

4.6.5 Test Data:

Table Maximum Peak Output Power

Channel	Frequency (MHz)	Peak Power Output (mW)	Peak Power Output (dBm)
1	2412	26.44	14.223
6	2437	29.77	14.739
11	2462	28.51	14.551

4.6.6 RF Exposure Calculations:

From FCC 1.1310, the maximum permissible RF exposure for an uncontrolled environment is 1 mW/cm².

The Minimum Allowable Distance ,R, of EUT is calculated as follows:

$$\text{Friis Transmission Formula: } P_d = (P_{out} * G) / (4 * \delta^2 * R^2) \\ R = [(P_{out} * G) / (4 * \delta^2 * P_d)]^{1/2}$$

Where P_d = power density in mW/cm² = 1mW/ cm²

Maximum Peak Gain at 2.4GHz: (refer to antenna spec.)

G = antenna numeric gain = $\text{Log}^1(\text{dB gain}/10)$

P_{out} = output power to antenna in mW (Refer to table 4.3.1)

δ = 3.1416

Since the host equipment is a notebook computer, the normal use distance is more than 20cm, the suitable standard for RF exposure is §1.1307(b)(1) MPE test. According to the result of 4.3.1, the calculated minimum allowance distance of EUT is listed below:

Table 5.2.1 MPE Minimum Allowance Distance of EUT

Channel	Frequency (MHz)	Maximum output power (mW)	Minimum Allowance Distance (cm)
1	2412	26.44	1.877
7	2442	29.77	1.991
11	2462	28.51	1.949

Note: Antenna gain=2.24dBi

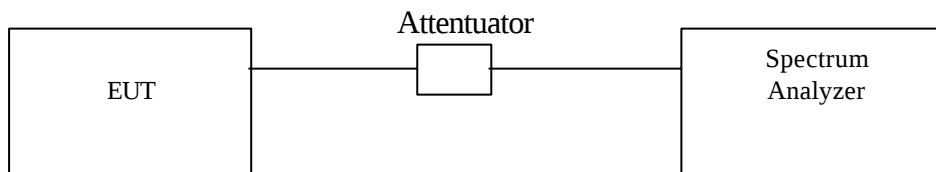
The minimum allowable distance is very close to the enclosure of the antenna and also very far away from the human being under normal use condition. So, the RF exposure warning or SAR Measurement is not needed.

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

4.7.1 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.
Cable loss=1.13dB
2. Using Peak Search to read the peak power after Maximum Hold function is completed.

4.7.2 Test Setup

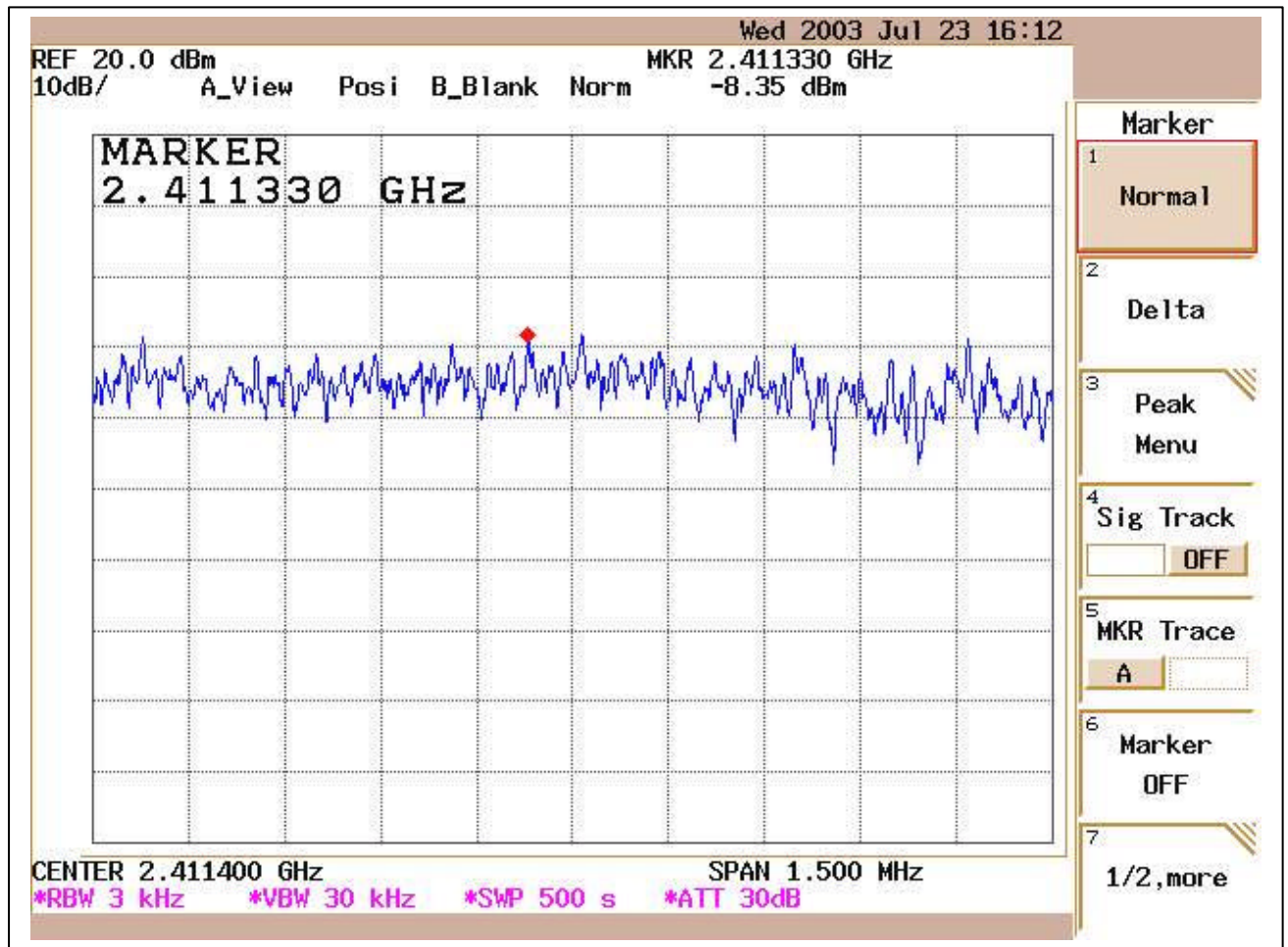


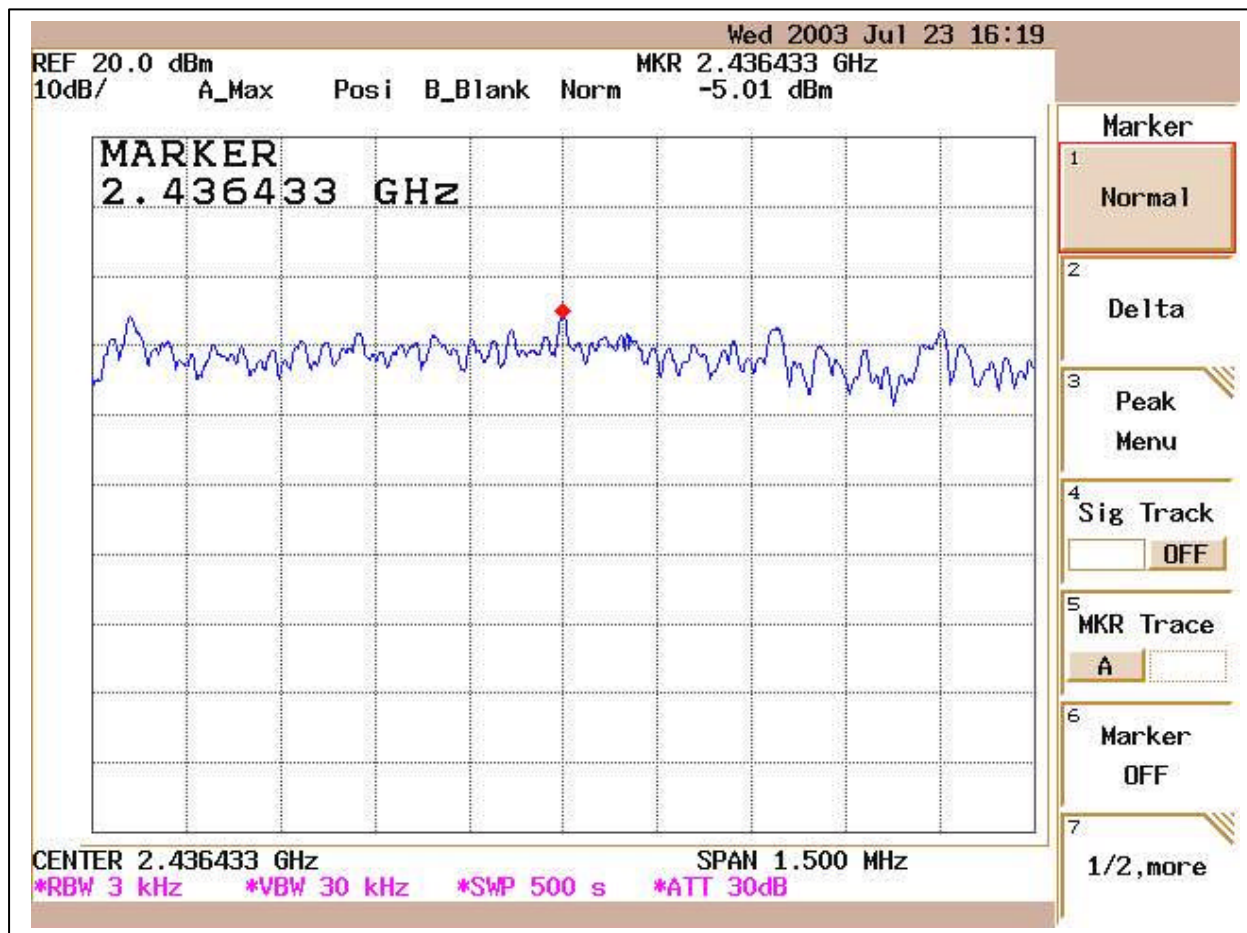
4.7.3 Test Data:

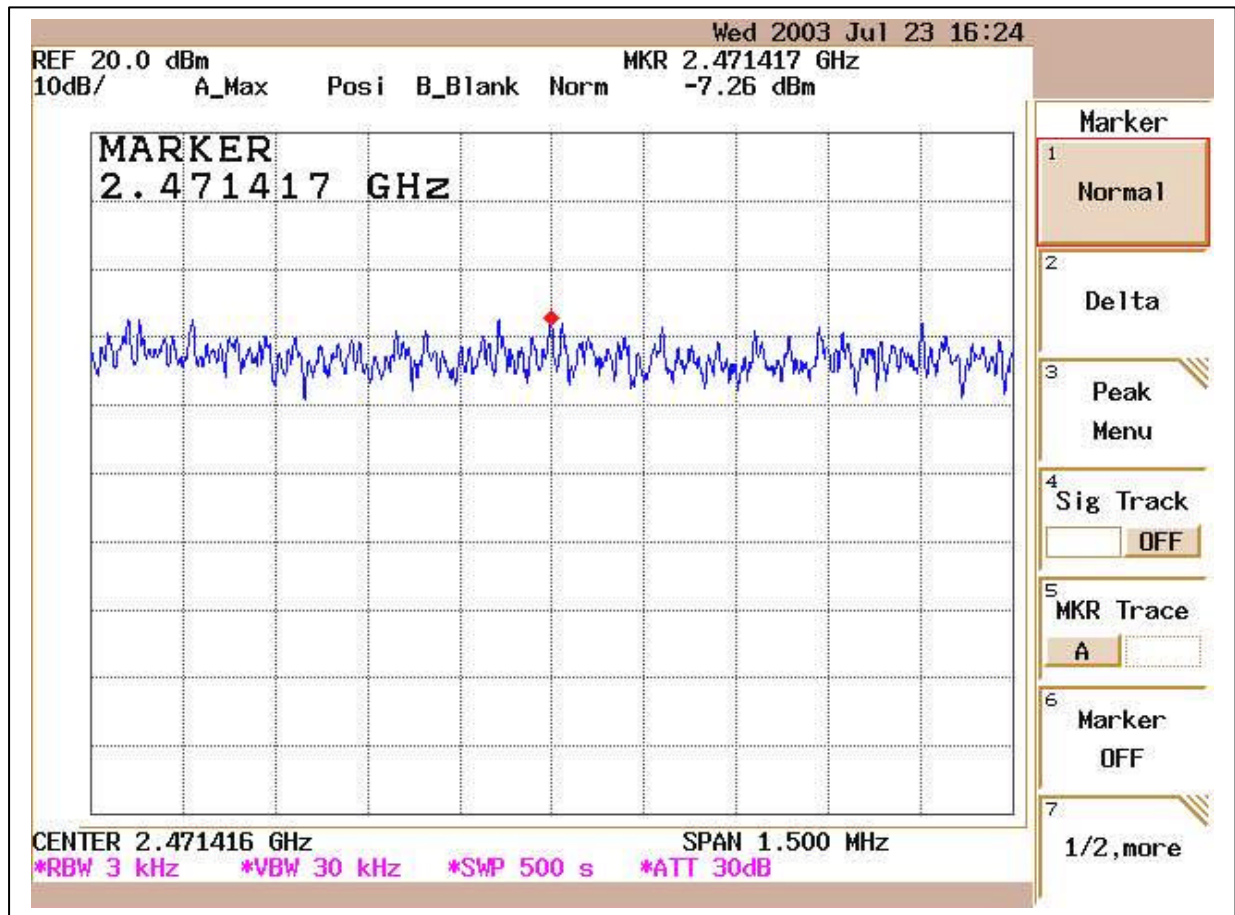
Table Maximum Peak Output Power Density

Chennel	Peak Power Output (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
1	-7.22	8	Pass
6	-3.88	8	Pass
11	-6.13	8	Pass

Note: Two RF output(MAIN & AUX) have been test,the worse data shown above.
Cable Lose=1.13dB







5. TEST RESULTS (802.11g)

5.1 Powerline Conducted Emissions [Section 15.207]

5.1.1 EUT Configuration

The conducted emission test setups are in accordance with Figs 9, 10(a) and 10(b) of ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996.

The EUT was set up on the non-conductive table that is 1.0 by 1.5 meter, 80cm above ground. The wall of the shielded room was located 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit shown on the figure 1 of ANSI C63.4-2001.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides one 50 ohms terminating impedance was provided for connecting the test instrument. The excess length of the power cord was folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length.

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

If the EUT is a Personal Computer or a peripheral of personal computer, and the personal computer has an auxiliary AC outlet which can be used for providing power to an external monitor, then all measurements will be made with the monitor power from first the computer-mounted AC outlet and then a floor-mounted AC outlet.

5.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dB below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dB below the applicable average limits, the emissions were also measured with the average detectors.

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.

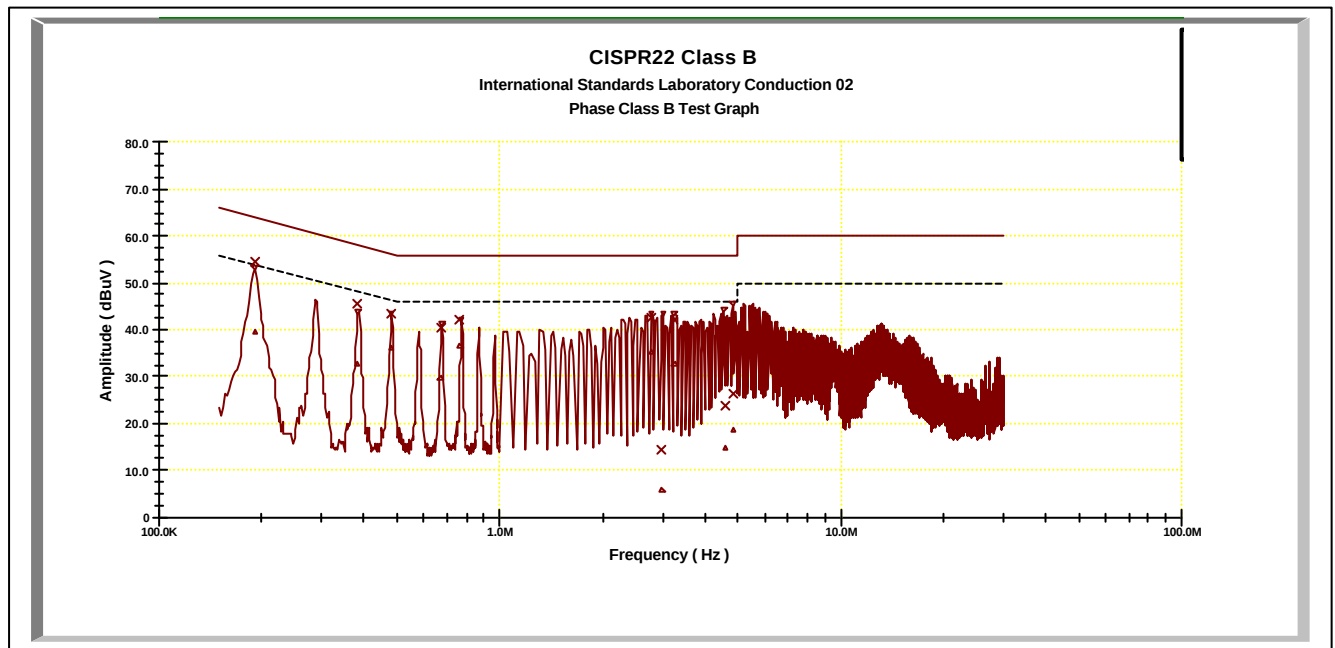
5.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

Frequency Range:	150 KHz--30MHz
Detector Function:	Quasi-Peak/Average
Bandwidth (RBW):	9KHz

5.1.4 Test Data:

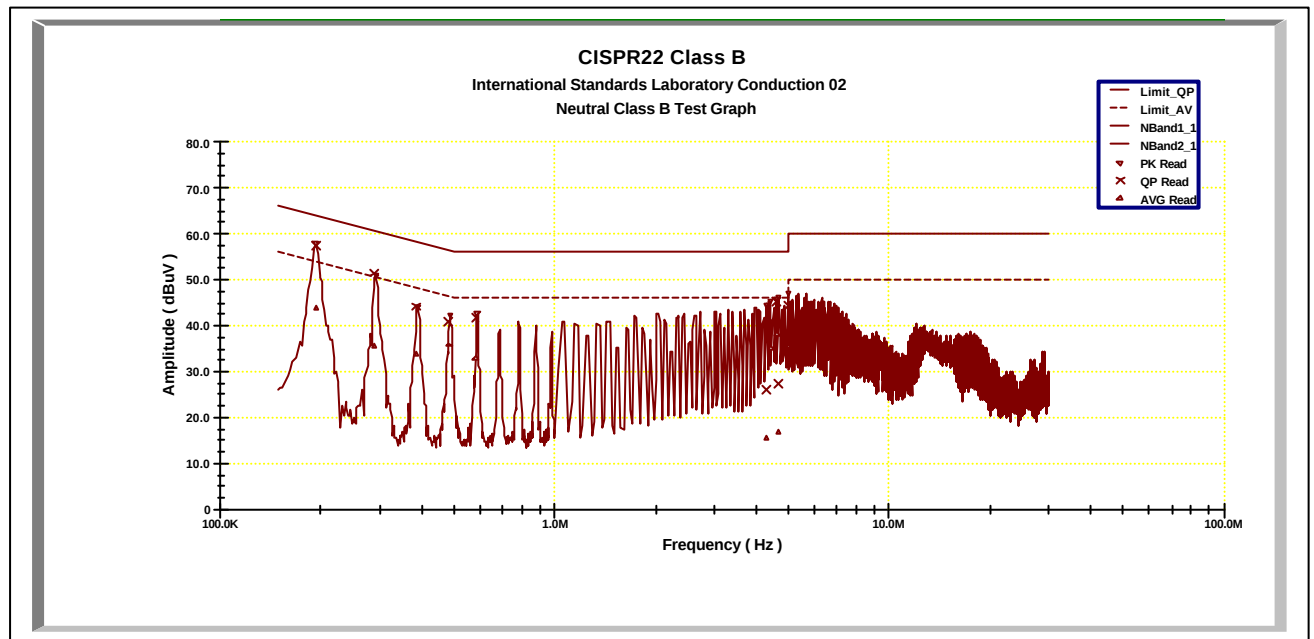
Power Line Conducted Emissions (Hot) Channel 1, 6, 11

Frequency (MHz)	Corrective Factor		Quasi-Peak			Average		
	LISN Loss (dB)	Cable Loss (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
0.19098	0.10	0.02	54.34	64.83	-10.49	39.65	54.83	-15.17
0.38286	0.10	0.02	45.38	59.35	-13.96	32.49	49.35	-16.85
0.4785	0.11	0.03	43.50	56.61	-13.11	36.08	46.61	-10.53
0.6701	0.15	0.04	40.47	56.00	-15.53	29.67	46.00	-16.33
0.76528	0.16	0.05	41.99	56.00	-14.01	36.60	46.00	-9.40
2.77416	0.24	0.11	42.60	56.00	-13.40	35.20	46.00	-10.80
2.99361	0.25	0.11	14.44	56.00	-41.56	5.63	46.00	-40.37
3.25051	0.26	0.11	42.26	56.00	-13.74	32.64	46.00	-13.36
4.566	0.32	0.13	23.71	56.00	-32.29	14.64	46.00	-31.36
4.83139	0.33	0.13	26.26	56.00	-29.74	18.62	46.00	-27.38



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

Frequency (MHz)	Corrective Factor		Quasi-Peak			Average		
	LISN Loss (dB)	Cable Loss (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
0.1934	0.10	0.02	57.34	64.76	-7.42	43.66	54.76	-11.10
0.28923	0.10	0.02	51.53	62.02	-10.49	35.40	52.02	-16.62
0.38645	0.10	0.02	44.15	59.24	-15.09	33.87	49.24	-15.37
0.48323	0.11	0.03	40.79	56.48	-15.69	35.77	46.48	-10.71
0.5788	0.13	0.04	41.78	56.00	-14.22	32.95	46.00	-13.05
4.3022	0.21	0.12	25.86	56.00	-30.14	15.58	46.00	-30.42
4.43308	0.21	0.12	40.71	56.00	-15.29	35.21	46.00	-10.79
4.62289	0.21	0.13	45.08	56.00	-10.92	37.99	46.00	-8.01
4.67341	0.21	0.13	27.33	56.00	-28.67	16.87	46.00	-29.13
5.0046	0.22	0.13	44.41	60.00	-15.59	35.55	50.00	-14.45



* 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.
Two type of antennas have been test, and the worse data show above.
Margin = Amplitude + Insertion Loss- Limit
A margin of -8dB means that the emission is 8dB below the limit

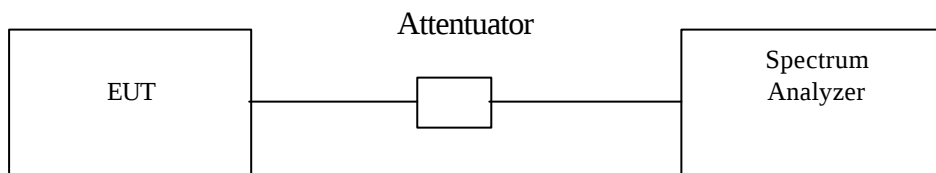
5.2 Bandwidth for DSSS [Section 15.247 (a)(2)]

5.2.1 Test Procedure

The Transmitter output of EUT was connected to the spectrum analyzer through an attenuator. 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

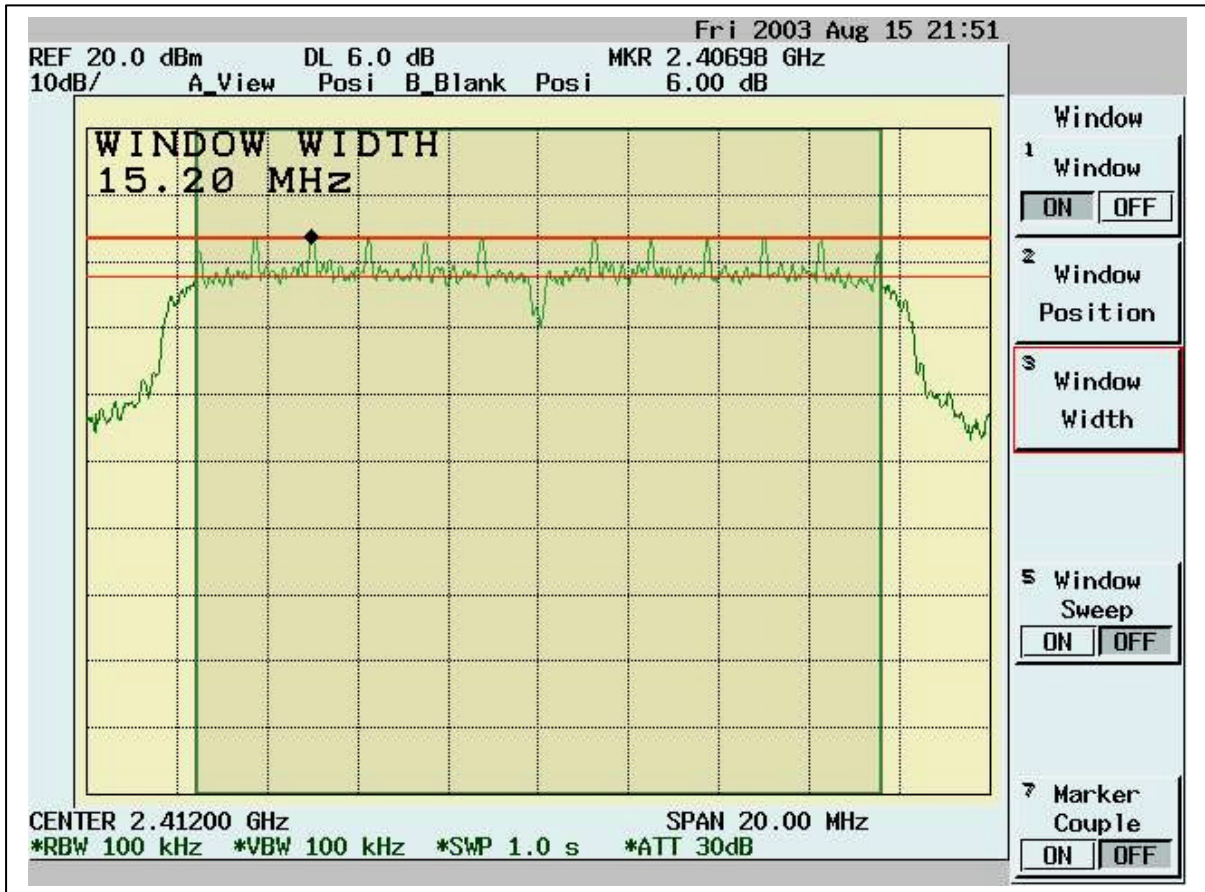
5.2.2 Test Setup

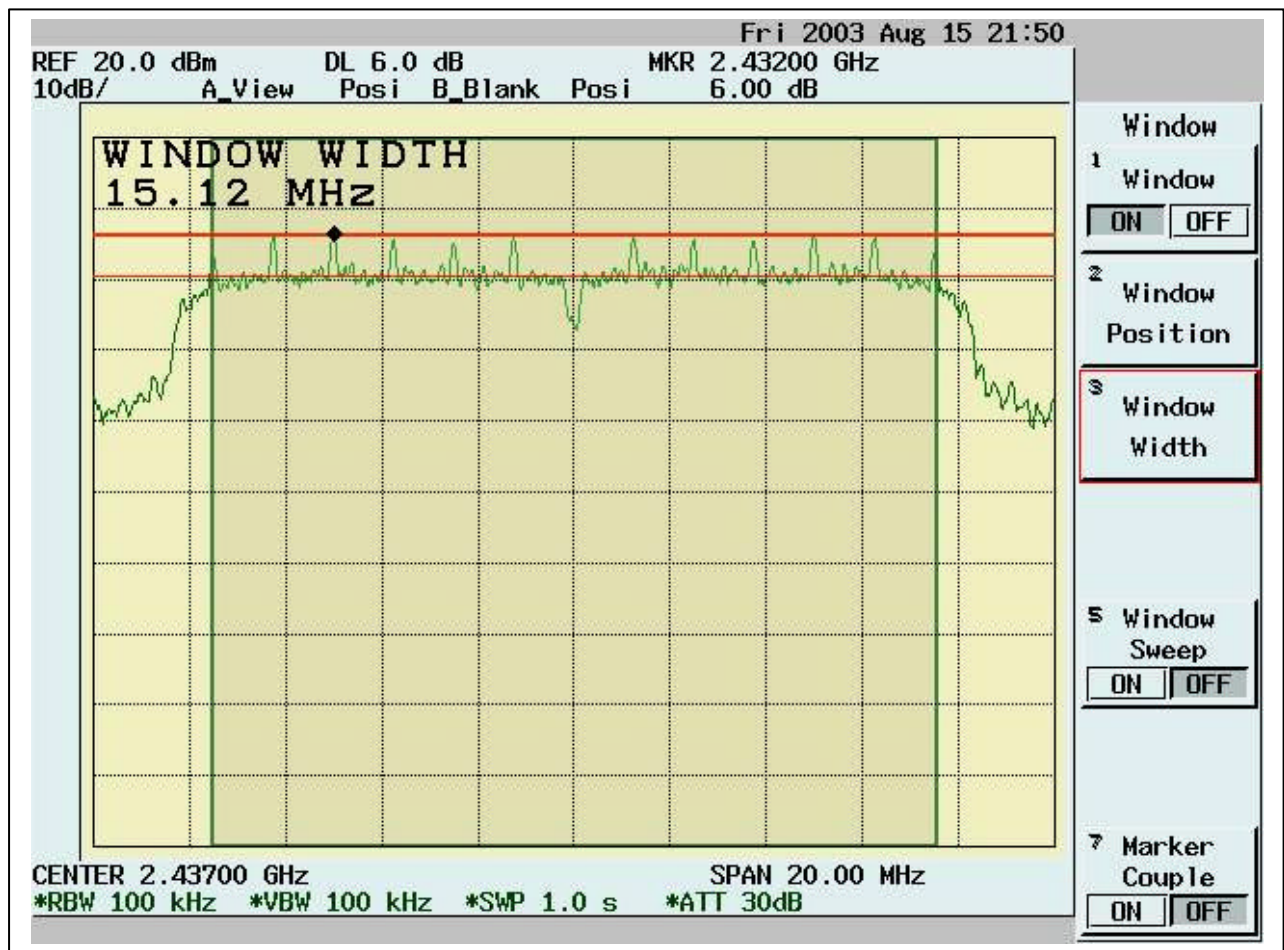


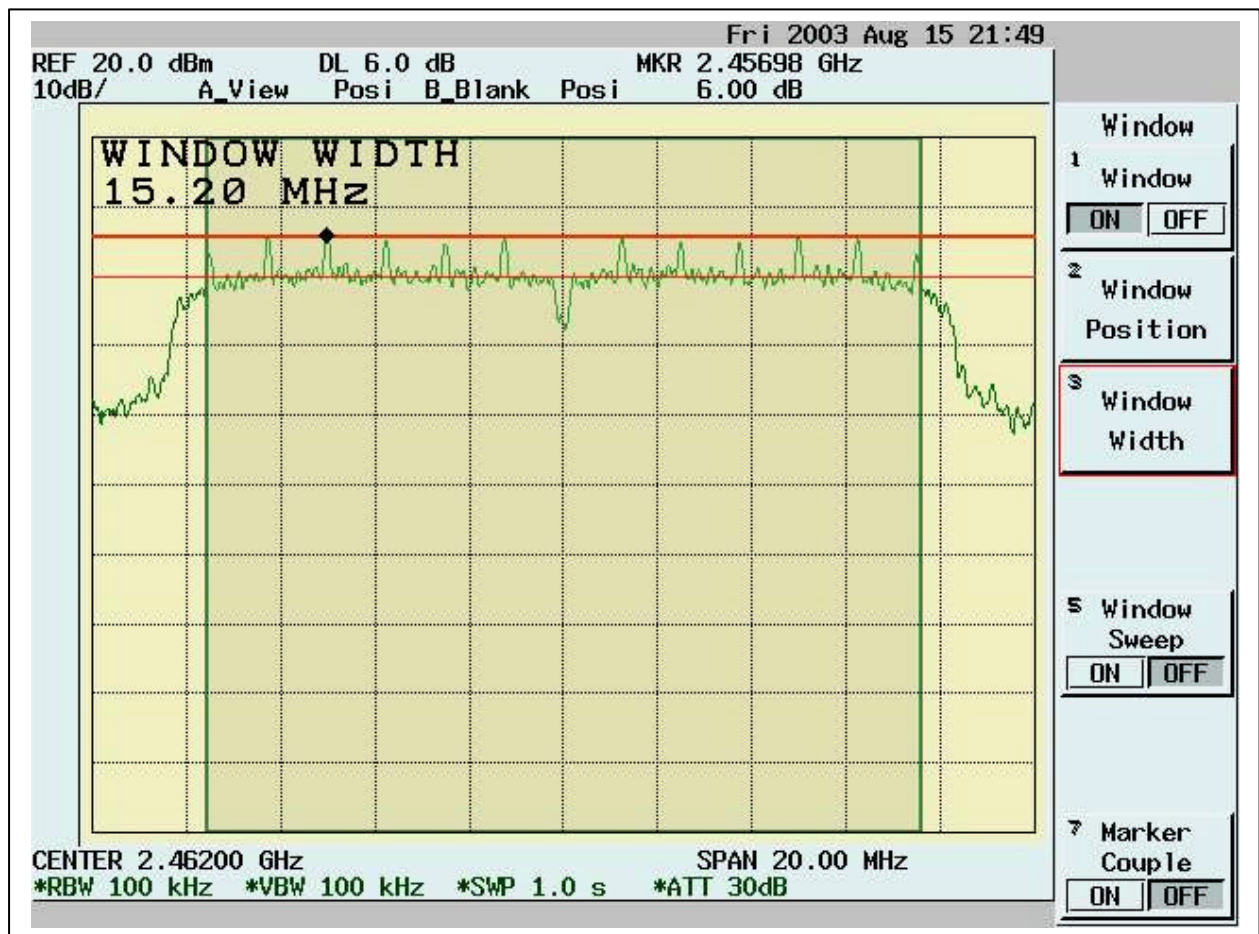
5.2.3 Test Data:

Table 6dB Bandwidth

Chennel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	15.20	0.5	Pass
6	2437	15.12	0.5	Pass
11	2462	15.20	0.5	Pass





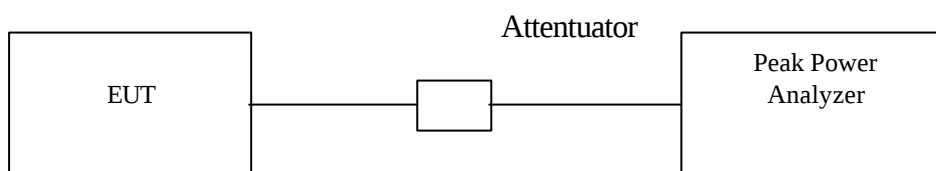


5.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

5.3.1 Test Procedure

1.The Transmitter output of EUT was connected to the peak power analyzer through an attenuator.

5.3.2 Test Setup



5.3.3 Test Data

Maximum Peak Output Power					
Channel	Frequency (MHz)	Peak Power Output (mW)	Peak Power Output (dBm)	Limit (dBm)	Pass/Fail
1	2412	139.89	21.458	30	Pass
6	2437	156.96	21.958	30	Pass
11	2462	164.47	22.161	30	Pass

Cable lose=1.13dB

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 according 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)	1MHz

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**

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-Ampl. (dB)	Ampl. (dBuV/m)	Limit (dBuV/m)	Margin*	Height (cm)	Position (°)
559.62	8.69	18.70	6.12	0.00	33.51	46.00	-12.49	100.00	128.00
675.05	9.77	18.82	6.66	0.00	35.25	46.00	-10.75	150.00	258.00
749.74	9.66	19.80	6.99	0.00	36.45	46.00	-9.55	150.00	209.00
799.21	9.17	19.90	7.27	0.00	36.34	46.00	-9.66	100.00	242.00
824.43	10.80	20.14	7.38	0.00	38.33	46.00	-7.67	100.00	242.00
829.28	5.87	20.19	7.39	0.00	33.46	46.00	-12.54	100.00	47.00
900.09	7.55	20.40	7.67	0.00	35.63	46.00	-10.37	100.00	242.00
903.97	6.11	20.46	7.69	0.00	34.25	46.00	-11.75	200.00	242.00

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

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-Ampl. (dB)	Ampl. (dBuV/m)	Limit (dBuV/m)	Margin*	Height (cm)	Position (°)
49.4	21.25	7.94	1.92	0.00	31.11	40.00	-8.89	100.00	218.00
74.62	23.77	5.79	2.30	0.00	31.85	40.00	-8.15	100.00	56.00
98.87	19.87	10.23	2.66	0.00	32.77	43.50	-10.73	100.00	347.00
560.59	7.54	18.69	6.12	0.00	32.35	46.00	-13.65	100.00	104.00
599.39	6.93	18.50	6.32	0.00	31.75	46.00	-14.25	100.00	347.00
626.55	6.87	19.00	6.44	0.00	32.31	46.00	-13.69	200.00	72.00
675.05	11.95	18.82	6.66	0.00	37.43	46.00	-8.57	100.00	169.00
749.74	8.28	19.80	6.99	0.00	35.07	46.00	-10.93	100.00	104.00
799.21	4.51	19.90	7.27	0.00	31.67	46.00	-14.33	250.00	104.00
824.43	9.49	20.14	7.38	0.00	37.01	46.00	-8.99	150.00	39.00
879.72	3.11	20.40	7.57	0.00	31.08	46.00	-14.92	150.00	218.00
900.09	5.08	20.40	7.67	0.00	33.15	46.00	-12.85	100.00	185.00
959.26	2.48	20.90	7.88	0.00	31.25	46.00	-14.75	100.00	250.00

* 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, Transmitting from Main antenna) .

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

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-Am pl. (dB)	Ampl. (dBuV/m)	Limit (dBuV /m)	Margin (dB)	Height (cm)	Position (°)
2375.62	44.78	30.55	1.14	46.21	30.26	54.00	-23.74	100	88
3326.67	45.26	31.19	1.46	46.63	31.28	54.00	-22.72	104	57
7147.85	45.35	39.82	2.35	46.24	41.28	54.00	-12.72	100	02
7521.48	38.84	39.48	2.41	45.99	34.74	54.00	-19.26	100	41
7861.14	34.43	40.70	2.47	44.40	33.20	54.00	-20.80	106	09
7997	31.47	41.19	2.50	43.76	31.39	54.00	-22.61	109	94
8285.71	29.32	41.09	2.55	43.02	29.94	54.00	-24.06	100	153

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

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-A mpl. (dB)	Ampl. (dBuV/m)	Limit (dBuV/ m)	Margin (dB)	Height (cm)	Position (°)
3275.72	45.96	31.13	1.44	46.62	31.91	54.00	-22.09	100	56
7130.87	45.34	39.84	2.34	46.25	41.27	54.00	-12.73	100	89
7912.09	31.80	40.88	2.48	44.16	31.01	54.00	-22.99	109	47
14127.9	27.98	43.33	3.37	42.52	32.16	54.00	-21.84	100	24

Note:

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

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-Am pl. (dB)	Ampl. (dBuV/ m)	Limit (dBuV/m)	Margin*	Height (cm)	Position (°)
2120.88	44.24	30.65	1.05	46.20	29.74	54.00	-16.91	100	97
3275.72	45.92	31.13	1.44	46.62	31.87	54.00	-17.11	100	03
6944.06	32.95	39.68	2.31	46.34	28.59	54.00	-17.80	102	89
7130.87	45.49	39.84	2.34	46.25	41.43	54.00	-18.20	100	41
7521.48	39.33	39.48	2.41	45.99	35.23	54.00	-18.46	100	23
7997	31.03	41.19	2.50	43.76	30.95	54.00	-17.87	100	78

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

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-Am pl. (dB)	Ampl. (dBuV/ m)	Limit (dBuV/ m)	Margin*	Height (cm)	Position (°)
2069.93	45.11	30.67	1.03	46.20	30.61	54.00	-23.39	100	65
2494.51	45.16	30.50	1.18	46.21	30.63	54.00	-23.37	101	73
3241.76	46.23	31.09	1.43	46.61	32.14	54.00	-21.86	100	183
7130.87	45.27	39.84	2.34	46.25	41.21	54.00	-12.79	100	44
7572.43	37.24	39.66	2.42	45.75	33.57	54.00	-20.43	108	25
7912.09	31.59	40.88	2.48	44.16	30.80	54.00	-23.20	100	153
8200.8	29.27	41.12	2.53	43.24	29.69	54.00	-24.31	100	43
8829.17	29.68	40.60	2.65	42.72	30.21	54.00	-23.79	101	165

Note:

“***” Not in the restricted band, Limit level=Fundamental Emission-20dB

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

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-Ampl. (dB)	Ampl. (dBuV/m)	Limit (dBuV/m)	Margin* (dB)	Height (cm)	Position (°)
985.01	44.65	30.58	1.01	46.20	30.03	54.00	-23.97	100	34
3224.78	45.92	31.07	1.42	46.61	31.80	54.00	-22.20	101	110
6995	32.10	39.97	2.32	46.31	28.08	54.00	-25.92	100	22
7147.85	44.57	39.82	2.35	46.24	40.49	54.00	-13.51	100	51
7861.14	32.44	40.70	2.47	44.40	31.21	54.00	-22.79	100	160
8200.8	30.05	41.12	2.53	43.24	30.47	54.00	-23.53	102	73
8863.14	29.02	40.56	2.65	42.75	29.50	54.00	-24.50	100	101

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

Meter Reading		Correction Factor			Corrected Emissions			Antenna	Turntable
Freq. (MHz)	Ampl. (dBuV)	Ant. (dB/m)	Cable (dB)	Pre-Ampl. (dB)	Ampl. (dBuV/m)	Limit (dBuV/m)	Margin* (dB)	Height (cm)	Position (°)
2222.78	44.65	30.61	1.09	46.20	30.14	54.00	-23.86	100	32
3326.67	45.21	31.19	1.46	46.63	31.23	54.00	-22.77	100	19
7130.87	44.78	39.84	2.34	46.25	40.71	54.00	-13.29	100	129
7538.46	37.34	39.54	2.42	45.91	33.39	54.00	-20.61	109	253
7861.14	32.09	40.70	2.47	44.40	30.87	54.00	-23.13	100	69
8098.9	29.09	41.16	2.52	43.50	29.27	54.00	-24.73	102	172
8863.14	28.52	40.56	2.65	42.75	28.99	54.00	-25.01	100	200
9814.18	27.59	39.20	2.80	41.63	27.96	54.00	-26.04	102	92

Note:

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

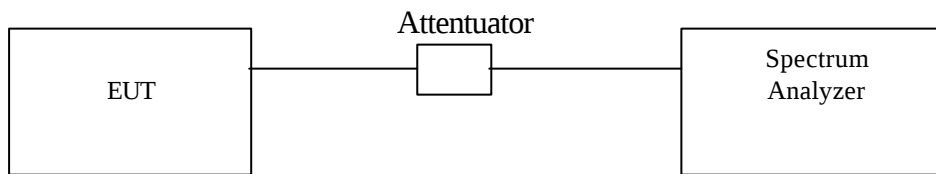
All frequencies from 1GHz to 25 GHz have been tested.

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:

Band Edge measurement (Conducted)

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Carrier - Outsideband Limit: > 20dB (dB)	Pass/Fail
1	2409.9	111.56	---	---
Outside band	2400.0	81.07	30.49	Pass
11	2457.0	113.56	---	---
Outside band	2472.8	88.48	25.06	Pass

.

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, 2.48 GHz.
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)**

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit: > 20dB (dBC)	Limit (dBuV/m)	Equip. Setup VBW	Pass or Fail
1(peak mode)	2414.3	79.27	31.67	110.94	---	-----	1MHz	-----
Outside band	2399.4	56.09	31.67	87.76	23.18	-----	1MHz	Pass
1(average mode)	2406.6	70.27	31.67	101.94	---	-----	10Hz	-----
Restricted band	2390.0	19.0	31.67	50.67	-----	54	10Hz	Pass
11(peak mode)	2464.61	82.04	31.64	113.68	----	-----	1MHz	-----
Outside band	2474.1	59.01	31.64	90.65	23.03	-----	1MHz	Pass
11(average mode)	2457.0	71.8	31.64	103.44	----	-----	10Hz	-----
Restricted band	2483.5	19.30	31.64	50.94	-----	54	10Hz	Pass

Note: The Spectrum plot of emission level measurement in Restricted band is attached.

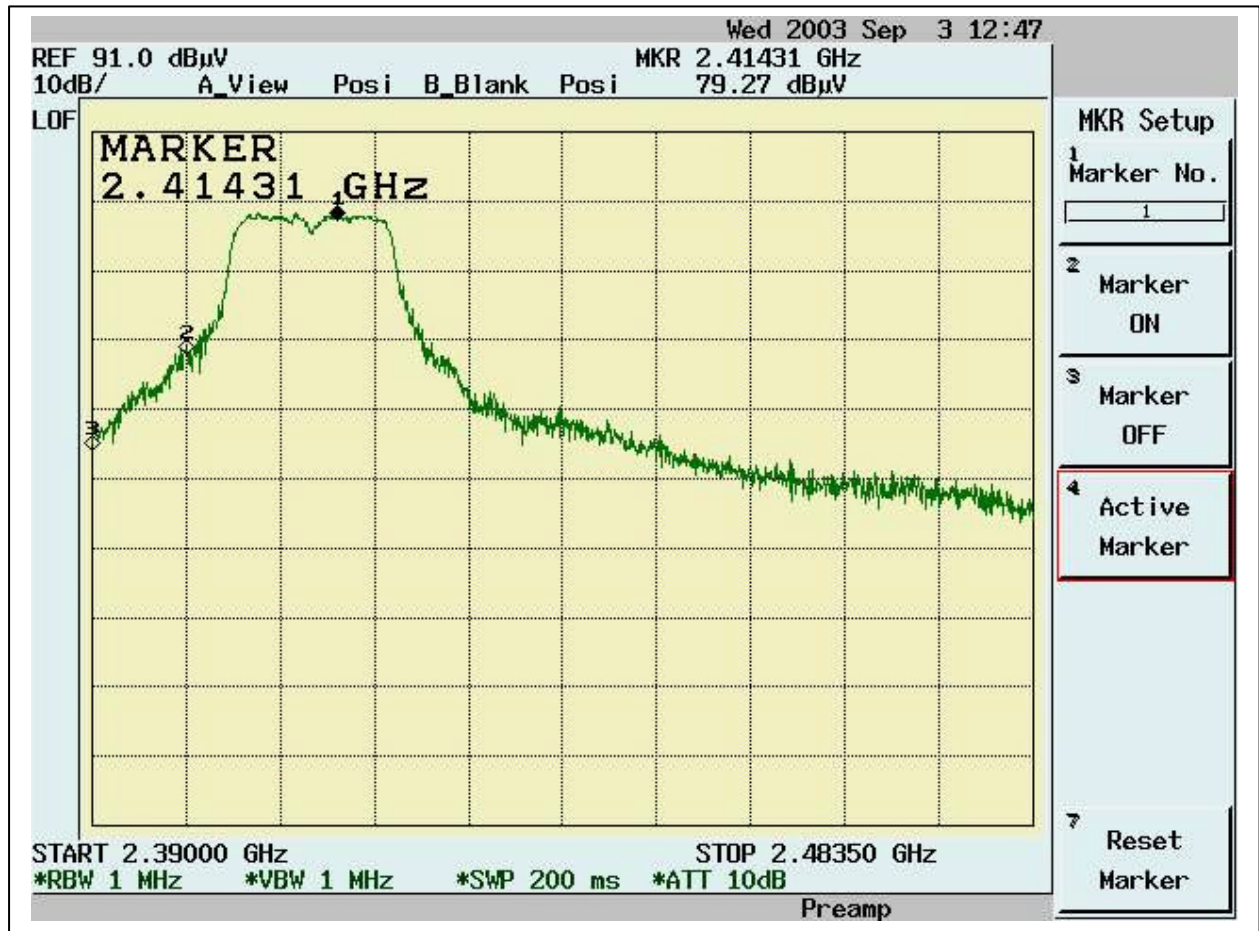
Emission Level = Spectrum Reading + Correction Factor

Correction Factor = Antenna Factor + cable loss – amplifier gain

Both Horizontal and Vertical polarization have been tested and the worst data is listed above.

Band Edge measurement for radiated emission in Restricted Band(Radiated)

Peak Mode (Channel 1)



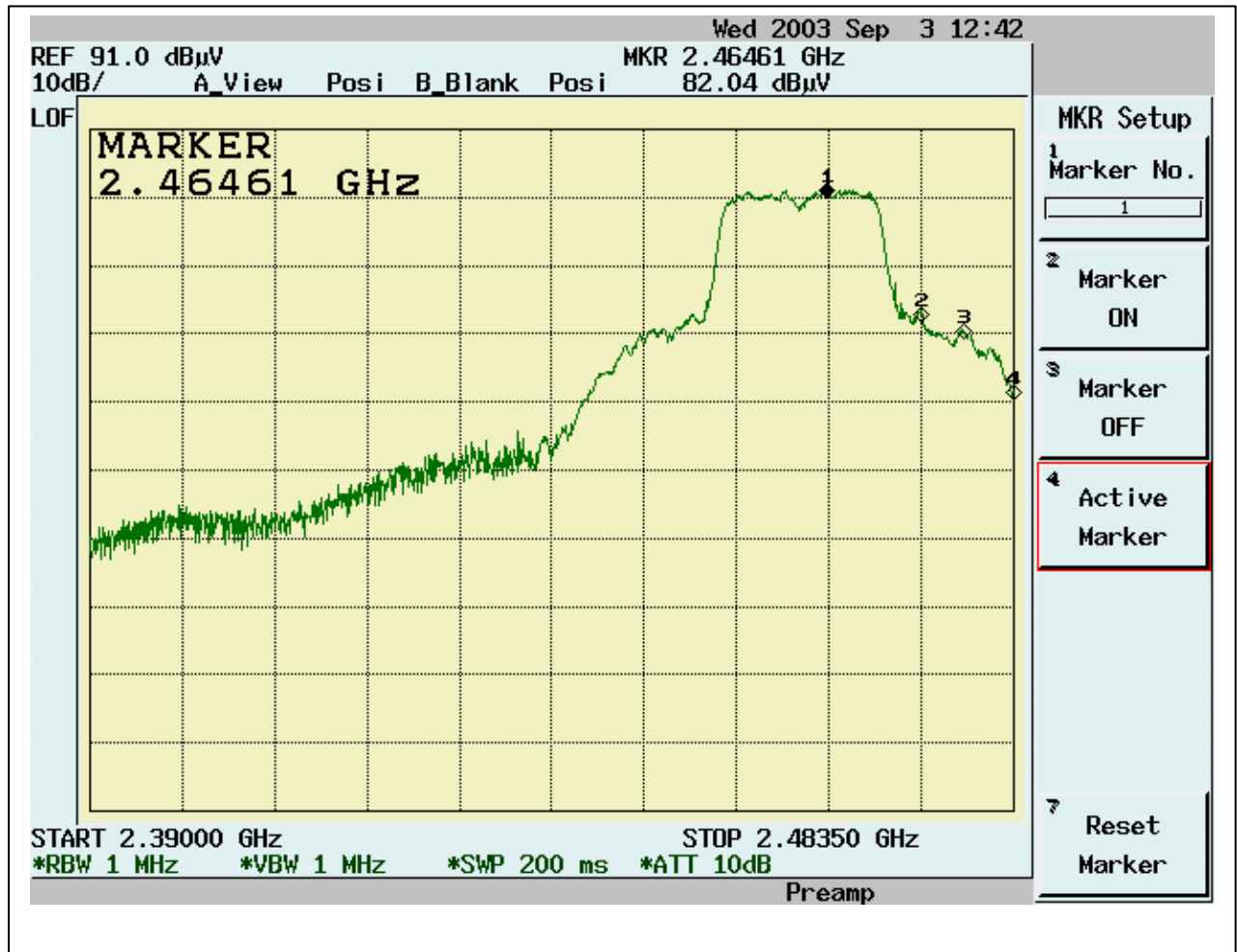
Band Edge measurement for radiated emission in Restricted Band(Radiated)

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 Restricted Band(Radiated)

Average Mode (Channel 11)



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

5.6.1 Applied Standards

FCC 47 CFR Part 15 Section 15.247(b)(5) & Part 1 Section 1.1307(b)(1)

5.6.2 Limits for Maximum Permissible Exposure (MPE)

A. Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (S) (mW/cm ²)	Average Time (Minutes)
300-1500	----	-----	f/300	6
1500-100,000	----	-----	5	6

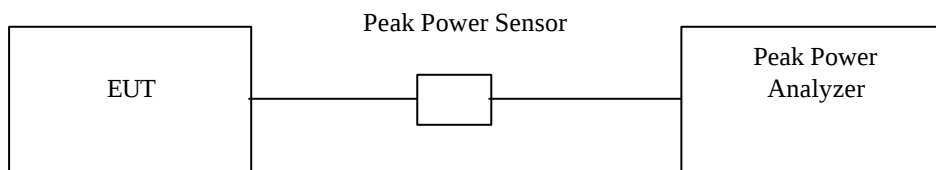
B. Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (S) (mW/cm ²)	Average Time (Minutes)
300-1500	----	-----	f/1500	30
1500-100,000	----	-----	1.0	30

5.6.3 Test Procedure

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

5.6.4 Test Setup



5.6.5 Test Data:

Table Maximum Peak Output Power

Channel	Frequency (MHz)	Peak Power Output (mW)	Peak Power Output (dBm)
1	2412	139.89	21.458
6	2437	156.96	21.958
11	2462	164.47	22.161

5.6.6 RF Exposure Calculations:

From FCC 1.1310, the maximum permissible RF exposure for an uncontrolled environment is 1 mW/cm².

The Minimum Allowable Distance ,R, of EUT is calculated as follows:

$$\text{Friis Transmission Formula: } P_d = (P_{out} * G) / (4 * \delta * R^2) \\ R = [(P_{out} * G) / (4 * \delta * P_d)]^{1/2}$$

Where P_d = power density in mW/cm² = 1mW/ cm²

Maximum Peak Gain at 2.4GHz: (refer to antenna spec.)

G = antenna numeric gain = $\text{Log}^1(\text{dB gain}/10)$

P_{out} = output power to antenna in mW (Refer to table 4.3.1)

δ = 3.1416

Since the host equipment is a notebook computer, the normal use distance is more than 20cm, the suitable standard for RF exposure is §1.1307(b)(1) MPE test. According to the result of 4.3.1, the calculated minimum allowance distance of EUT is listed below:

Table 5.2.1 MPE Minimum Allowance Distance of EUT

Channel	Frequency (MHz)	Maximum output power (mW)	Minimum Allowance Distance (cm)
1	2412	139.89	4.318
7	2442	156.96	4.574
11	2462	164.47	4.682

Note: Antenna gain=2.24dBi

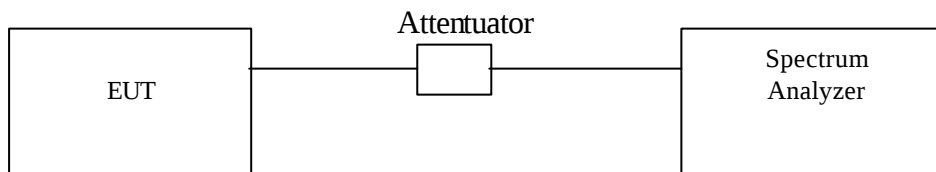
The minimum allowable distance is very close to the enclosure of the antenna and also very far away from the human being under normal use condition. So, the RF exposure warning or SAR Measurement is not needed.

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.
 Cable loss=1.13dB
2. Using Peak Search to read the peak power after Maximum Hold function is completed.

5.7.2 Test Setup

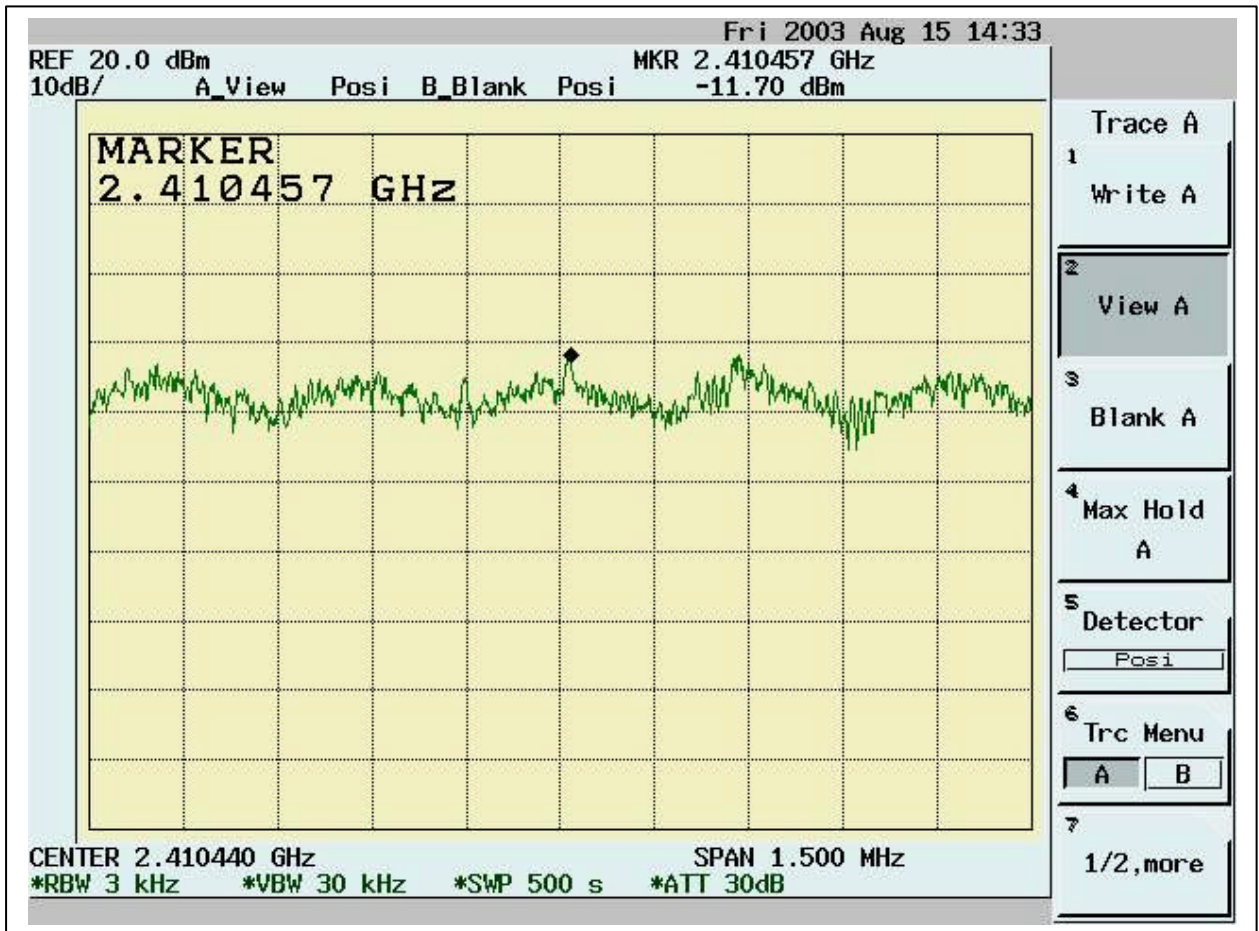


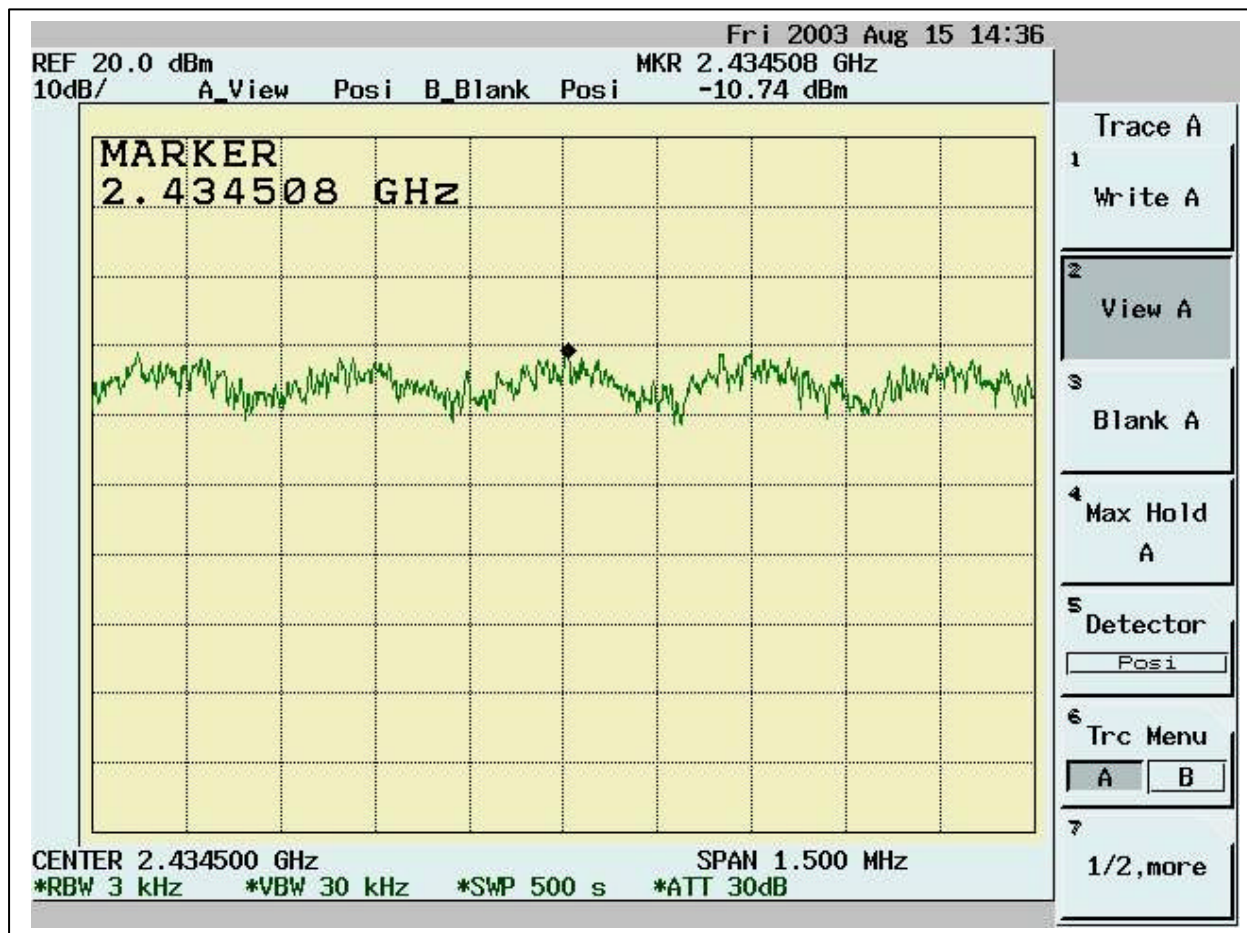
5.7.3 Test Data:

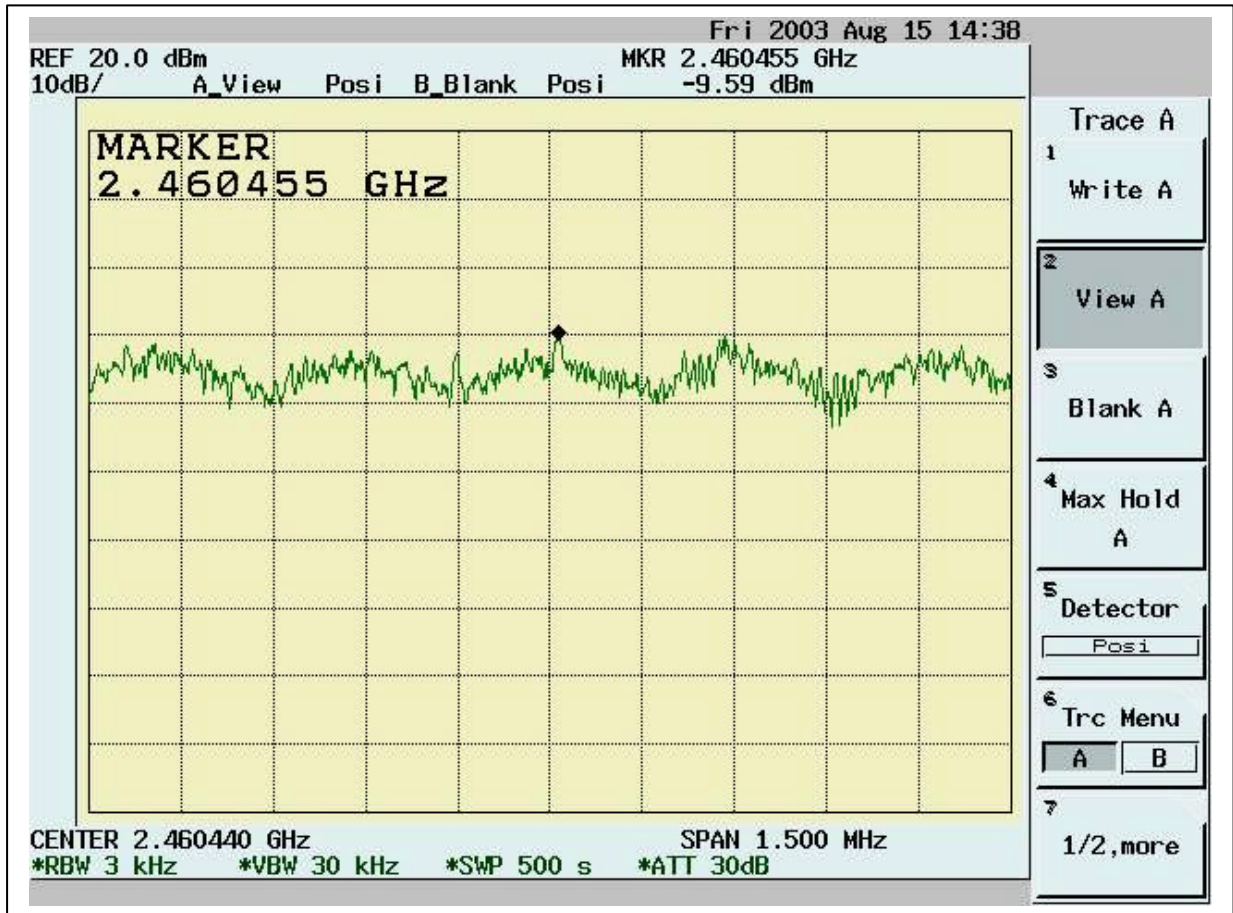
Table Maximum Peak Output Power Density

Chennel	Frequency (MHz)	Peak Power Output (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
1	2412	-10.57	8	Pass
6	2437	-9.61	8	Pass
11	2462	-8.46	8	Pass

Cable loss=1.13dB







6. Appendix

6.1 Appendix A: Measurement Procedure for Powerline Conducted Emissions

The EUT is set up in accordance with the suggested configuration given in ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996. 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 Figure 1 of the ANSI C63.4-2001 or CISPR16. 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 according to ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996. 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 according to ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996. 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	50 Ohms Load Conduction 02	EMCO	N/A	ISL-50ohms conduction 02	11/21/2002	11/21/2003
Conduction	Coaxial Cable 1F-C2	Harbourindustries	RG400	1F-C2	06/03/2003	06/03/2004
Conduction	Digital Hygro-Thermometer Conduct	MicroLife	HT-2126G	ISL-Conduction02	12/16/2001	12/16/2003
Conduction	EMI Receiver 02	HP	85460A	3448A00183	08/21/2002	08/21/2003
Conduction	ISN T4	Schaffner	ISN T400	16593	08/20/2002	08/20/2004
Conduction	LISN 01	R&S	ESH2-Z5	890485/013	05/07/2003	05/07/2004
Conduction	LISN 03	R&S	ESH3-Z5 831.5518.52	828874/D10	10/31/2002	10/31/2003
Radiation	Spectrum Analyzer 06	Advantest	R3162	91700295	09/25/2002	09/24/2003
Radiation	EMI Receiver 05	AFJ	ER 55CR	55390143234	11/07/2002	11/07/2003
Radiation	BILOG Antenna 08	Schaffner	CBL6112B	2756	06/04/2003	06/04/2004
Radiation	Microwave Cable Chmb 02 3M	HUBER+SUHNER AG.	Sucoflex 103	42731/3 & 42729/3	03/21/2003	03/21/2004
Radiation	Coaxial Cable Chmb 02-10M	Belden	RG-8/U	Chmb 02-10M	01/14/2003	01/14/2004
Radiation	Digital Hygro-Thermometer Chmb 02	MicroLife	HT-2126G	Chmb 02	02/07/2003	02/07/2004
Rad. Above 1Ghz	Horn Antenna 02	Com-Power	AH-118	10088	02/25/2003	02/25/2004
Rad. Above 1Ghz	Horn Antenna 04	Com-Power	AH-826	081-001	10/17/2002	10/17/2003
Rad. above 1Ghz	Horn Antenna 05	Com-Power	AH-640	100A	09/13/2001	09/13/2003
Rad. above 1Ghz	Microwave Cable Chmb 05	HUBER+SUHNER AG.	Sucoflex 103	42726/3 & 42727/3	09/11/2002	09/11/2003
Rad. Above 1Ghz	Preamplifier 02	MITEQ	AFS44-00102 650-40-10P-44	728229	05/07/2003	05/07/2004
Rad. Above 1Ghz	Preamplifier 09	MITEQ	AFS44-00102 650-40-10P-44	858687	02/28/2003	02/28/2004

Location	Equipment Name	Brand	Model	S/N	Last Cal. Date	Next Cal. Date
RF	Peak Power Analyzer	HP	8990A	3621A01269	09/12/2002	09/12/2003
Rad. Above 1Ghz	Preamplifier 10	MITEQ	JS-26004000-27-5A	818471	02/28/2002	02/28/2004
Rad. Above 1Ghz	Signal Generator 03	Anritsu	MG3642A	6200162550	02/05/2003	02/05/2004
Rad. Above 1Ghz	Signal Generator 04	Anritsu	MG3692A	020311	02/06/2002	02/06/2004
Rad. Above 1Ghz	Spectrum Analyzer 07	Advantest	R3182	110600649	10/17/2002	10/17/2003

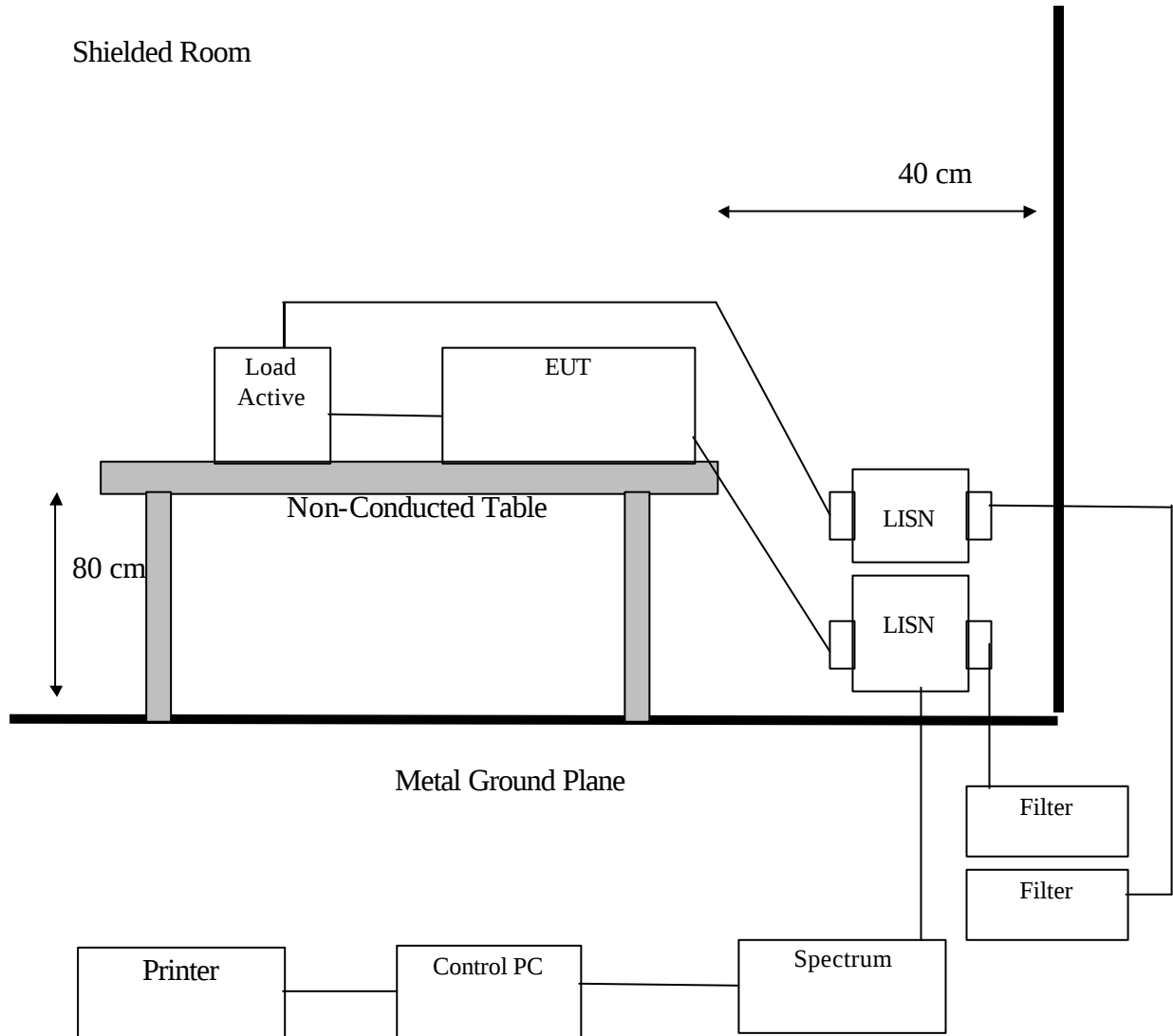
Note: Calibration traceable to NIST or national or international standards.

6.3.2 Software for Controlling Spectrum/Receiver and Calculating Test Data

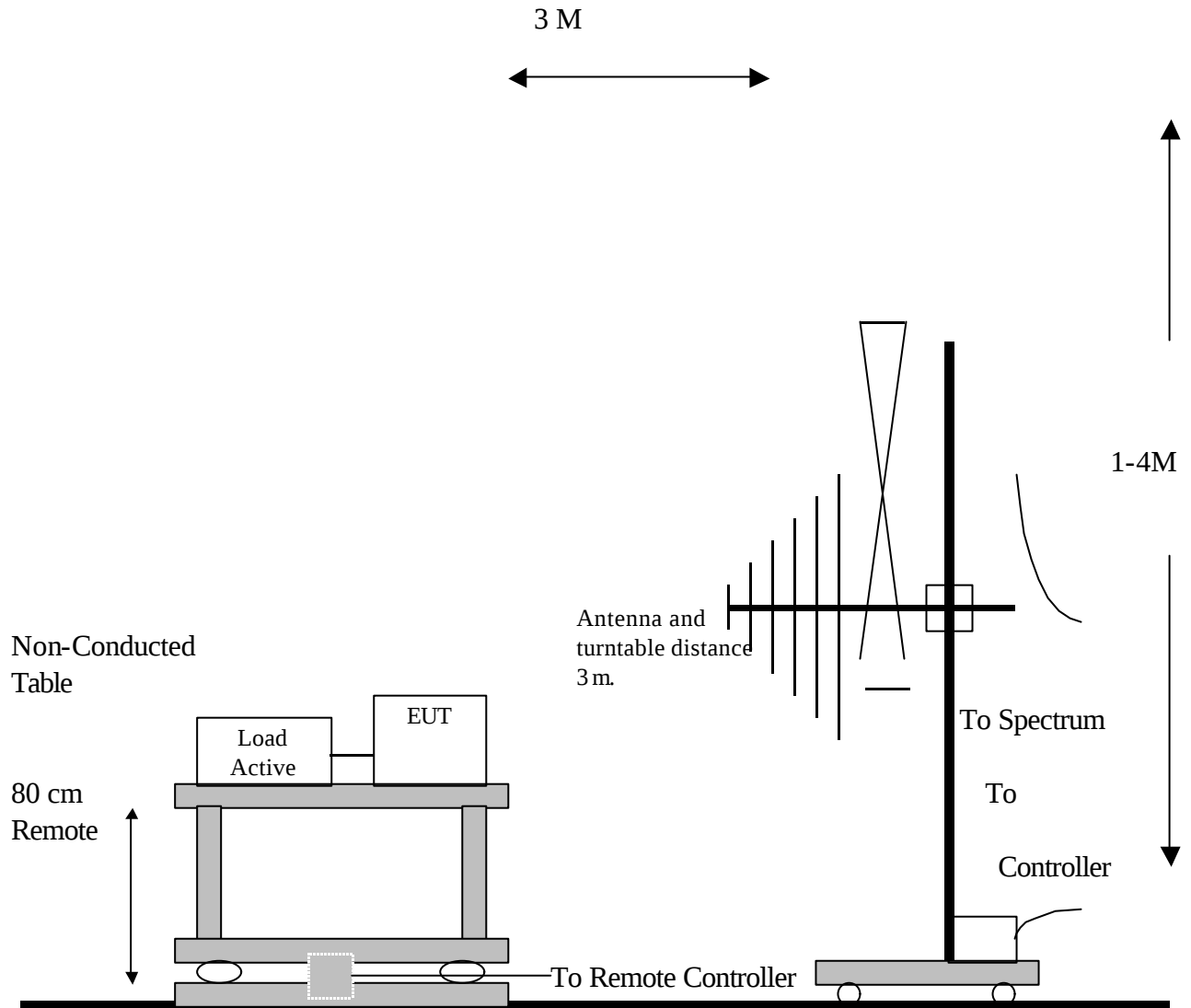
Radiation/Conduction	Filename	Version	Issued Date
Conduction	Tile.exe	1.12E	7/7/2000
Radiation	Tile.exe	1.12C	6/16/2000

6.4 Appendix D: Layout of EUT and Support Equipment

6.4.1 General Conducted Test Configuration



6.4.2 General Radiation Test Configuration



1-4M

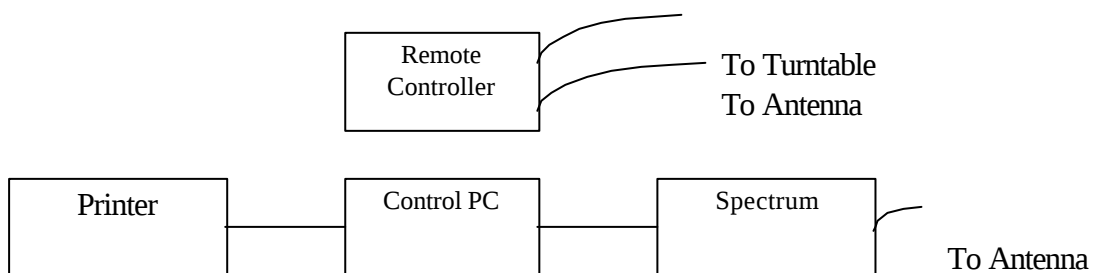
Antenna and
turntable distance
3 m.

To Spectrum

To
Controller

- To Remote Controller

Metal Full Soldered Ground Plane



To Turntable
To Antenna

To Antenna

Printer

Cont

Spectrum

To Antenna

6.5 Appendix E: Description of Support Equipment

6.5.1 Description of Support Equipment

None

6.5.2 Software for Controlling Support Unit

None

6.5.3 I/O Cable Condition of EUT and Support Units

Description	Path	Cable Length	Cable Type	Connector Type
DC Adapter Cord	Power Adapter to DC-IN port	1.2M	Nonshielded, Detachable	Plastic 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 $U_c(y)$	Normal			k=1	0.850
7	Total Uncertainty @95% mim. Confidence Level	Normal	k=2	1.701		

Measurement Uncertainty Calculations:

$$U_c(y) = \text{square root} (u_1(y)^2 + u_2(y)^2 + \dots + u_n(y)^2)$$

$$U = 2 * U_c(y)$$

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:

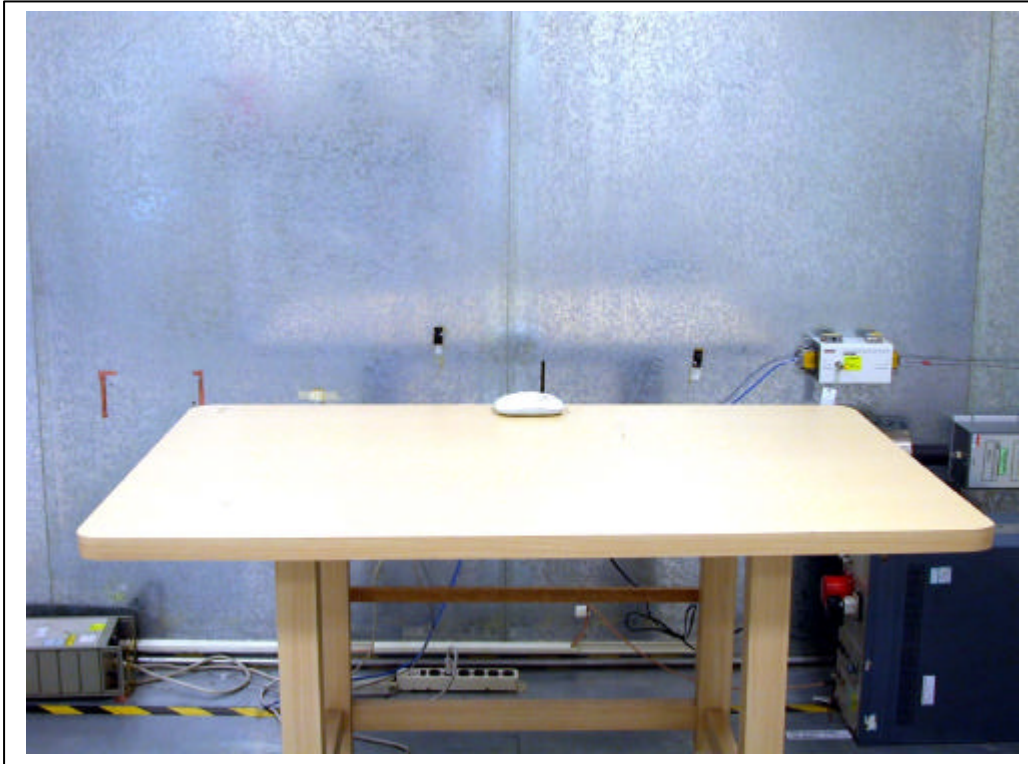
$$U_c(y) = \text{square root} (u_1(y)^2 + u_2(y)^2 + \dots + u_n(y)^2)$$

$$U = 2 * U_c(y)$$

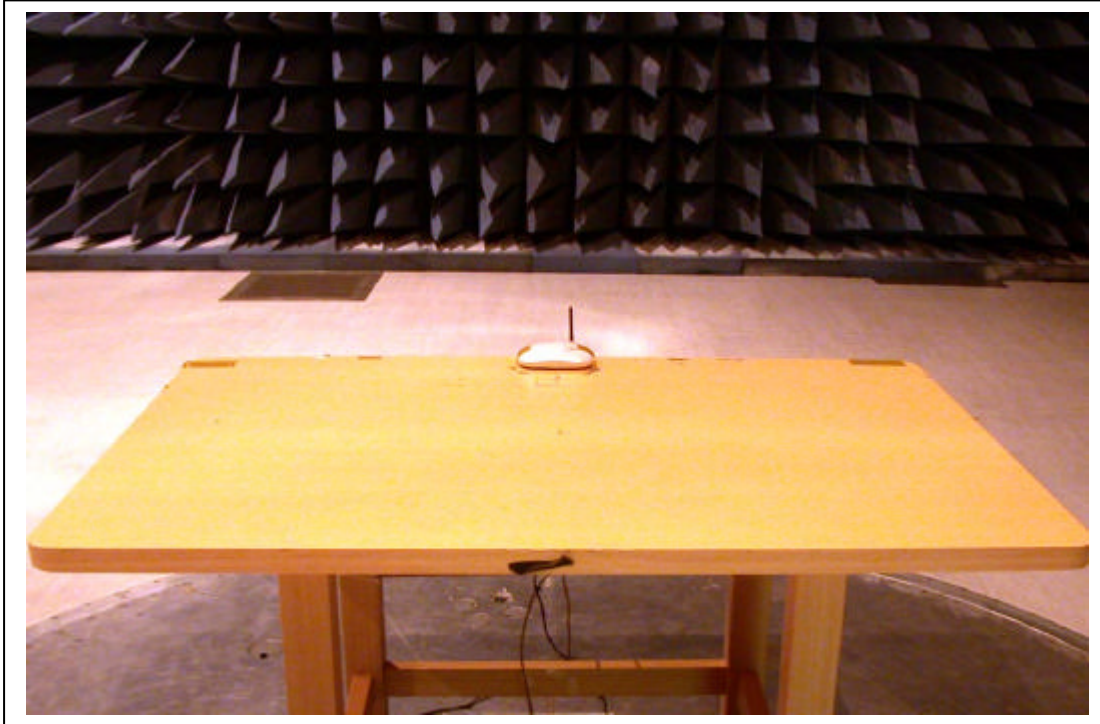
Note: The measurement Uncertainties mentioned above also refer to NIS 81-1994 of NAMAS :
The treatment of Uncertainty in EMC Measurement.

6.7 Appendix G: Photographs of EUT Configuration Test Set Up

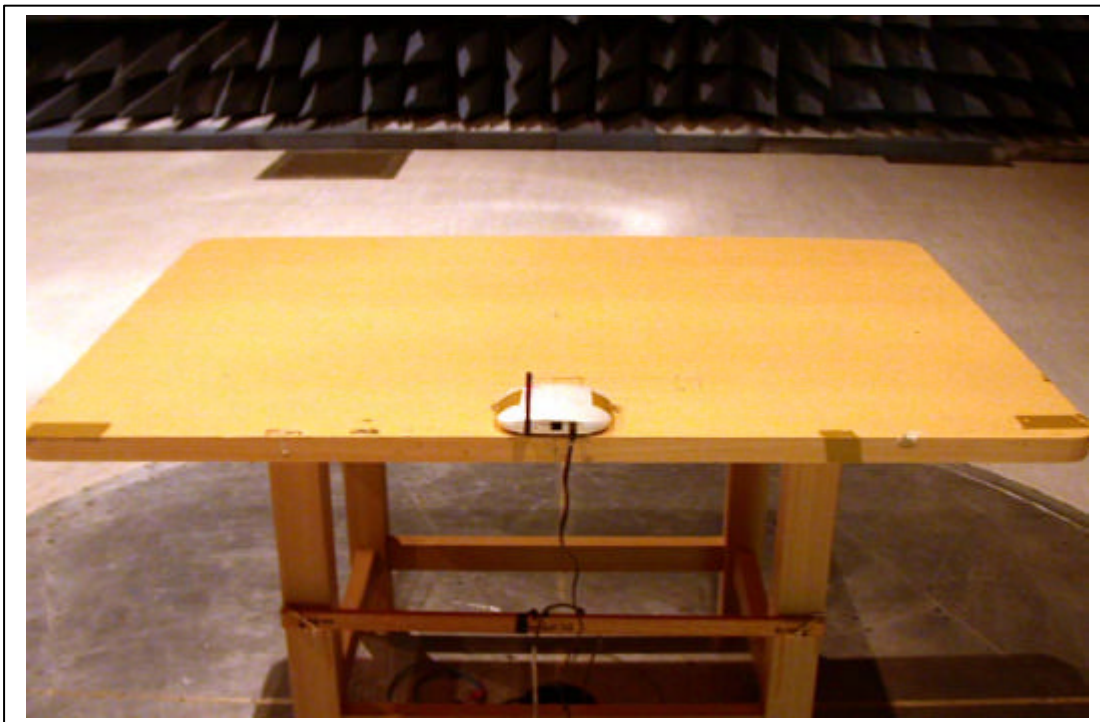
The Front View of Highest Conducted Set-up For EUT



The 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.