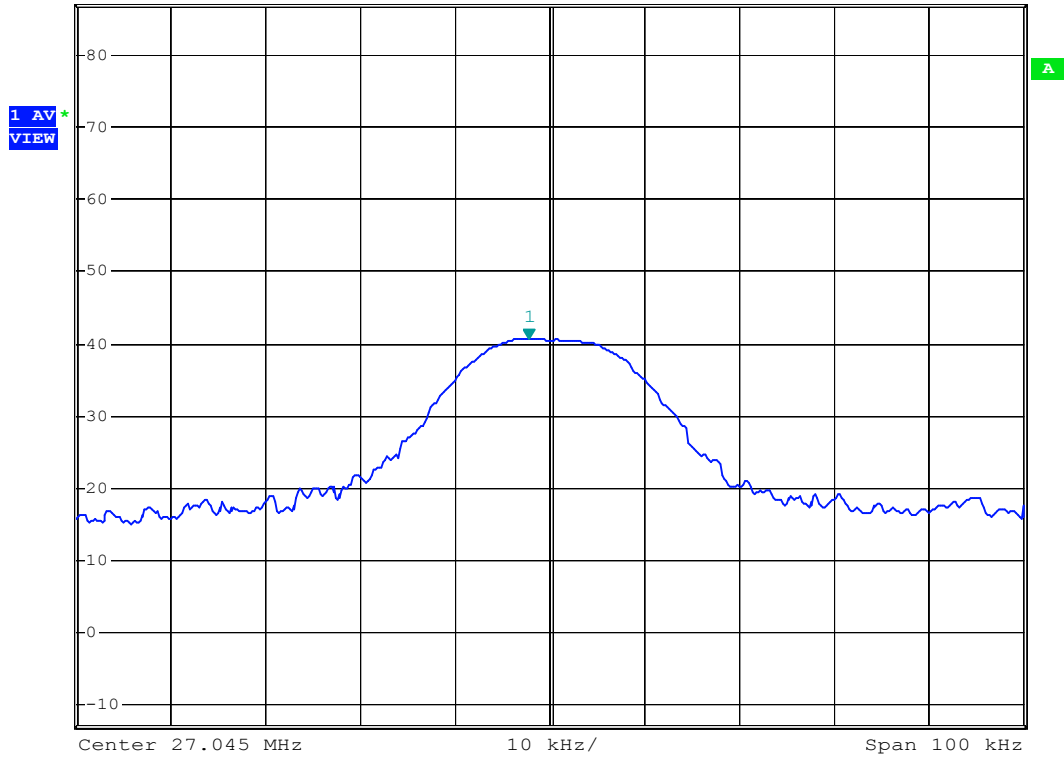
Ref 87 dBμV \*Att 0 dB \*RBW 10 kHz Marker 1 [T1 ]  
\*VBW 30 kHz 40.85 dBμV  
SWT 2.5 ms 27.043200000 MHz



Y-axis (Average Detector)



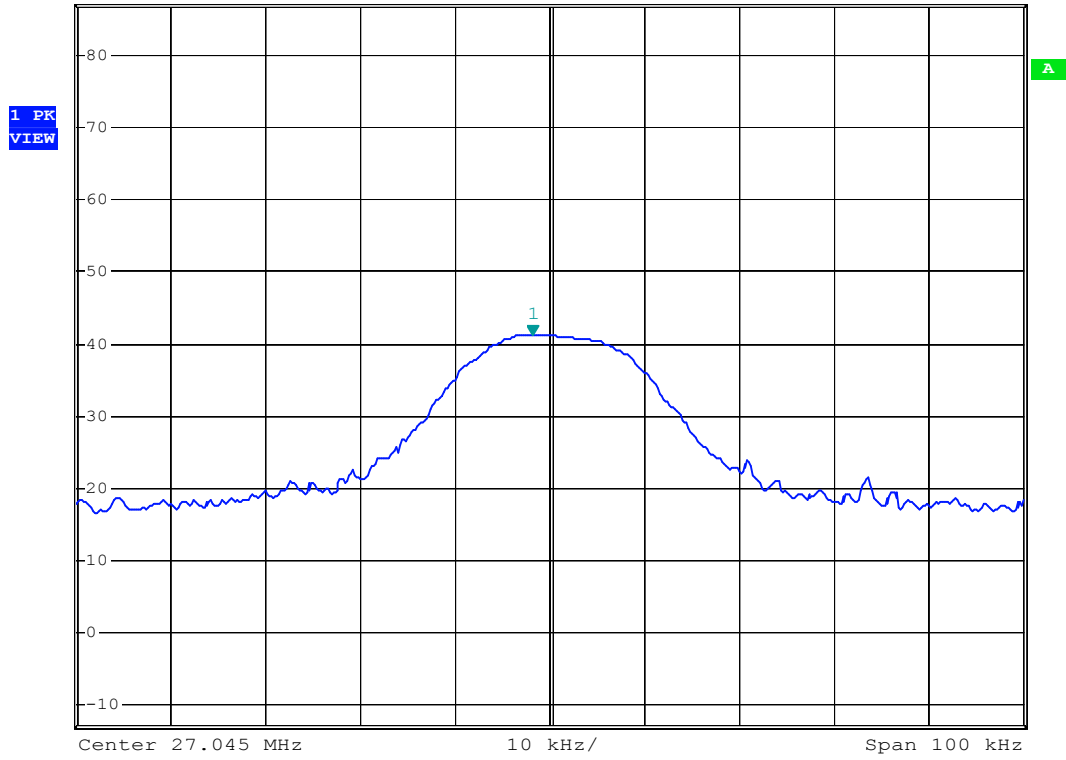
Ref 87 dBμV \*Att 0 dB \*RBW 10 kHz Marker 1 [T1 ]  
\*VBW 30 kHz 40.70 dBμV  
SWT 2.5 ms 27.042800000 MHz



Z-axis (Peak Detector)



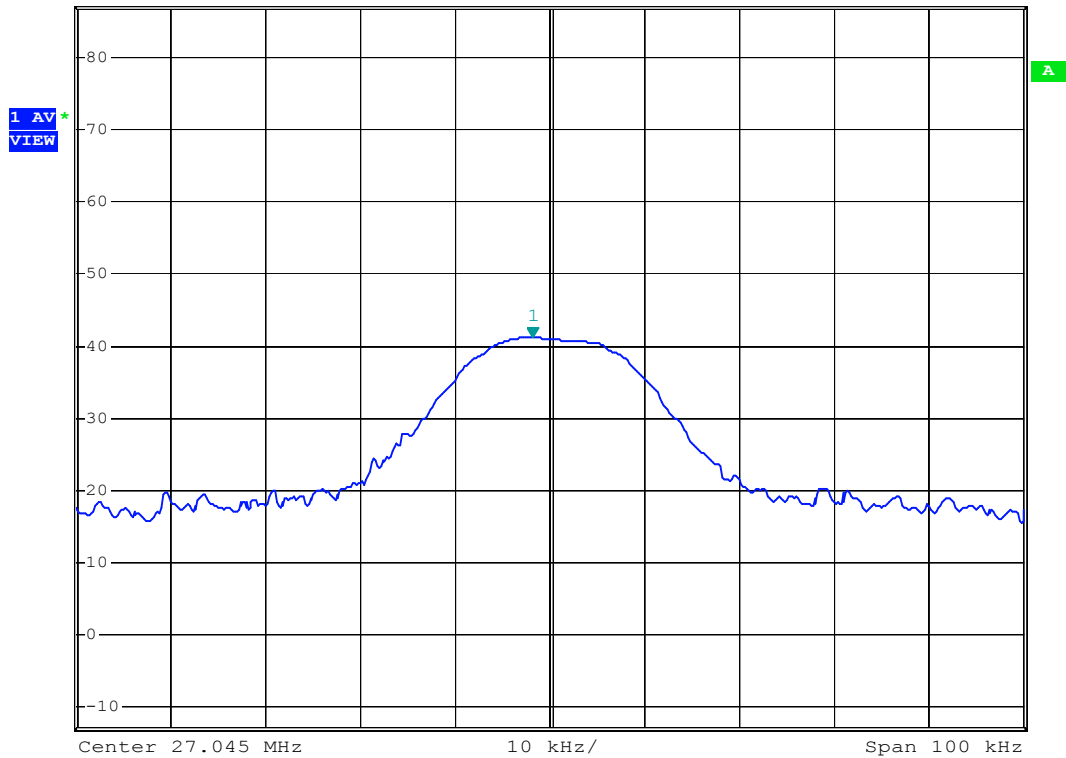
Ref 87 dB $\mu$ V      \*Att 0 dB      \*RBW 10 kHz      Marker 1 [T1]      41.32 dB $\mu$ V  
SWT 2.5 ms      27.043200000 MHz



Z-axis (Average Detector)



Ref 87 dB $\mu$ V      \*Att 0 dB      \*RBW 10 kHz      Marker 1 [T1]      41.27 dB $\mu$ V  
SWT 2.5 ms      27.043200000 MHz



## 5.2 Bandwidth of fundamental Measurement

### 5.2.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

### 5.2.2 Test Procedure

1. The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.
2. Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.
3. The maximum readings were taken using loop antenna at a fixed one meter height and then rotating the turntable. EUT's axis were set to worst mode in "Field Strength of fundamental Measurement" to measured.

### 5.2.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Test Mode	Peak Mode
Detector Function:	Peak
Resolution Bandwidth (RBW):	1KHz
Video Bandwidth (VBW)	3KHz
Measurement Distance	3 m

5.2.4 Test Data:

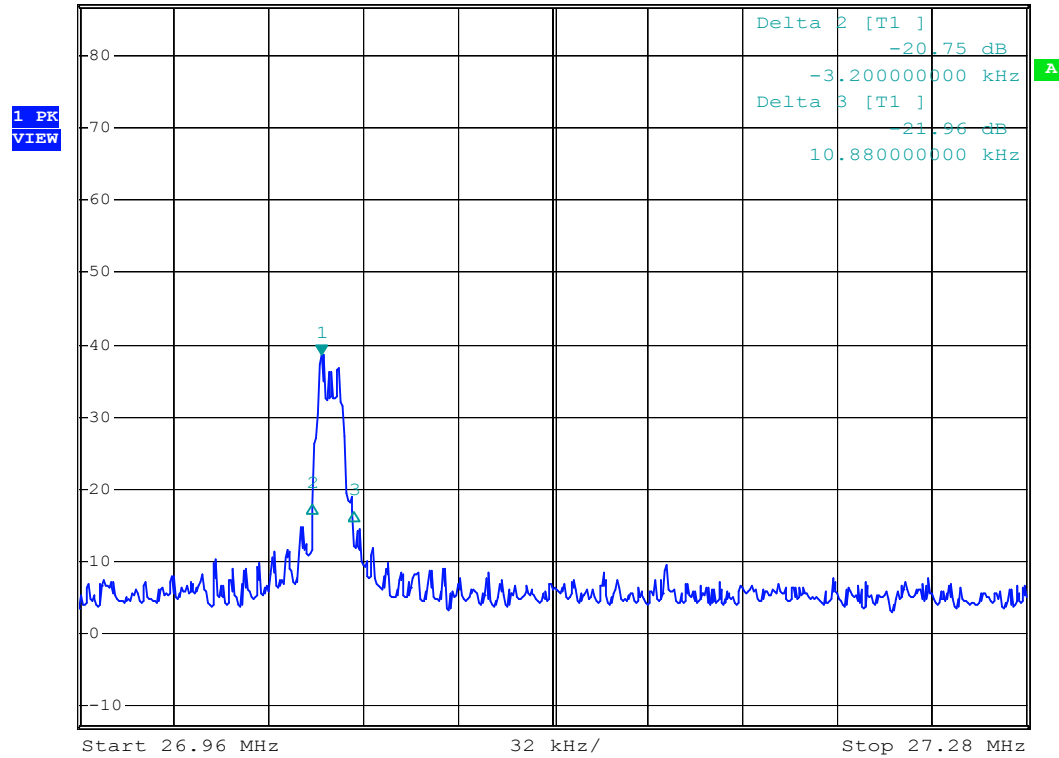
Temp. (° C): 25  
 Humidity (%): 55  
 Test Engr: Jerry

Mode (axis)	Frequency	20dB Bandwidth
	(MHz)	(KHz)
Z	27.045	14.08

Z-axis



Ref 87 dBµV      \*Att 0 dB      \*RBW 1 kHz      Marker 1 [T1]      38.68 dBµV  
 \*VBW 3 kHz      27.041920000 MHz  
 SWT 320 ms



## 5.3 Radiated Emission Measurement [Section 15.209 & 15.227(b)]

### 5.3.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

### 5.3.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. We found the maximum readings by varying the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured.

30MHz to 1GHz: The highest emissions between 30 MHz to 1000 MHz were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission.

For the test of 2<sup>nd</sup> to 10<sup>th</sup> harmonics frequencies, the equipment setup was also refer to EMI Receiver/Spectrum Analyzer Configuration. The frequencies were tested using Peak mode first, if the test data is higher than the emissions limit, an additional measurement using Average mode will be performed and the average reading will be compared to the limit and record in test report.

### 5.3.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range Tested:	30MHz~1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth (RBW):	100KHz
Video Bandwidth (VBW)	300KHz
Measurement Distance	3 m

5.3.4 Test Data:

30MHz~1GHz Open Field Radiated Emissions (Horizontal)

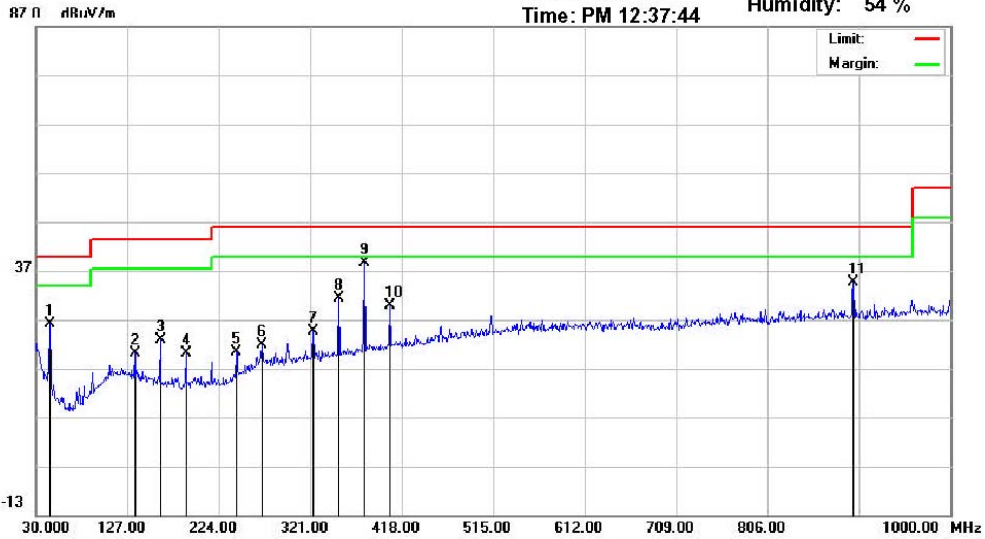


Address: No.120, Lane 180, San Ho Tsuen, Hsin Ho Road  
, Lung-Tan Hsiang, Tao Yuan Conty, Taiwan R.O.C.  
Tel: 03-4071718

Radiated Emission Measurement

Date: 2008/5/23  
Time: PM 12:37:44

Operator: Jerry  
Temperature: 26 °C  
Humidity: 54 %



Site : Chamber 02

Condition : FCC Class B 3M Radiation

Polarization: *Horizontal*

Mk.	Frequency (MHz)	RX_R (dBuV/m)	Ant_F (dB)	Cab_L (dB)	PreAmp (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
	44.5500	14.02	10.63	1.49	0	26.14	40.00	-13.86	100	87	peak
	134.7600	6.25	11.57	2.35	0	20.17	43.50	-23.33	180	213	peak
	161.9200	10.45	9.92	2.52	0	22.89	43.50	-20.61	175	193	peak
	189.0800	8.51	9.03	2.65	0	20.19	43.50	-23.31	182	214	peak
	242.4300	6.94	10.57	2.92	0	20.43	46.00	-25.57	237	108	peak
	269.5900	4.83	13.93	3.1	0	21.86	46.00	-24.14	115	348	peak
	323.9100	7.16	13.92	3.44	0	24.52	46.00	-21.48	142	201	peak
	351.0700	13.05	14.62	3.6	0	31.27	46.00	-14.73	248	197	peak
*	378.2300	19.70	15.16	3.71	0	38.57	46.00	-7.43	348	243	peak
	405.3900	10.30	15.72	3.82	0	29.84	46.00	-16.16	294	9	peak
	897.1800	8.70	20.39	5.59	0	34.68	46.00	-11.32	159	54	peak

\*:Maximum data x:Over limit !:over margin

### 30MHz~1GHz Open Field Radiated Emissions (Vertical)

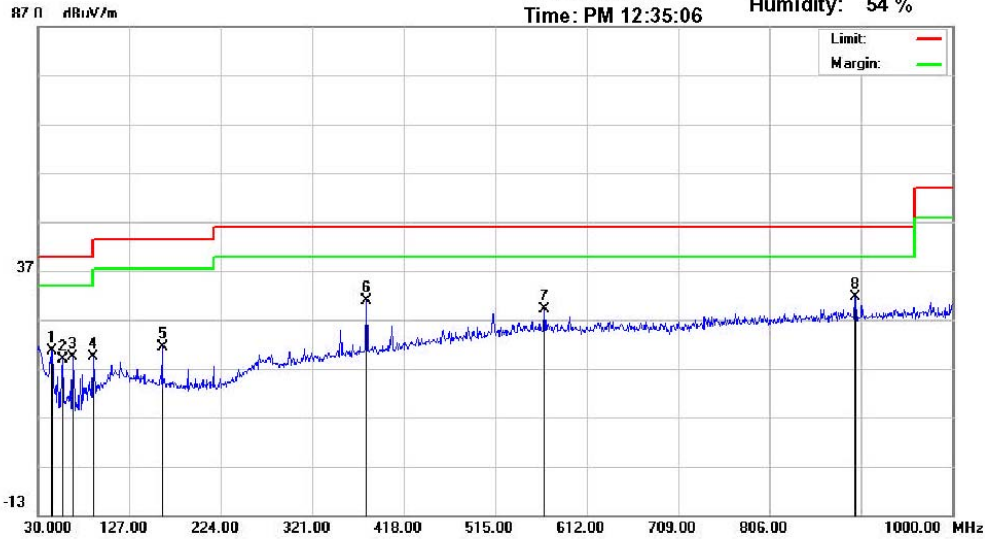


Address: No.120, Lane 180, San Ho Tsuen, Hsin Ho Road  
, Lung-Tan Hsiang, Tao Yuan Conty, Taiwan R.O.C.  
Tel: 03-4071718

Radiated Emission Measurement

Date: 2008/5/23  
Time: PM 12:35:06

Operator: Jerry  
Temperature: 26 °C  
Humidity: 54 %



Site : Chamber 02

Condition : FCC Class B 3M Radiation

Polarization: *Vertical*

Mk.	Frequency (MHz)	RX_R (dBuV/m)	Ant_F (dB)	Cab_L (dB)	PreAmp (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant.Pos (cm)	Tab.Pos (deg.)	Detector
	44.5500	8.45	10.63	1.49	0	20.57	40.00	-19.43	292	59	peak
	56.1900	10.17	7.05	1.66	0	18.88	40.00	-21.12	241	346	peak
	66.8600	11.38	6.26	1.77	0	19.41	40.00	-20.59	159	31	peak
	88.2000	8.70	8.59	1.98	0	19.27	43.50	-24.23	397	83	peak
	161.9200	8.95	9.92	2.52	0	21.39	43.50	-22.11	100	24	peak
	378.2300	11.91	15.16	3.71	0	30.78	46.00	-15.22	100	320	peak
	567.3800	5.96	18.73	4.47	0	29.16	46.00	-16.84	100	71	peak
*	897.1800	5.54	20.39	5.59	0	31.52	46.00	-14.48	131	99	peak

\*:Maximum data x:Over limit !:over margin

NOTE: All frequencies from 30MHz to 1GHz have been tested



## 5.4 Restricted Bands Measurement [Section 15.205]

### 5.4.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

### 5.4.2 Test Procedure (Radiated)

1. Antenna and Turntable test procedure same as Radiated Emission Measurement.  
Equipment mode: Spectrum analyzer  
Detector function: Peak  
RBW: 100KHz  
VBW: 300KHz
2. EUT's axis were set to worst mode in "Field Strength of fundamental Measurement" to measured.
3. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed.
4. Find the next peak frequency outside the operation frequency band
5. Get the spectrum reading after Maximum Hold function is completed.

### 5.4.3 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

5.4.4 Test Data

Table Measurement (Radiated)

Temp. (° C): 25

Test Engr: Jerry

Humidity (%): 55

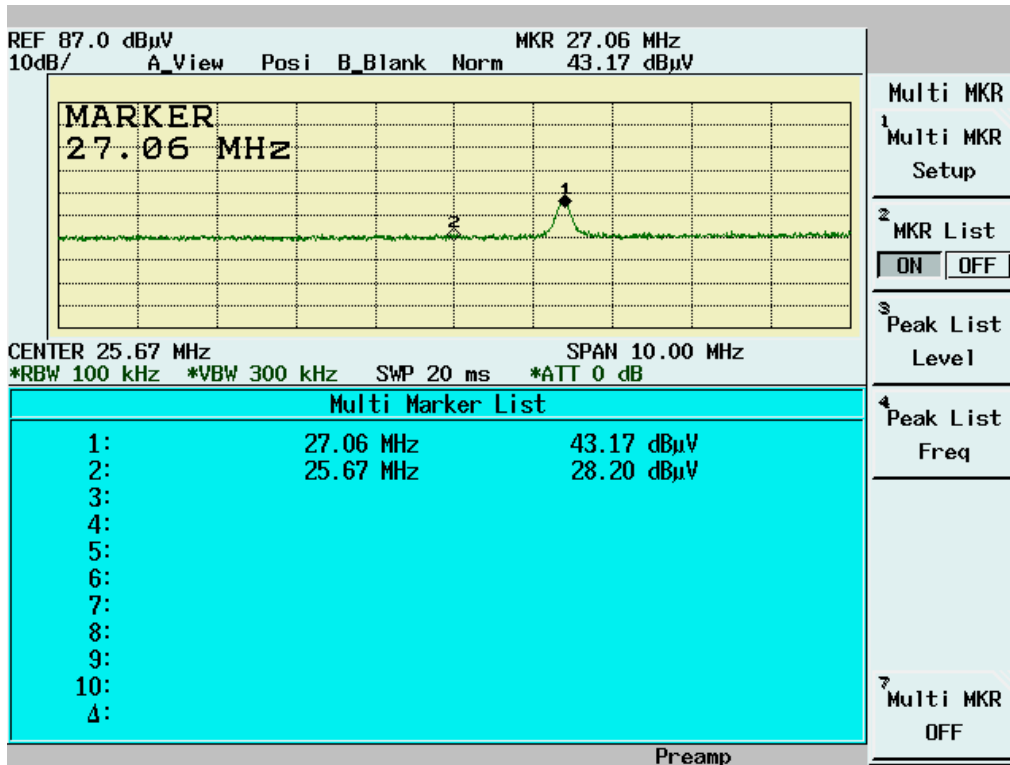
Description	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Equip. Setup VBW	Pass or Fail
Fundamental (peak mode)	27.06	43.17	10.08	53.25	---	300KHz	---
Restricted band (peak mode)	25.67	28.2	10.08	38.28	100	300KHz	Pass

Note:

- The spectrum plot of emission level measurement in restricted band is attached.
- Emission Level=Spectrum Reading+Correction Factor
- Correction Factor=Antenna Factor+cable loss–amplifier gain
- EUT's X, Y Z axis have been tested and the worst data is listed above.

Measurement for radiated emission in Restricted Band (Radiated)

Peak Mode



## 6. Appendix

### 6.1 Appendix A: Test Procedure for Radiated Emissions

#### Preliminary Measurements in the Anechoic Chamber

The radiated emissions are initially measured in the anechoic chamber at a measurement distance of 3 meters. Desktop EUT are placed on a wooden stand 0.8 meter in height. The measurement antenna is 3 meters from the EUT. The test setup in anechoic chamber is the same as open site. The turntable rotated 360°. The antenna height is varied from 1-2.5m. The primary objective of the radiated measurements in the anechoic chamber is to identify the frequency spectrum in the absence of the electromagnetic environment existing on the open test site. The frequencies can then be pre-selected on the open test site to obtain the corresponding amplitude. The initial scan is made with the spectrum analyzer in automatic sweep mode. The spectrum peaks are then measured manually to determine the exact frequencies.

#### Measurements on the Open Site or 10m EMC Chamber

The radiated emissions test will then be repeated on the open site or 10m EMC chamber to measure the amplitudes accurately and without the multiple reflections existing in the shielded room. The EUT and support equipment are set up on the turntable of one of the 3 or 10 meter open field sites. Desktop EUT are set up on a wooden stand 0.8 meter above the ground.

For the initial measurements, the receiving antenna is varied from 1-4 meter height and is changed in the vertical plane from vertical to horizontal polarization at each frequency. Both readings are recorded with the quasi-peak detector with 120KHz bandwidth. For frequency between 30 MHz and 1000MHz, the reading is recorded with peak detector or quasi-peak detector. For frequency above 1 GHz, the reading is recorded with peak detector or average detector with 1 MHz bandwidth.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading. The interconnecting cables were arranged and moved to get the maximum emission. Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings.

## 6.2 Appendix B: Test Equipment

### 6.2.1 Test Equipment List

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Radiation	BILOG Antenna 08	Schaffner	CBL6112B	2756	06/13/2007	06/12/2008
Radiation	Coaxial Cable Chmb 02-10M	Belden	RG-8/U	Chmb 02-10M	02/13/2008	02/12/2009
Radiation	Digital Hygro-Thermometer Chmb 02	MicroLife	HT-2126G	Chmb 02	12/26/2006	12/26/2008
Radiation	EMI Receiver 02	HP	85460A	3448A00183	12/29/2007	12/28/2008
Radiation	Spectrum Analyzer 13	Advantest	R3132	121200411	03/16/2008	03/15/2009
Radiation	Spectrum Analyzer 14	Advantest	R3182	140600028	12/06/2007	12/06/2008
Radiation	Loop Antenna 03	Com-Power	AL-130	17101	05/10/2007	05/10/2008
Radiation	Spectrum Analyzer 19	R&S	FSP40	100116	09/12/2007	09/12/2008

Note: Calibration is traceable to NIST or national or international standards.

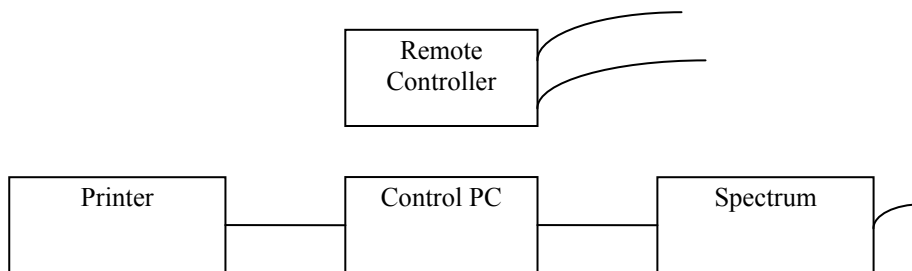
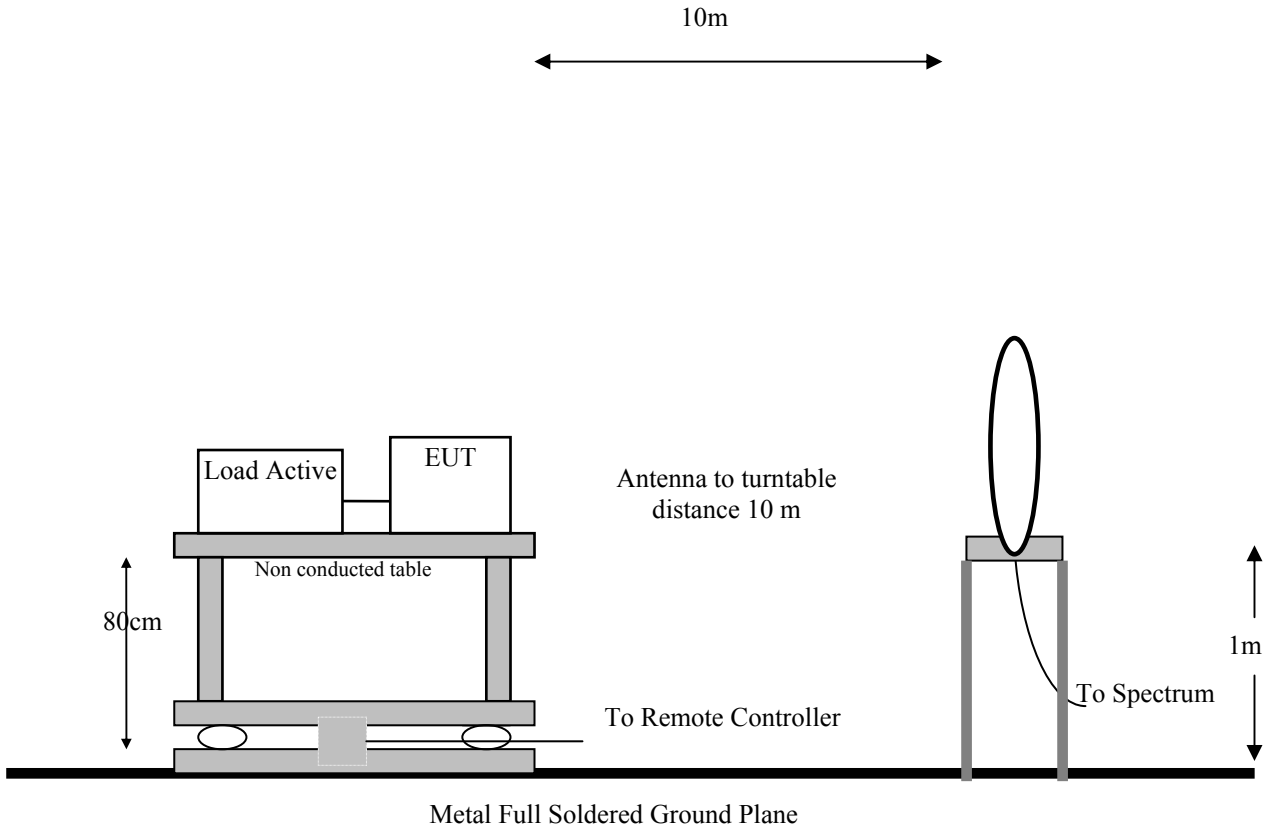
### 6.2.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

Radiation/Conduction	Filename	Version	Issued Date
Radiation	Tile.exe	1.12C	6/16/2000

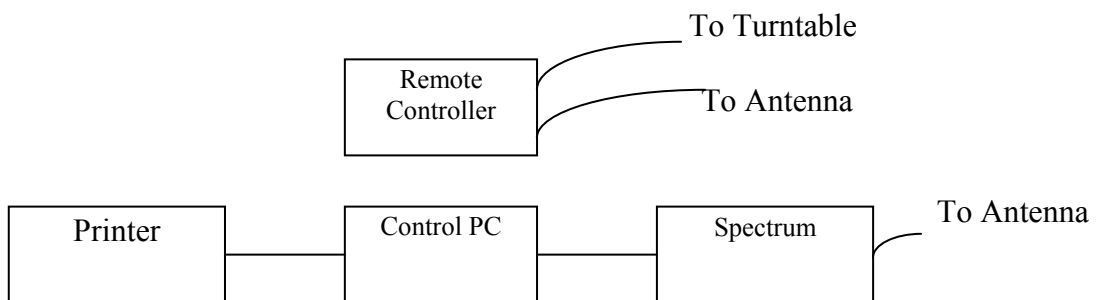
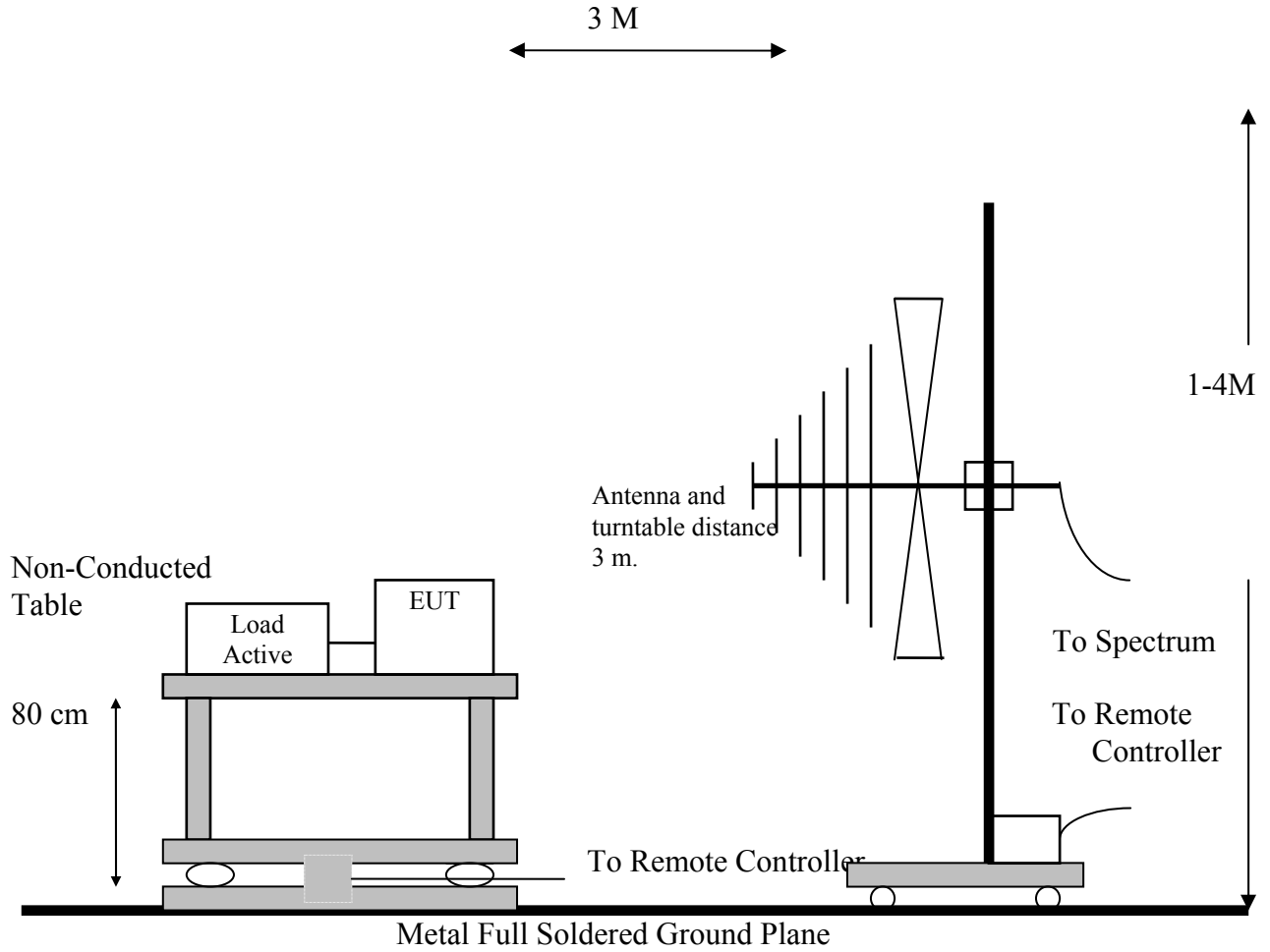
### 6.3 Appendix C: Layout of EUT and Support Equipment

#### 6.3.1 General Radiation Test Configuration

##### 6.3.1.1 9KHz-30MHz



6.3.1.2 30MHz-1GHz



## 6.4 Appendix D: Accuracy of Measurement

The measurement uncertainty refers to CISPR 16-4-2:2003. The coverage factor  $k = 2$  yields approximately a 95 % level of confidence.

<Conduction 03>:  $\pm 0.88$ dB

<Chamber 02 (3M)>

30MHz~1GHz:  $\pm 3.306$  dB

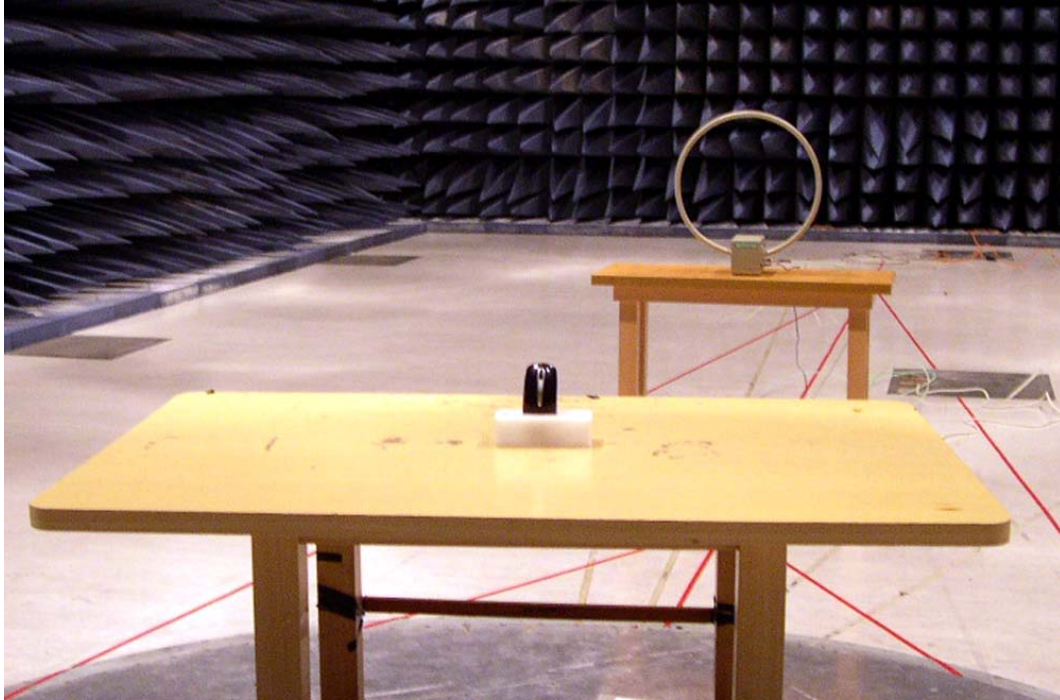
1GHz~18GHz:  $\pm 2.62$  dB

18GHz~26GHz:  $\pm 3.609$  dB

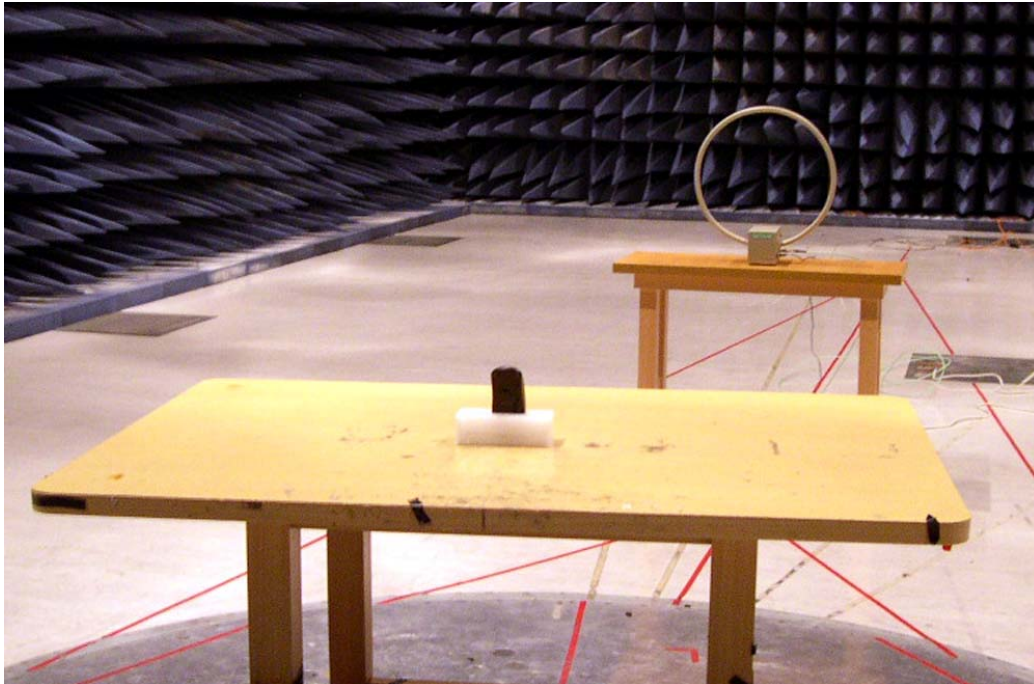
26GHz~40GHz:  $\pm 2.702$  dB

## 6.5 Appendix E: Photographs of EUT Configuration Test Set Up

The Front View of Highest Radiated Set-up For EUT

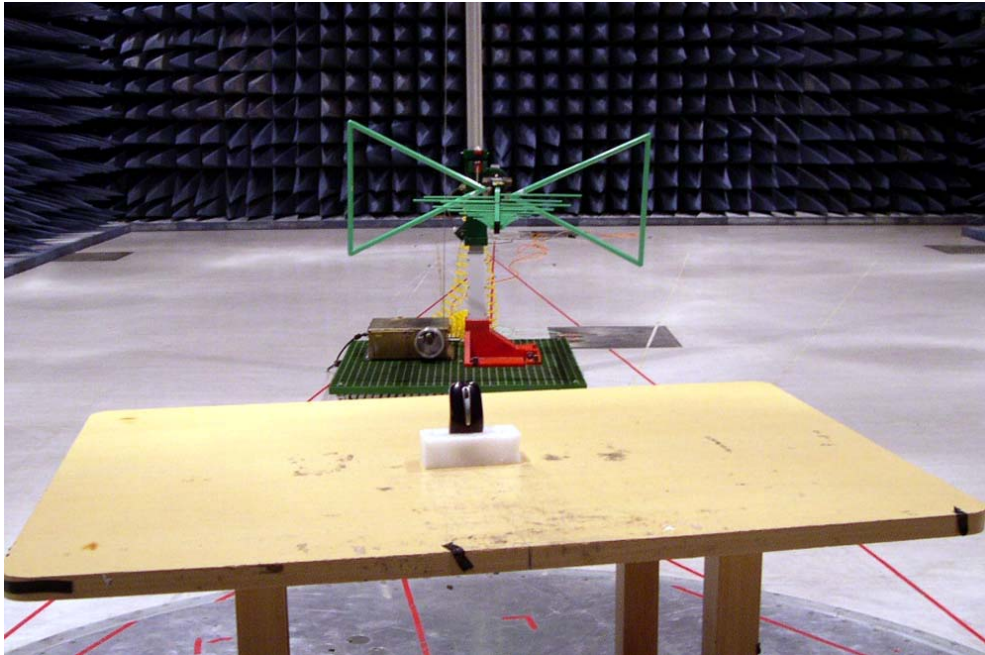


The Back View of Highest Radiated Set-up For EUT





The Front View of Highest Radiated Set-up For EUT



The Back View of Highest Radiated Set-up For EUT

