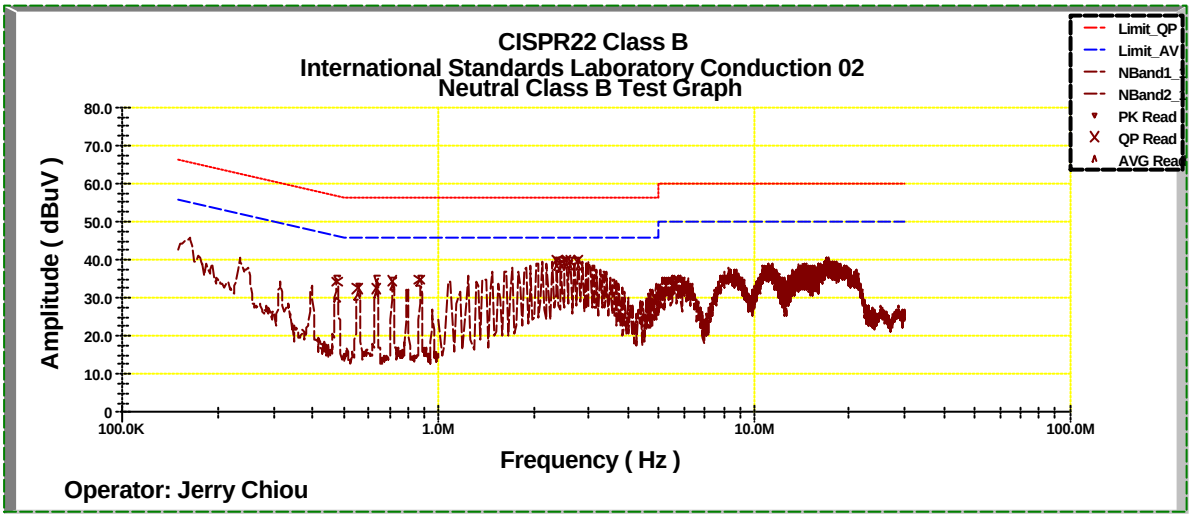
Power Line Conducted Emissions (Neutral) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):24
10:48:16AM,Thursday,December02,2004 Humidity(%):50

Frequency	LISNLoss	CableLoss	QPCorrct.	QPLimit	QPMargin	AVECorrct.	AVELimit	AVEMargin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.47756	0.11	0.07	34.21	56.64	-22.43	29.52	46.64	-17.12
0.55493	0.13	0.07	32.56	56.00	-23.44	30.14	46.00	-15.86
0.63610	0.14	0.07	32.42	56.00	-23.58	30.74	46.00	-15.26
0.71333	0.15	0.07	34.46	56.00	-21.54	32.60	46.00	-13.40
0.87225	0.18	0.07	34.72	56.00	-21.28	33.83	46.00	-12.17
2.37773	0.20	0.10	39.91	56.00	-16.09	37.87	46.00	-8.13
2.45586	0.20	0.10	39.48	56.00	-16.52	37.43	46.00	-8.57
2.53660	0.20	0.10	39.82	56.00	-16.18	38.45	46.00	-7.55
2.61527	0.20	0.11	39.61	56.00	-16.39	37.81	46.00	-8.19
2.77407	0.20	0.11	39.75	56.00	-16.25	37.82	46.00	-8.18



* NOTE: During the test, the EMI receiver was set to Max. Hold then switch the EUT Channel between 1 , 6, 11 to get the maximum reading of all these channels .
Margin = Amplitude + Insertion Loss- Limit
A margin of -8dB means that the emission is 8dB below the limit

5.2 Bandwidth for DSSS [Section 15.247 (a)(2)]

5.2.1 Test Procedure

The Transmitter output of EUT was connected to the spectrum analyzer. The 6 dB bandwidth of the fundamental frequency was measured. The setting of spectrum analyzer is as follows

Equipment mode	Spectrum analyzer
Detector function	Peak mode
RBW	100KHz
VBW	100KHz

5.2.2 Test Setup

5.2.3 Test Data:

6dB Bandwidth

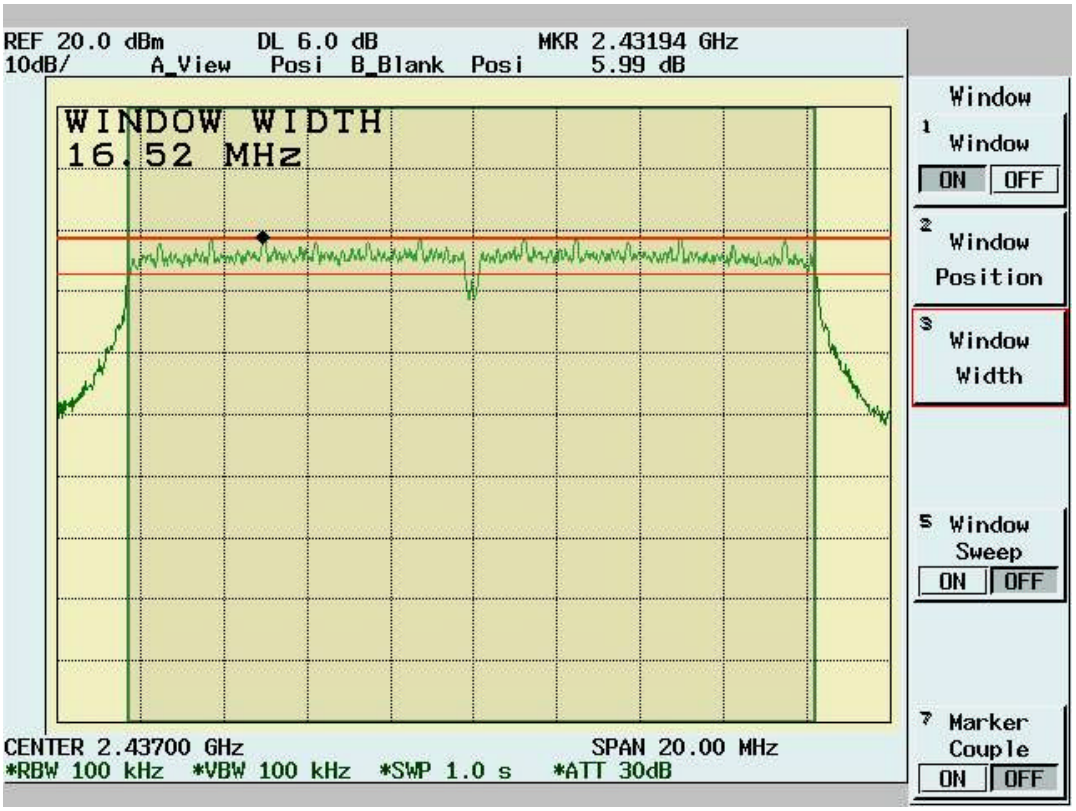
Temp. (deg. C): 25

Test Engr: Jerry Chiou Humidity (%): 50

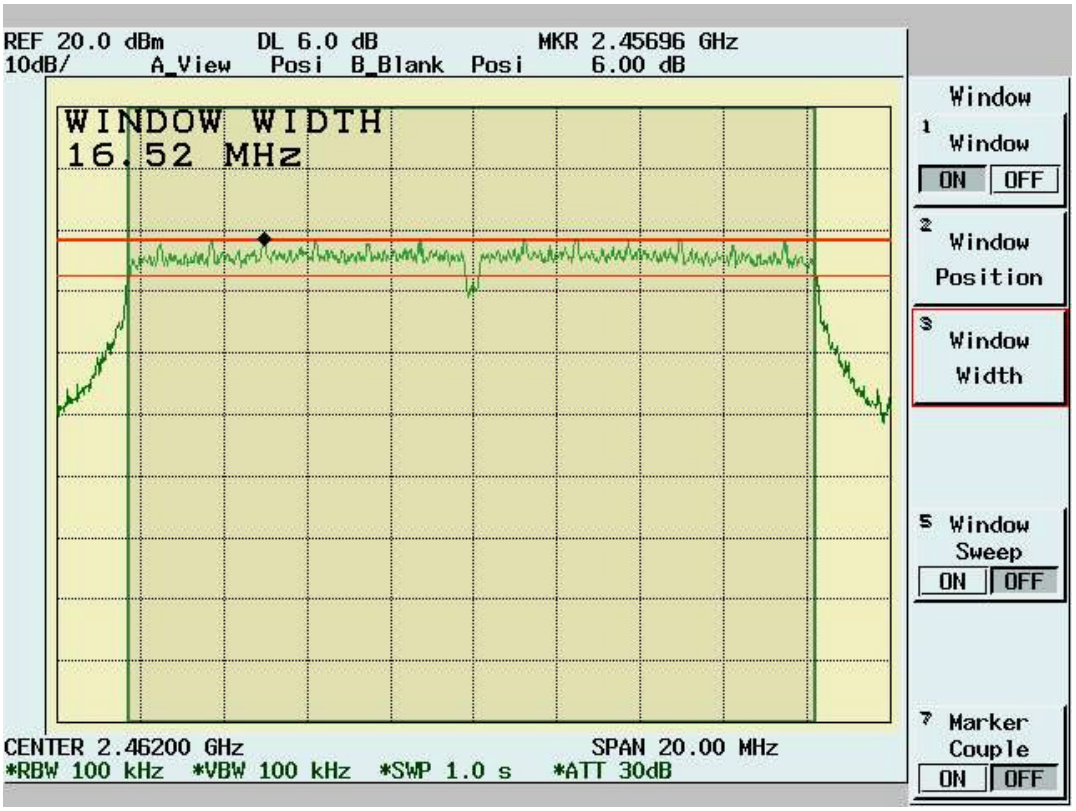
Chennel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	16.52	0.5	Pass
6	2437	16.52	0.5	Pass
11	2462	16.52	0.5	Pass

Channel 1:

Channel 6:



Channel 11:

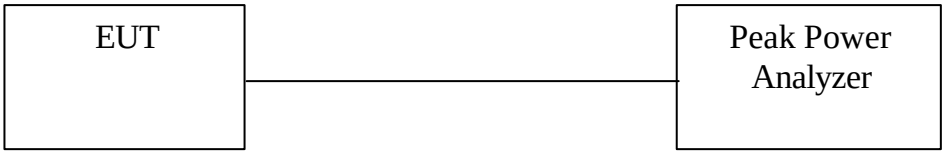

REF 20.0 dBm
10dB/
DL 6.0 dB
A_View
Posi
B_Blank
Posi
MKR 2.45696 GHz
6.00 dB
WINDOW WIDTH
16.52 MHz
CENTER 2.46200 GHz
SPAN 20.00 MHz
*RBW 100 kHz
*VBW 100 kHz
*SWP 1.0 s
*ATT 30dB
Window
1 Window
ON OFF
2 Window Position
3 Window Width
5 Window Sweep
ON OFF
7 Marker Couple
ON OFF

5.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

5.3.1 Test Procedure

The Transmitter output of EUT was connected to the peak power analyzer.

5.3.2 Test Setup



5.3.3 Test Data

Maximum Peak Output Power

Temp. (deg. C): 25

Test Engr: Jerry Chiou Humidity (%): 50

Channel	Frequency (Mhz)	Analyzer Reading (dBm)	Cable Loss (dB)	Peak Power Output (mW)	Peak Power Output (dBm)	Limit (dBm)	Pass/Fail
1	2412	18.468	1.1	90.53	19.568	30	Pass
6	2437	17.906	1.1	79.54	19.006	30	Pass
11	2462	17.281	1.1	68.88	18.381	30	Pass

Note: Two RF output(MAIN & AUX) have been test,the worse data shown above.

5.4 Radiated Emission Measurement [Section [15.247(c)(4)]

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

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.

30M 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.

1GHz – 25GHz: The highest emissions were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in peak mode to determine the precise amplitude of the emission. 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. During test the EMI receiver and spectrum was setup ac*cording to EMI Receiver/Spectrum Analyzer Configuration.*

For the test of 2nd to 10th 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.

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

Frequency Range Tested:	30MHz~1000MHz
Detector Function:	Quasi-Peak Mode
Resolution Bandwidth (RBW):	120KHz
Video Bandwidth (VBW)	1MHz
Frequency Range Tested:	1GHz – 25 GHz
Detector Function:	Peak Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	3MHz
Frequency Range Tested:	1GHz – 25 GHz
Detector Function:	Average Mode
Resolution Bandwidth (RBW):	1MHz
Video Bandwidth (VBW)	10 Hz

5.4.4 Test Data (30MHz – 1GHz):

30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):22
03:50:45PM,Monday,November29,2004 Humidity(%):55

Frequency	RxAmp.	AntFact	CableLoss	PreAmpGain	Corrct.Emi.	Limit	Margin	Ant.Pos.	TablePos.
MHz	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg)
498.51	20.98	17.46	5.29	0.00	43.73	46.00	-2.27	146.00	71.00
631.4	14.94	18.96	6.15	0.00	40.05	46.00	-5.95	146.00	334.00
700.27	13.12	19.01	6.54	0.00	38.67	46.00	-7.33	103.00	24.00
764.29	11.09	20.10	6.95	0.00	38.14	46.00	-7.86	103.00	24.00
791.45	12.34	20.10	7.14	0.00	39.58	46.00	-6.42	103.00	24.00
799.21	7.16	20.10	7.22	0.00	34.48	46.00	-11.52	103.00	304.00

30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):22
03:52:43PM,Monday,November29,2004 Humidity(%):55

Frequency	RxAmp.	AntFact	CableLoss	PreAmpGain	Corrct.Emi.	Limit	Margin	Ant.Pos.	TablePos.
MHz	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg)
99.84	16.96	10.27	1.88	0.00	29.11	43.50	-14.39	195.00	6.00
299.66	22.10	13.59	3.72	0.00	39.41	46.00	-6.59	195.00	6.00
366.59	19.03	14.83	4.33	0.00	38.19	46.00	-7.81	195.00	88.00
498.51	17.20	17.46	5.29	0.00	39.95	46.00	-6.05	195.00	6.00
565.44	13.17	18.83	5.70	0.00	37.70	46.00	-8.30	152.00	41.00
634.31	8.38	18.97	6.16	0.00	33.51	46.00	-12.49	103.00	89.00
749.74	6.84	20.09	6.93	0.00	33.87	46.00	-12.13	103.00	105.00
767.2	5.74	20.10	6.96	0.00	32.80	46.00	-13.20	195.00	6.00
791.45	4.23	20.10	7.14	0.00	31.47	46.00	-14.53	195.00	88.00

NOTE:

✍✍ During the Pre-test, the EUT has been tested for Channel 1 , 6, 11 transmit from Main and Aux antenna respectively to get all the critical emission frequencies. In the final test all the critical emission frequencies has been tested and the test data are listed above.

✍✍ Margin = Corrected Amplitude – Limit

Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit

All frequencies from 30MHz to 1GHz have been tested

5.4.5 Test Data (1GHz – 25 GHz) .

1GHz~ 25 GHz (Horizontal), Channel 1: 2412 MHz

Operator:JerryChiou RBW:1MHz
Humidity(%):37
Temperature(C):21

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2008.99	45.23pk	31.00	2.57	35.31	43.49pk	54.00av	-10.51	100	46
2156.34	45.41pk	30.97	2.12	35.38	43.12pk	54.00av	-10.88	100	92
2610.89	45.21pk	30.94	1.38	35.48	42.05pk	54.00av	-11.95	102	235
12604.4	31.12pk	41.68	3.67	36.34	40.12pk	54.00av	-13.88	101	244

1GHz~ 25 GHz (Vertical), Channel 1: 2412 MHz

Operator:JerryChiou RBW:1MHz
Humidity(%):37
Temperature(C):21

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
1991.51	44.89pk	30.93	2.59	35.31	43.10pk	54.00av	-10.90	100	44
2271.23	45.42pk	30.95	1.77	35.42	42.72pk	54.00av	-11.28	101	128
2523.48	45.63pk	30.91	1.36	35.51	42.39pk	54.00av	-11.61	102	207
4821.68	35.07pk	34.92	2.12	39.12	32.99pk	54.00av	-21.01	100	18
12058.9	34.84pk	42.23	3.65	37.74	42.98pk	54.00av	-11.02	100	101

Note:

✍✍ According to ANSI C63.4-2001 8.3.1.2 Notes(1):Where limits are specified by agencies for both average and peak (or quasi-peak) detection , if the peak (or quasi-peak) measured value complies with the average limit , it is unnecessary to perform an average measurement.

✍✍ " * ": Fundamental Frequency

✍✍ "**": Not in the restricted band, Limit level=Fundamental Emission-20dB

✍✍ " pk": peak mode

✍✍ "av": average mode

✍✍ "---": No meter reading data due to the emission level is smaller than spectrum noise level.

✍✍ The Spectrum noise level+Correction Factor < Limit - 6 dB

✍✍ Margin=Corrected Amplitude – Limit

✍✍ Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

✍✍ A margin of -8dB means that the emission is 8dB below the limit.

All frequencies from 1GHz to 25 GHz have been tested.

1GHz~ 25 GHz (Horizontal) , Channel 6 : 2437 MHz

Operator:JerryChiou

RBW:1MHz
Humidity(%):37
Temperature(C):21

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
1771.73	45.04pk	29.08	2.43	35.26	41.29pk	54.00av	-12.71	100	59
1996.5	44.63pk	30.97	2.60	35.31	42.89pk	54.00av	-11.11	100	43
2131.37	45.52pk	30.97	2.20	35.37	43.32pk	54.00av	-10.68	100	84
12490.5	31.67pk	41.71	3.69	36.45	40.62pk	54.00av	-13.38	100	214

1GHz~ 25 GHz (Vertical), Channel 6 : 2437 MHz

Operator:JerryChiou

RBW:1MHz
Humidity(%):37
Temperature(C):21

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2136.36	44.80pk	30.97	2.18	35.37	42.59pk	54.00av	-11.41	100	86
2241.26	45.66pk	30.95	1.86	35.41	43.06pk	54.00av	-10.94	101	119
4870.63	31.44pk	35.11	2.14	39.16	29.52pk	54.00av	-24.48	100	13
12178.8	34.47pk	42.09	3.66	37.38	42.83pk	54.00av	-11.17	100	132

Note:

✍✍ According to ANSI C63.4-2001 8.3.1.2 Notes(1):Where limits are specified by agencies for both average and peak (or quasi-peak) detection , if the peak (or quasi-peak) measured value complies with the average limit , it is unnecessary to perform an average measurement.

✍✍ " * ": Fundamental Frequency

✍✍ "**": Not in the restricted band, Limit level=Fundamental Emission-20dB

✍✍ " pk": peak mode

✍✍ "av": average mode

✍✍ "---": No meter reading data due to the emission level is smaller than spectrum noise level.

✍✍ The Spectrum noise level+Correction Factor < Limit - 6 dB

✍✍ Margin=Corrected Amplitude – Limit

✍✍ Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

✍✍ A margin of -8dB means that the emission is 8dB below the limit.

All frequencies from 1GHz to 25 GHz have been tested.

1GHz~ 25 GHz (Horizontal), Channel 11: 2462 MHz

Operator:JerryChiou

RBW:1MHz
Humidity(%):37
Temperature(C):21

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2036.46	45.22pk	30.99	2.49	35.33	43.37pk	54.00av	-10.63	100	54
2278.72	45.00pk	30.94	1.75	35.43	42.27pk	54.00av	-11.73	101	131
2930.57	46.22pk	31.07	1.44	35.38	43.35pk	54.00av	-10.65	103	335
9847.15	29.15pk	40.14	3.35	33.38	39.26pk	54.00av	-14.74	101	3

1GHz~ 25 GHz (Vertical), Channel 11 : 2462 MHz

Operator:JerryChiou

RBW:1MHz
Humidity(%):37
Temperature(C):21

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission	Limit	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2121.38	45.55pk	30.98	2.23	35.36	43.39pk	54.00av	-10.61	100	81
2261.24	45.48pk	30.95	1.80	35.42	42.82pk	54.00av	-11.18	101	125
2341.16	45.34pk	30.93	1.56	35.45	42.38pk	54.00av	-11.62	101	150
4912.59	30.94pk	35.27	2.15	39.19	29.16pk	54.00av	-24.84	100	9
9835.17	33.63pk	40.16	3.34	33.42	43.71pk	54.00av	-10.29	101	3
12304.7	37.00pk	41.93	3.67	37.01	45.60pk	54.00av	-8.40	100	165

Note:

- According to ANSI C63.4-2001 8.3.1.2 Notes(1):Where limits are specified by agencies for both average and peak (or quasi-peak) detection , if the peak (or quasi-peak) measured value complies with the average limit , it is unnecessary to perform an average measurement.
- " * ": Fundamental Frequency
- "**": Not in the restricted band, Limit level=Fundamental Emission-20dB
- " pk": peak mode
- "av": average mode
- "---": No meter reading data due to the emission level is smaller than spectrum noise level.
- The Spectrum noise level+Correction Factor < Limit - 6 dB
- Margin=Corrected Amplitude – Limit
- Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain
- A margin of -8dB means that the emission is 8dB below the limit.

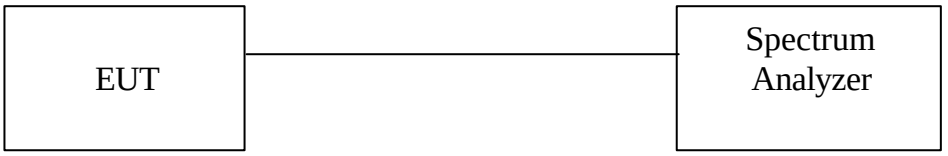
All frequencies from 1GHz to 25 GHz have been tested.

5.5 Band Edge Measurement

5.5.1 Test Procedure (Conducted)

1. The transmitter output of EUT was connected to the spectrum analyzer.
   Equipment mode: Spectrum analyzer
   Detector function: Peak mode
   SPAN: 100MHz
   RBW: 100KHz
   VBW: 100KHz
   Center frequency: 2.4GHz, 2.4835GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed
3. Find the next peak frequency outside the operation frequency band

5.5.2 Test Setup (Conducted)



5.5.3 Test Data:

Table: Band Edge measurement (Conducted)

Temp. (deg. C): 25

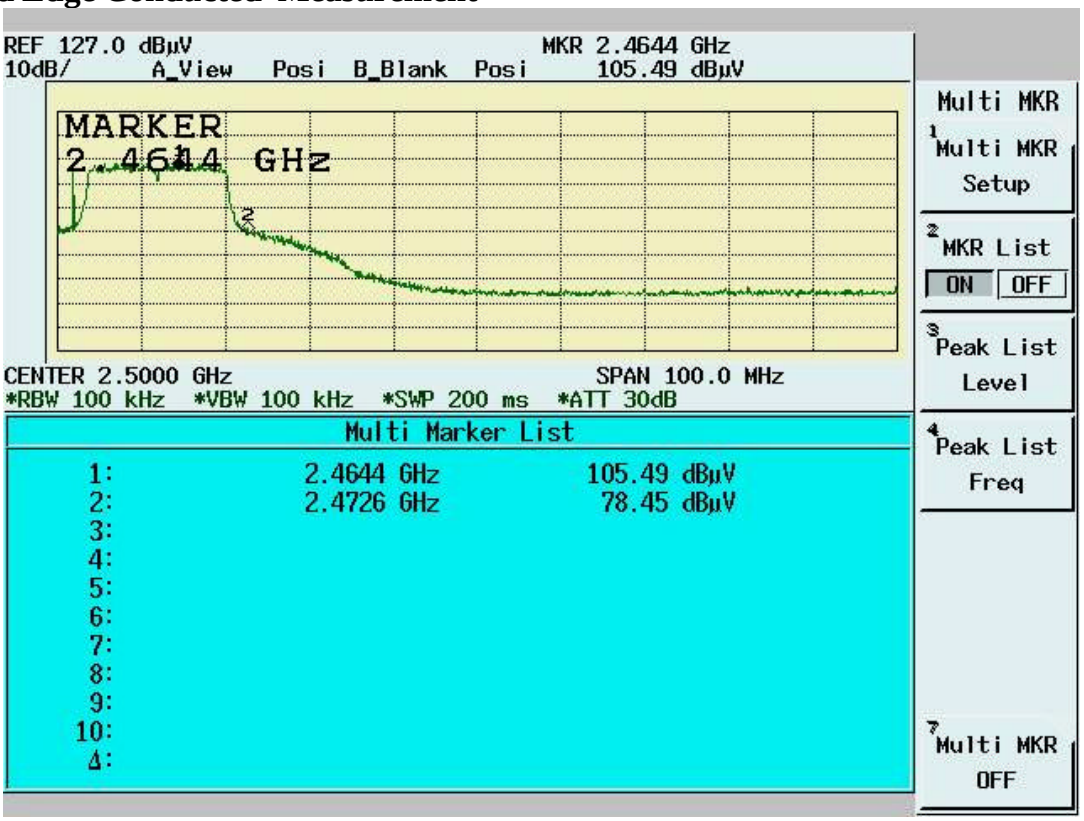
Test Engr: Jerry Chiou Humidity (%): 50

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Carrier - Outsideband Limit: >20dB (dB)	Pass/Fail
1	2406.9	106.33	---	---
Outside band	2400	79.3	27.03	Pass
11	2464.4	105.49	---	---
Outside band	2472.6	78.45	27.04	Pass

Note: Two RF output(MAIN & AUX) have been test,the worse data shown above.

Band Edge Conducted measurement

Band Edge Conducted Measurement



5.5.4 Test Procedure (Radiated)

1. Antenna and Turntable test procedure same as Radiated Emission Measurement.
   Equipment mode: Spectrum analyzer
   Detector function: Peak mode
   SPAN: 100MHz
   RBW: 1MHz
   VBW: 1MHz
   Center frequency: 2.395GHz, 2.48GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed.
3. Find the next peak frequency outside the operation frequency band
4. For peak frequency emission level measurement in Restricted Band ,
   Change RBW: 1MHz
   VBW: 10Hz
   Span: 100MHz.
5. Get the spectrum reading after Maximum Hold function is completed.

5.5.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

5.5.6 Test Data

Table Band Edge measurement (Radiated)

Temp. (deg. C): 25

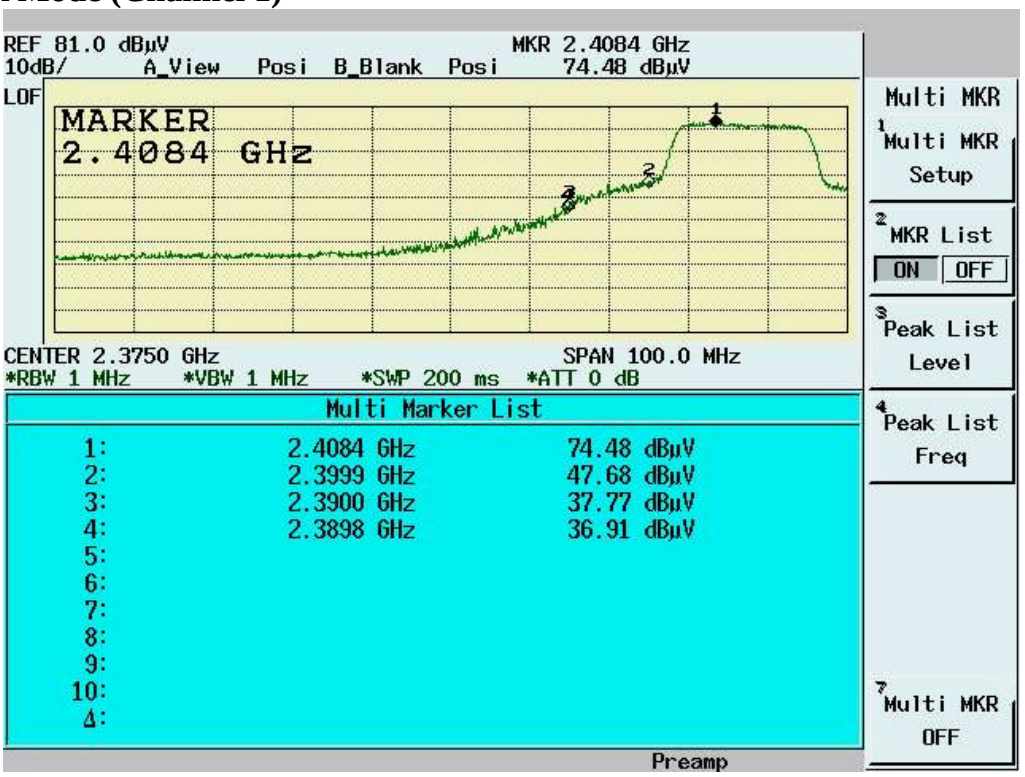
Test Engr: Jerry Chiou Humidity (%): 50

Description	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	dBc (Limit: > 20dBc)	Limit (dBuV/m)	Equip. Setup VBW	Pass or Fail
Channel_1 (average mode)	2407.1	55.45	35.48	90.93	---	---	10Hz	---
Channel_1 (peak mode)	2408.4	74.48	35.48	109.96	---	---	1MHz	---
Outside band (peak mode)	2399.9	47.68	35.48	83.16	26.8	---	1MHz	Pass
Channel_11 (average mode)	2457.7	55.83	35.5	91.33	---	---	10Hz	---
Channel_11 (peak mode)	2466.8	73.7	35.5	109.2	---	---	1MHz	---
Outside band (peak mode)	2475	46	35.51	81.51	27.69	---	1MHz	Pass
Channel_1 Restricted band (peak mode)	2390	37.77	35.47	73.24	---	74	1MHz	Pass
Restricted band (average mode)	2390	17.95	35.47	53.42	---	54	10Hz	Pass
Channel_11 Restricted band (peak mode)	2483.9	38	35.51	73.51	---	74	1MHz	Pass
Restricted band (average mode)	2483.5	17.87	35.51	53.38	---	54	10Hz	Pass

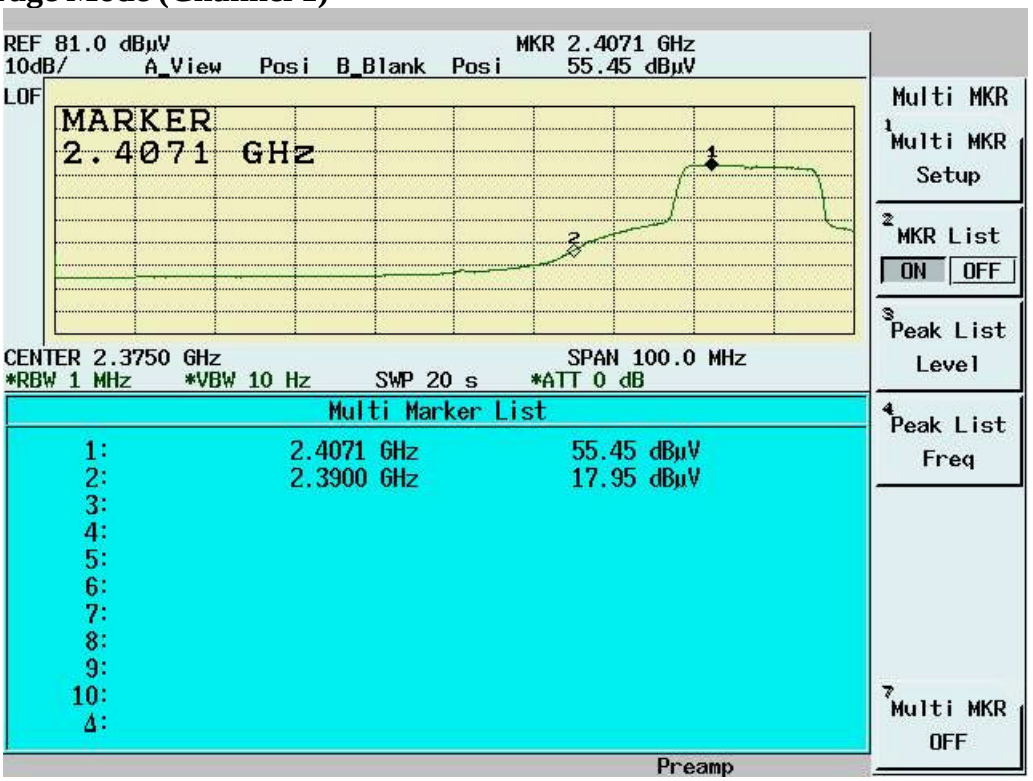
Note:

- ✍✍ 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
- ✍✍ Both Horizontal and Vertical polarizaion have been tested and the worst data is listed above.

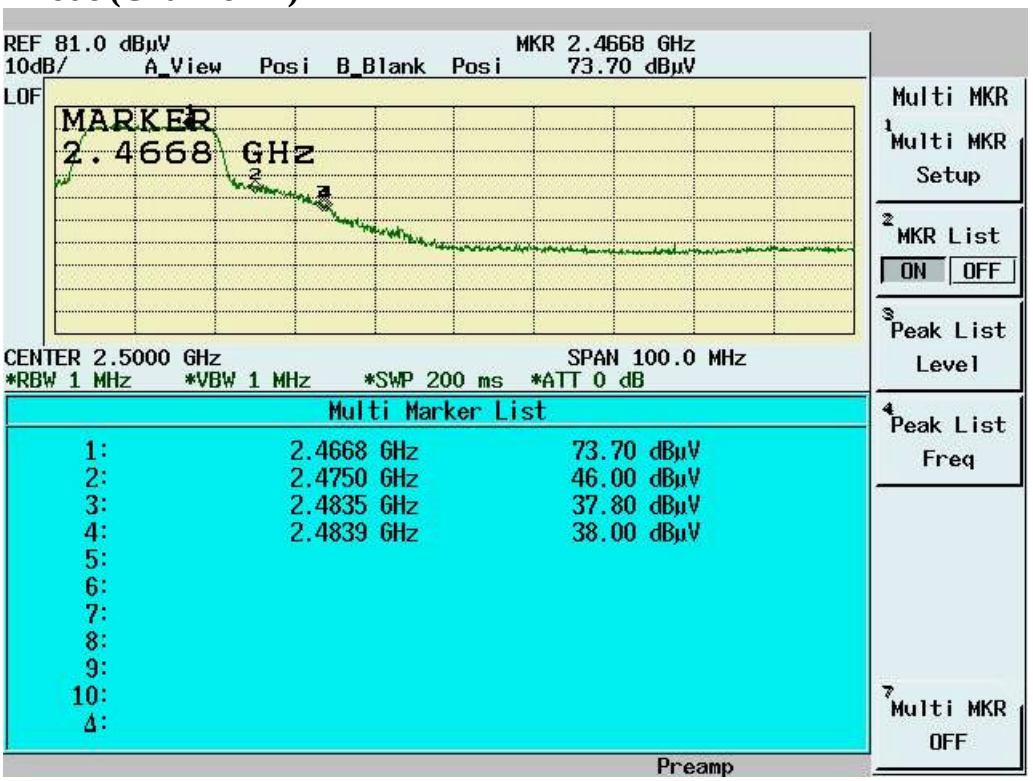
Band Edge measurement for radiated emission in Restricted Band(Radiated) Peak Mode (Channel 1)



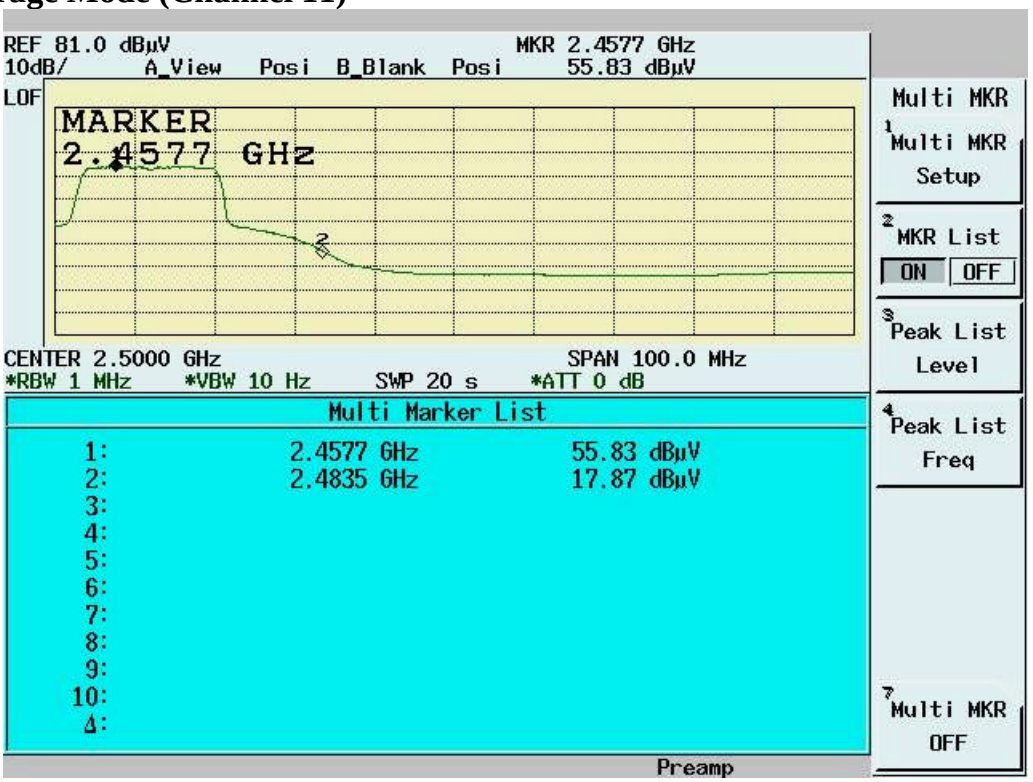
Band Edge measurement for radiated emission in Restricted Band(Radiated) Average Mode (Channel 1)



Band Edge measurement for radiated emission in Restricted Band(Radiated) Peak Mode (Channel 11)



Band Edge measurement for radiated emission in Ristricted Band(Radiated) Average Mode (Channel 11)



5.6 RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)]

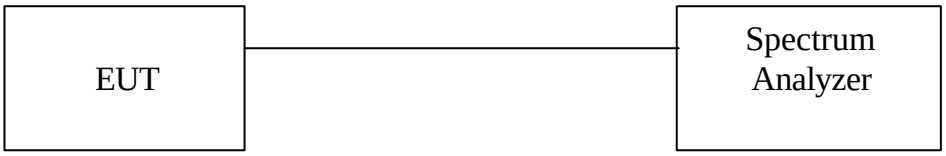
See MPE report

5.7 DSSS Peak Power Spectral Density [Section 15.247(d)]

5.7.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
   Equipment mode: Spectrum analyzer
   Detector function: Peak mode
   SPAN:1.5MHz
   RBW: 3KHz
   VBW: 30KHz
   Center frequency: fundamental frequency tested.
   Sweep time= 500 sec.
2. Using Peak Search to read the peak power after Maximum Hold function is completed.

5.7.2 Test Setup



5.7.3 Test Data

Maximum Peak Output Power Density

Temp. (deg. C): 25

Test Engr: Jerry Chiou Humidity (%): 50

Chennel	Frequency (MHz)	Spectrum Reading (dBm/3KHz)	Cable Loss (dB)	Peak Power Output (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
1	2412	-12.31	1.1	-11.21	8	Pass
6	2437	-12.16	1.1	-11.06	8	Pass
11	2462	-13.27	1.1	-12.17	8	Pass

Note: Two RF output(MAIN & AUX) have been test,the worse data shown above.

Channel 1

Channel 6

Channel 11

REF 10.0 dBm
10dB/
A_View Posi B_Blank Posi
MKR 2.464756 GHz
-13.27 dBm
MARKER
2.464756 GHz
Trace A
1 Write A
2 View A
3 Blank A
4 Max Hold A
5 Detector
Posi
6 Trc Menu
A B
7 1/2,more
CENTER 2.465071 GHz
SPAN 1.500 MHz
*RBW 3 kHz *VBW 30 kHz *SWP 500 s *ATT 30dB

6. Appendix

6.1 Appendix A: Measurement Procedure for Power line Conducted Emissions

The measurements are performed in a 3.5m x 3.4m x 2.5m shielded room, which referred as Conduction 01 test site, or a 3m x 3m x 2.3m test site, which referred as Conduction 02 test site. The EUT was placed on non-conduction 1.0m x 1.5m table, which is 0.8 meters above an earth-grounded.

Power to the EUT was provided through the LISN which has the Impedance (50ohm/50uH) vs. Frequency Characteristic in accordance with the required standard. Power to the LISNs were filtered to eliminate ambient signal interference and these filters were bonded to the ground plane. Peripheral equipment required to provide a functional system (support equipment) for EUT testing was powered from the second LISN through a ganged, metal power outlet box which is bonded to the ground plane at the LISN.

If the EUT is supplied with a flexible power cord, the power cord length in excess of the distance separating the EUT from the LISN shall be folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length. If the EUT is provided with a permanently coiled power cord, bundling of the cord is not required. If the EUT is supplied without a power cord, the EUT shall be connected to the LISN by a power cord of the type specified by the manufacturer which shall not be longer than 1 meter. The excess power cord shall be bundled as described above. If a non-flexible power cord is provided with the EUT, it shall be cut to the length necessary to attach the EUT to the LISN and shall not be bundled.

The interconnecting cables were arranged and moved to get the maximum emission. Both the line of power cord, hot and neutral, were measured.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

6.2 Appendix B: 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?C. 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 reading 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.

6.3 Appendix C: Test Equipment

6.3.1 Test Equipment List

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
Conduction	Coaxial Cable 1F-C2	Harbourindustries	RG400	1F-C2	06/02/2004	06/02/2005
Conduction	Digital Hygro-Thermometer Conduct	MicroLife	HT-2126G	ISL-Conduction 02	12/04/2004	12/04/2006
Conduction	EMI Receiver 02	HP	85460A	3448A00183	10/01/2004	10/01/2005
Conduction	LISN 01	R&S	ESH2-Z5	890485/013	04/29/2004	04/29/2005
Conduction	LISN 04	EMCO	3810/2	9604-1429	12/18/2003	12/18/2004
Radiation	BILOG Antenna 07	Schaffner	CBL6112B	2755	12/19/2003	12/19/2004
Radiation	Coaxial Cable Chmb 02-10M	Belden	RG-8/U	Chmb 02-10M	11/16/2004	11/16/2005
Radiation	Microwave Cable Chmb 02 3M	HUBER+SUHNER AG.	Sucoflex 103	42731/3 & 42729/3	03/17/2004	03/17/2005
Radiation	Digital Hygro-Thermometer Chmb 02	MicroLife	HT-2126G	Chmb 02	12/04/2004	12/04/2006
Radiation	EMI Receiver 03	HP	85460A	3448A00209	01/08/2004	01/08/2005
Radiation	Spectrum Analyzer 13	Advantest	R3132	121200411	02/12/2004	02/12/2005
Rad. Above 1Ghz	Horn Antenna 02	Com-Power	AH-118	10088	02/17/2004	02/17/2005
Rad. Above 1Ghz	Horn Antenna 04	Com-Power	AH-826	081-001	09/22/2004	09/22/2005
Rad. Above 1Ghz	Horn Antenna 05	Com-Power	AH-640	100A	01/07/2004	01/07/2005
Rad. Above 1Ghz	Microwave Cable RF SK-01	HUBER+SUHNER AG.	Sucoflex 102	22139 /2	02/17/2004	02/17/2005
Rad. Above 1Ghz	Peak Power Analyzer	HP	8990A	3621A01269	01/02/2004	01/02/2005
Rad. Above 1Ghz	Power Sensor Radar	HP	84815A	3318A01828	01/02/2004	01/02/2006
Rad. Spurious Emission	Power Meter 01	HP	438A	3513U06187	01/07/2004	01/07/2005
Rad. Spurious Emission	Power Sensor RF 01	HP	8481H	MY41091048	05/28/2004	05/28/2005
Rad. Above 1Ghz	Preamplifier 02	MITEQ	AFS44-00102650-40-10P-44	728229	05/12/2004	05/12/2005
Rad. Above 1Ghz	Preamplifier 09	MITEQ	AFS44-00102650-40-10P-44	858687	05/12/2004	05/12/2005
Rad. Above 1Ghz	Preamplifier 10	MITEQ	JS-26004000-27-5A	818471	02/28/2004	02/28/2005
Rad. Above 1Ghz	Spectrum Analyzer 07	Advantest	R3182	110600649	04/08/2004	04/08/2005

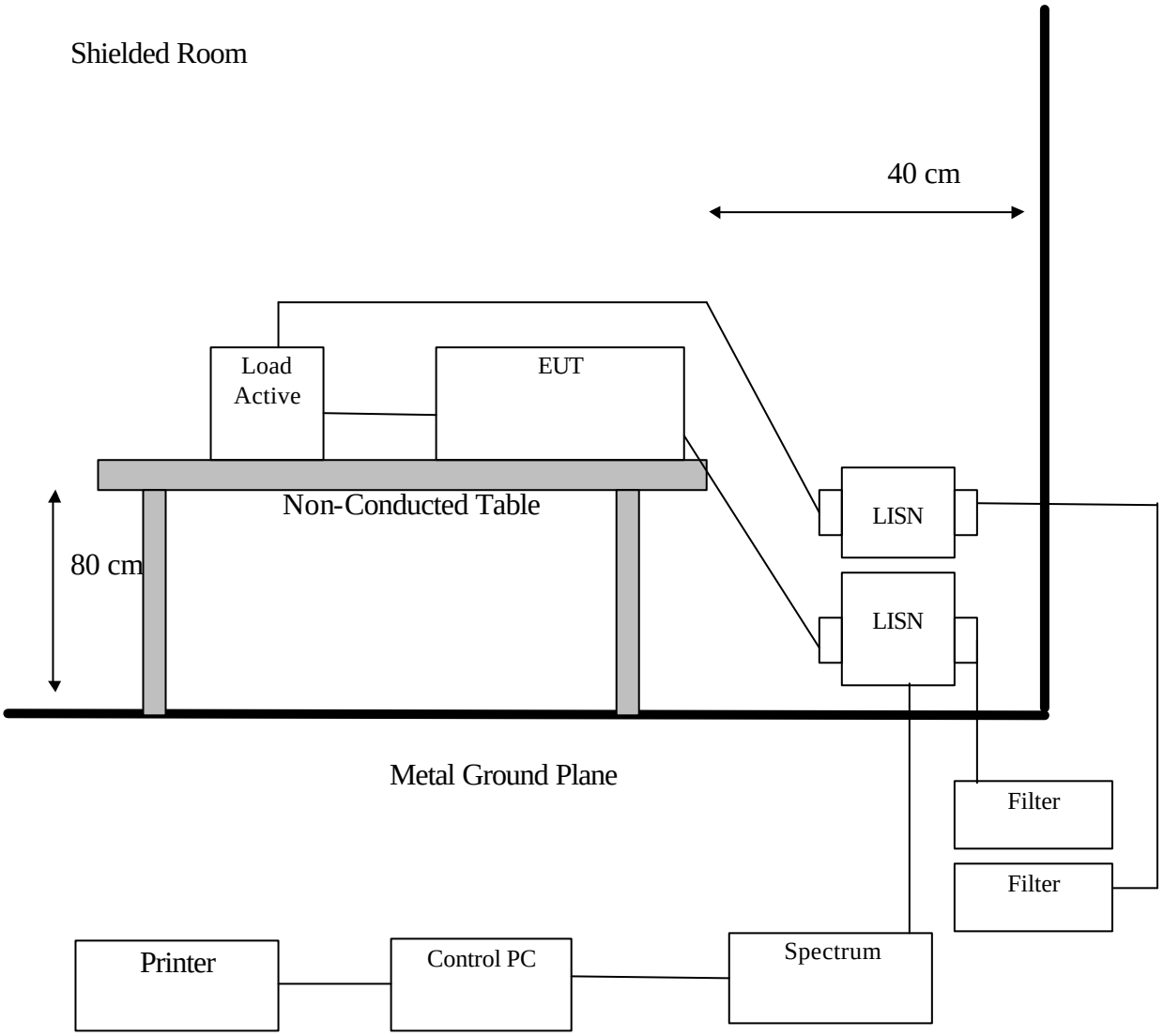
Note: Calibration is traceable to NIST or national or international standards.

6.3.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

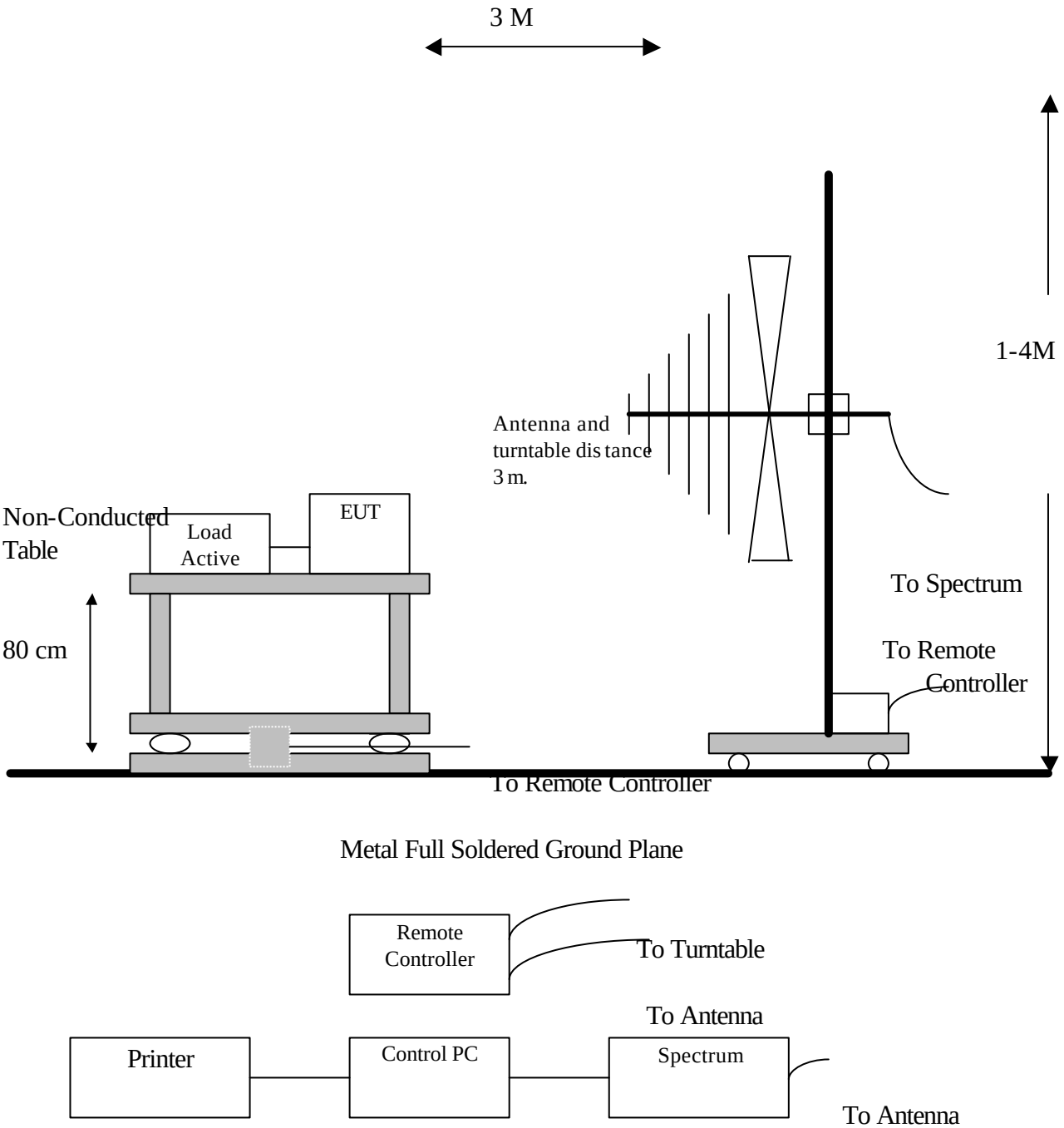
Radiation/Conduction	Filename	Version	Issued Date
Conduction	Tile.exe	1.12E	7/7/2000
Radiation	Tile.exe	1.12C	6/16/2000

6.4 Appendix D: Layout of EUT and Support Equipment

6.4.1 General Conducted Test Configuration



6.4.2 General Radiation Test Configuration



6.5 Appendix E: Description of Support Equipment

6.5.1 Description of Support Equipment

Support Unit 1.

Description:	DELL Mouse
Model Number:	M-SAW34
Serial Number:	LZE24108086
Power Supply Type:	N/A
Power Cord:	N/A
FCC ID:	DZL211029

Support Unit 2.

Description:	Acer Monitor
Model:	G781
Serial Number:	99900710121440044 5T7AA31T
Power Cord:	Non-shielded, Detachable
FCC ID:	(Comply with FCC Standards)

Support Unit 3.

Description:	DELL Notebook Personal Computer
Model:	Latitude D400
Serial Number:	N/A
CPU:	Pentium M- 1.5GHz(FSB 400 MHz)
A/C Adapter Type:	LITEON 65W (Model PA-1650-05D) 3 Pins
Hard Disk Driver:	Toshiba (Model: MK4019GAX) 40 GB
MDC Modem:	Conexant (Model: RD01-D480)
VGA Connector:	One 15 Pins
Serial Connector:	One 9 Pins
RJ11 Connector:	One 2 Pins
RJ45 Connector:	One 8 Pins
USB Connector:	Two 4 Pins
1394 Connector:	One 4 Pins
Smart Card Slot:	One
PCMCIA Slot:	One
Earphone Port:	One
Microphone Port:	One
Power In Port:	One
Battery:	Sanyo 6-cell (Model: 6T087)
RAM:	Nanya DDR 256MB x 1
LCD Panel and Inverter:	Toshiba 12.1”XGA (Model: LTM12C505D) ; RICOH KEIKI Inverter (Model: K3E19T5 0090)
Power Cord:	Non-shielded, Detachable

Support Unit 4.

Description:	802.11g Wireless Cable Residential Gateway
Condition:	Pre-Production
Model:	CBW500A
Serial Number:	N/A
AC-DC Adapter:	DVE (Model:DSA-0131F-12 EU 12)2-pin or OEM (Model: AD-121ANB) 2-pin
Power Input Port:	one
RJ-45 LAN Port:	4-Port 8-pin
RJ-45 WAN Port:	1-Port 8-pin
Wireless Antenna:	two

6.5.2 Software for Controlling Support Unit

Test programs exercising various part of EUT were used. The programs were executed as follows:

A. Read and write to the disk drives.
B. Send H pattern to the video port device (Monitor).
C. The RF software makes the transmitter continuously sending RF signals
D. Repeat the above steps.

	Filename	Issued Date
430x_Mfg_Tools_2_1_6_3	wl_tool.exe	2003/05/21
430x_Mfg_Tools_2_1_6_3	epi_ttcp.exe	2003/04/03
Monitor	HH.bat	8/20/1991

6.5.3 I/O Cable Condition of EUT and Support Units

Description	Path	Cable Length	Cable Type	Connector Type
AC Power Cord	110V (~240V) to AC Power Cord Inlet (3-pin)	1.8M	Nonshielded, Detachable	Plastic Head
Monitor Data Cable	Monitor to PC VGA port	1.6M	Shielded, Un-detachable	Metal Head
Mouse Data Cable	Mouse to PC Mouse port	1.8M	Shielded, Un-detachable	Metal Head

6.6 Appendix F: Accuracy of Measurement

Test Site: Conduction 02

Item	Source of Uncertainty	Probability Distribution	Total Uncertainties (dB)		Standard Uncertainty (dB)	
1	Systematic Effects: (Assessment from 20 repeat observation; 1 reading on EUT)	Normal	k=2	0.104	k=1	0.052
2	Random Effects: (Assessment from 20 random observations; 1 reading on EUT)	Normal	k=2	0.330	k=1	0.165
3	Receiver Calibration	Rectangular	k=1.73	1.000	k=1	0.577
4	LISN Factor Calibration	Normal	k=2	1.200	k=1	0.600
5	Cable Loss Calibration	Normal	k=2	1.000	k=1	0.500
6	Combined Standard Uncertainty Uc(y)	Normal			k=1	0.850
7	**Total Uncertainty @95% mim. Confidence Level**	**Normal**	**k=2**	**1.701**		

Measurement Uncertainty Calculations:

Uc (y) = square root ($u_1 (y)^2 + u_2 (y)^2 + ...+u_n (y)^2$)

U = 2 * Uc (y)

Note: The measurement Uncertainties mentioned above also refer to NIS 81-1994 of NAMAS : The treatment of Uncertainty in EMC Measurement.

Test Site: Chamber 02-3M

Item	Source of Uncertainty	Probability Distribution	Total Uncertainties (dB)		Standard Uncertainty (dB)	
1	Systematic Effects: (Assessment from 20 repeat observation; 1 reading on EUT)	Normal	k=2	0.067	k=1	0.034
2	Random Effects: (Assessment from 20 random observations; 1 reading on EUT)	Normal	k=2	0.103	k=1	0.052
3	Receiver Calibration	Rectangular	k=1.73	1.000	k=1	0.577
4	Antenna Factor Calibration	Normal	k=2	1.700	k=1	0.850
5	Cable Loss Calibration	Normal	k=2	1.000	k=1	0.500
6	Combined Standard Uncertainty Uc(y)	Normal			k=1	1.029
7	**Total Uncertainty @95% mim. Confidence Level**	**Normal**	**k=2**	**2.059**		

Measurement Uncertainty Calculations:

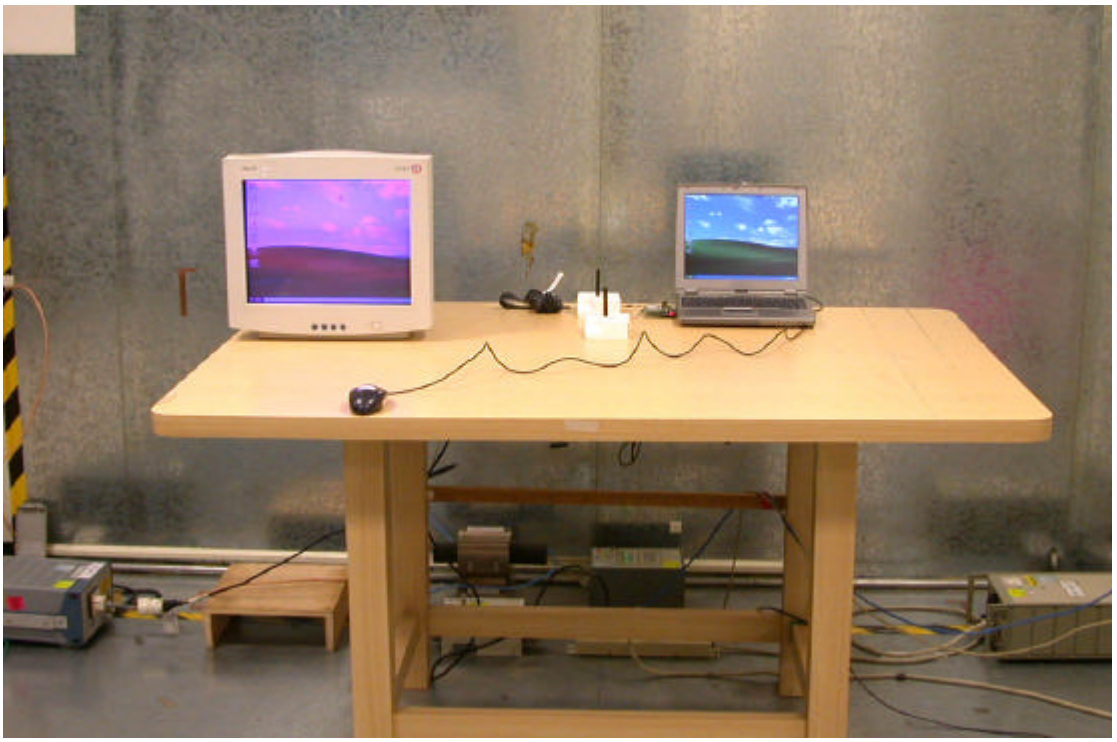
Uc (y) = square root ($u_1 (y)^2 + u_2 (y)^2 + ...+u_n (y)^2$)

U = 2 * Uc (y)

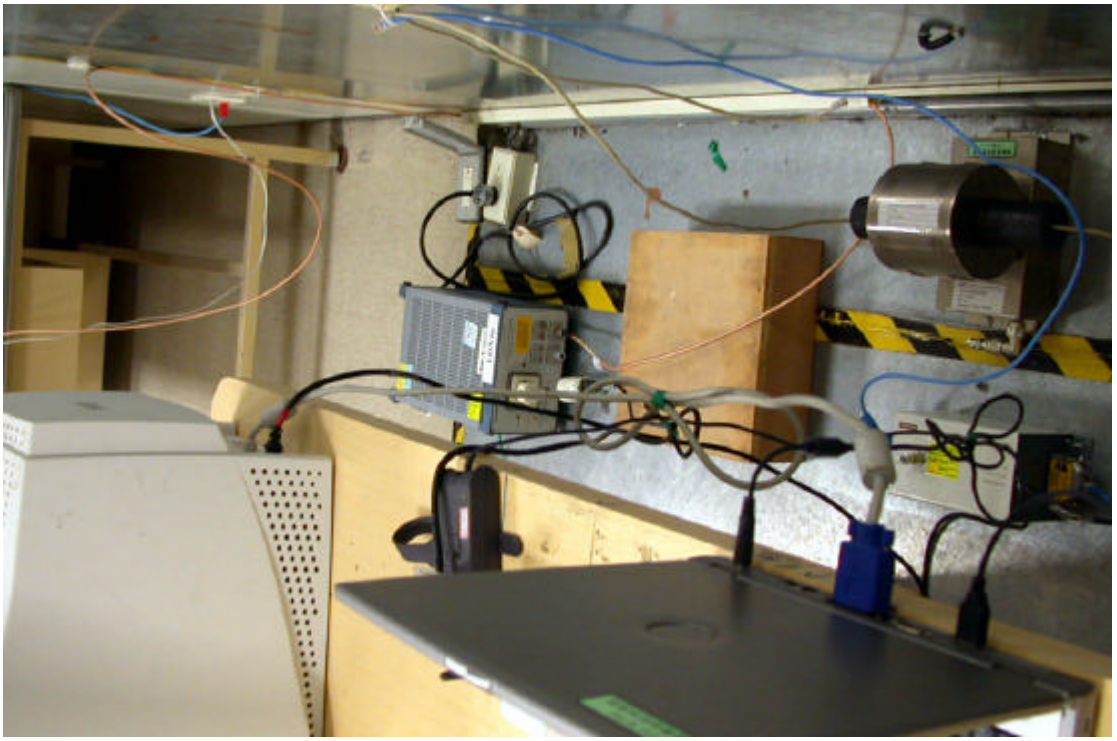
Note: The measurement Uncertainties mentioned above also refer to NIS 81-1994 of NAMAS : The treatment of Uncertainty in EMC Measurement.

6.7 Appendix G: Photographs of EUT Configuration Test Set Up

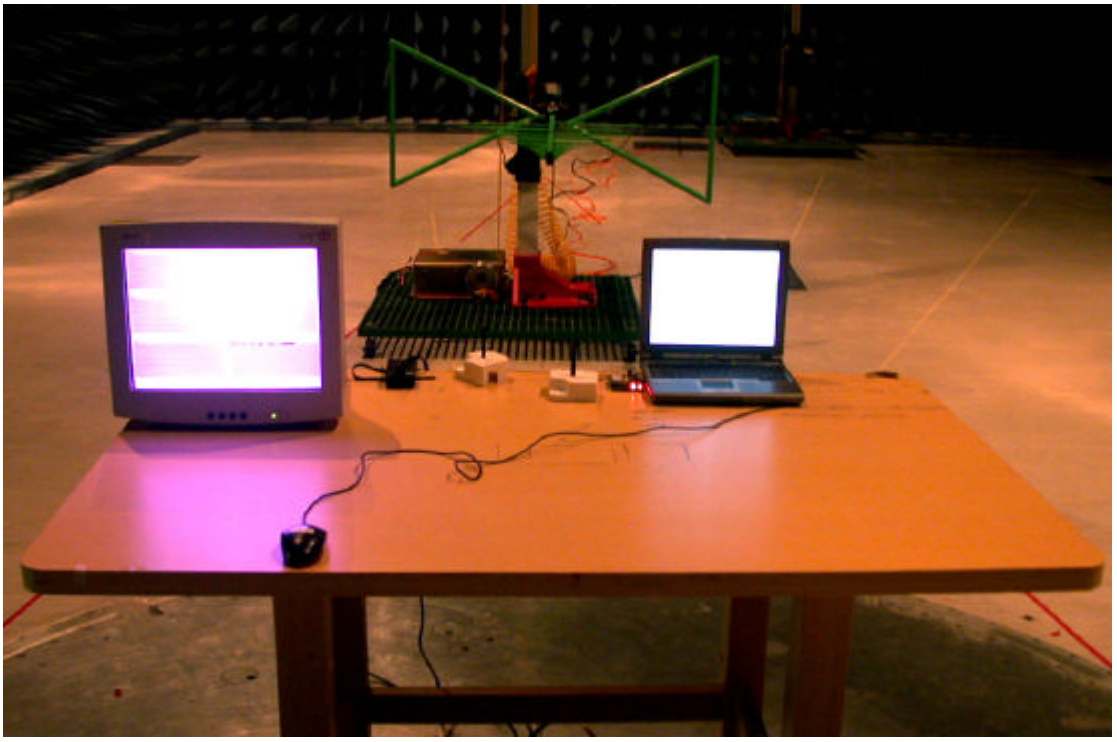
The Front View of Highest Conducted Set-up For EUT



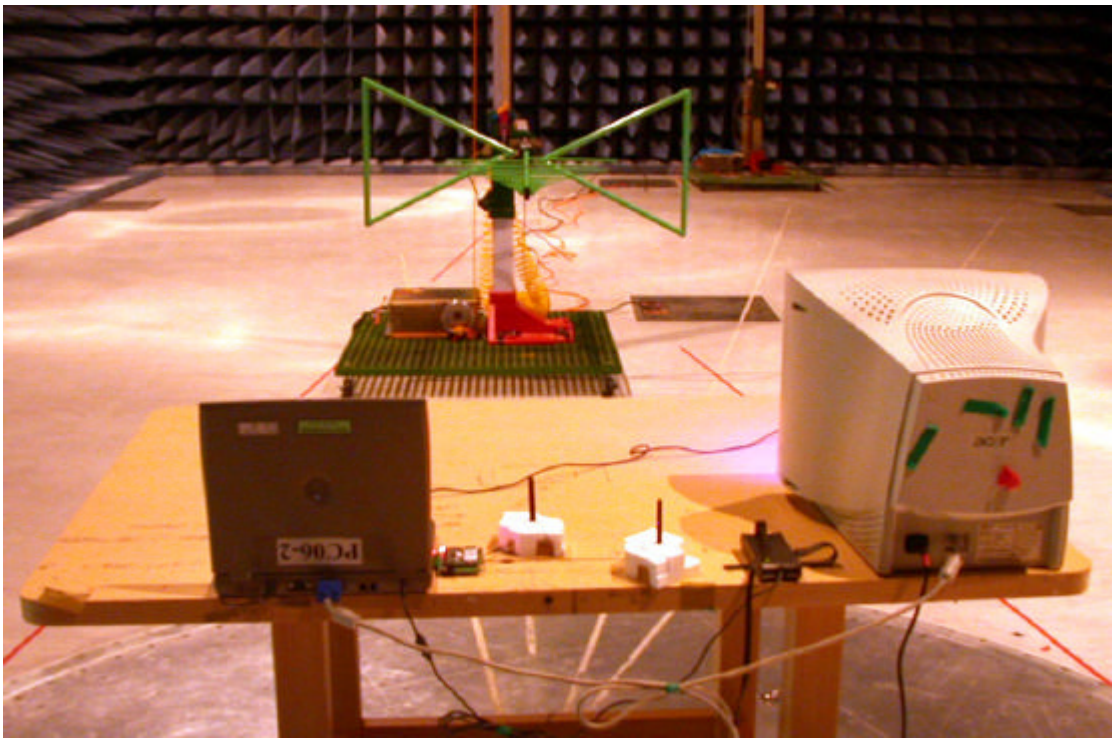
The Back View of Highest Conducted Set-up For EUT



The Front View of Highest Radiated Set-up For EUT



The Back View of Highest Radiated Set-up For EUT



6.8 Appendix H: Antenna Spec.

Please refer to the attached file.