



**Test Report**  
**for**  
**FCC Part 15 Subpart B & C**

*of*

*Product Name*

**802.11 BG Wireless Module**

*Model*

**VNT6656GEV00**

*Applied by:*

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*Test Performed by:*

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**HC LAB:** NVLAP:200234-0;VCCI: R-341,C-354; NEMKO:ELA 113A;BSMI:SL2-IN-E-0037;SL2-R1-E-0037;CNLA:1178; IC:IC4067  
**LT LAB:** NVLAP:200234-0;VCCI: R-1435,C-1440;NEMKO:ELA 113B; BSMI:SL2-IN-E-0013;CNLA:0997; IC:IC4164-1

ISL-T10-R2-3

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# 1. General

## 1.1 Certification of Accuracy of Test Data

**Standards:** CFR 47 Part 15 Subpart B Class B  
CFR 47 Part 15 Subpart C (Section 15.247)

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

**Equipment Tested:** 802.11 BG Wireless Module

**Model:** VNT6656GEV00

**Applied by:** VIA Technologies Inc

**Sample received Date:** 2006/06/16

**Final test Date :** 2006/06/21-2006/06/26

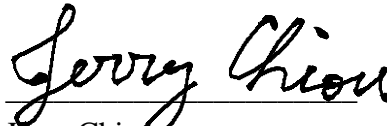
**Test Result** PASS

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

**Temperature** Refer to each site test data

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

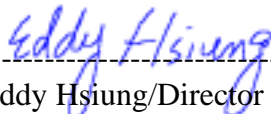
**Test Engineer:**

  
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

  
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Eddy Hsiung/Director

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 65 pages, including 1 cover page , 2 contents page, and 62 pages for the test description. This report must not be use to claim product endorsement by NVLAP or any agency of the U.S. Government.

This test data shown below is traceable to NIST or national or international standard. International Standards Laboratory certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

## 2. Test Results Summary

The 802.11b 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
15.207	AC Power Line Emissions	Pass	
15.247(a)(2)	Spectrum Bandwidth Of DSSS device	Pass	
15.247(b)	Max. Peak Output Power	Pass	
15.247( c )	Radiated Emissions 30MHz – 25 GHz	Pass	
15.247 ( c )	Band Edge Measurement	Pass	
15.247(b)(4)	Radiation Exposure	Pass	MPE report attached
15.247 (d)	Power Spectral Density	Pass	

The 802.11g 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
15.207	AC Power Line Emissions	Pass	
15.247(a)(2)	Spectrum Bandwidth Of DSSS device	Pass	
15.247(b)	Max. Peak Output Power	Pass	
15.247( c )	Radiated Emissions 30MHz – 25 GHz	Pass	
15.247 ( c )	Band Edge Measurement	Pass	
15.247(b)(4)	Radiation Exposure	Pass	MPE report attached
15.247 (d)	Power Spectral Density	Pass	

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

Description: 802.11 BG Wireless Module  
Model No.: VNT6656GEV00  
Frequency Range 802.11b/g: 2400~2483.5 MHz  
Support channel:  
802.11b/g 11 Channels

Modulation Skill:  
802.11b DBPSK(1Mbps), DQPSK(2Mbps),  
CCK(5.5/11Mbps)  
802.11g OFDM (6M - 54Mbps)

#### Antennas Type:

Antenna 1: PIFA (6-23-7M59K-021 , made by FAVORTRON CO., LTD)  
Antenna 2: PIFA (6-23-7M59K-011 , made by FAVORTRON CO., LTD)  
Antenna 3: PIFA (13-130-F14911, made by VSO ELECTRIC CO., LTD )  
Antenna 4: PIFA (13-130-F14931 , made by VSO ELECTRIC CO., LTD)  
Antenna 5: PIFA (13-130-F53021 , made by VSO ELECTRIC CO., LTD)  
Antenna 6: PIFA (13-130-F62011 , made by VSO ELECTRIC CO., LTD)  
Antenna 7: PIFA (13-130-F62021 , made by VSO ELECTRIC CO., LTD)  
Antenna 8: PIFA (13-130-F66021 , made by VSO ELECTRIC CO., LTD)  
Antenna 9: PIFA (13-130-F66041 , made by VSO ELECTRIC CO., LTD)

Antenna Connected: The antenna is connected to the RF connector of the WLAN adapter.

#### Antenna peak Gain:

Antenna 1: -0.01 dBi (11b/g)  
Antenna 2: -0.97 dBi (11b/g)  
Antenna 3: -4.4 dBi (11b/g)  
Antenna 4: -4.4 dBi (11b/g)  
Antenna 5: -3.37 dBi (11b/g)Black  
-6.03 dBi (11b/g)Grey  
Antenna 6: -0.22 dBi (11b/g)  
Antenna 7: -0.22 dBi (11b/g)  
Antenna 8: -0.31 dBi (11b/g)  
Antenna 9: -1.55 dBi (11b/g)

WLAN Power Type : 3.3V DC from the EUT

The channel and the operation frequency of 802.11b and 802.11g is listed below:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437		

During the test, the EUT was tested as a modular device of a notebook PC using a USB extender board to extend the EUT outside the notebook PC enclosure. There are nine PIFA antennas in the EUT:

All of antennas have been tested. The worse data of each antenna type are shown. Configuration list as below:

VNT6656GEV00	PIFA Antenna
802.11b/g	Antenna 1

EUT Power Setting

802.11b

	Data Rate	11 Mbps
Channel	Frequency(MHz)	Power Setting
Channel 1	2412	44
Channel 6	2437	44
Channel 11	2462	44

802.11g

	Data Rate	54 Mbps
Channel	Frequency(MHz)	Power Setting
Channel 1	2412	57
Channel 6	2437	57
Channel 11	2462	57

## 4. TEST RESULTS (802.11b)

### 4.1 Powerline Conducted Emissions [Section 15.207]

#### 4.1.1 EUT Configuration

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 used.

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.

#### 4.1.2 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.

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

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

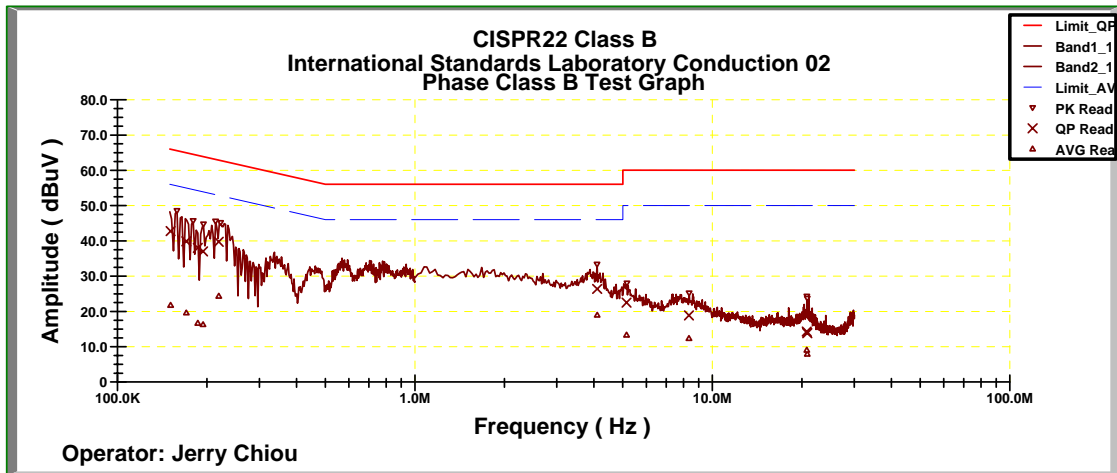


4.1.4 Test Data:

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

Operator: Jerry Chiou  
 Temperature(C): 25  
 Humidity(%): 56

Frequency	LISN Loss	Cable Loss	QPCorrt.	QPLimit	QPMargin	AVECorrt.	AVELimit	AVEMargin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.150949	0.15	0.02	42.75	65.97	-23.22	21.72	55.97	-34.25
0.17046	0.17	0.03	39.86	65.42	-25.55	19.57	55.42	-35.85
0.18623	0.19	0.04	38.01	64.96	-26.96	16.66	54.96	-38.31
0.19396	0.19	0.04	37.02	64.74	-27.73	16.26	54.74	-38.48
0.21903	0.19	0.06	39.73	64.03	-24.30	24.32	54.03	-29.71
4.09813	0.20	0.14	26.36	56.00	-29.64	18.94	46.00	-27.06
5.14422	0.25	0.15	22.48	60.00	-37.52	13.29	50.00	-36.71
8.3358	0.40	0.19	18.86	60.00	-41.14	12.34	50.00	-37.66
20.7521	0.92	0.34	14.29	60.00	-45.71	9.03	50.00	-40.97
20.8405	0.92	0.34	13.82	60.00	-46.18	7.90	50.00	-42.10



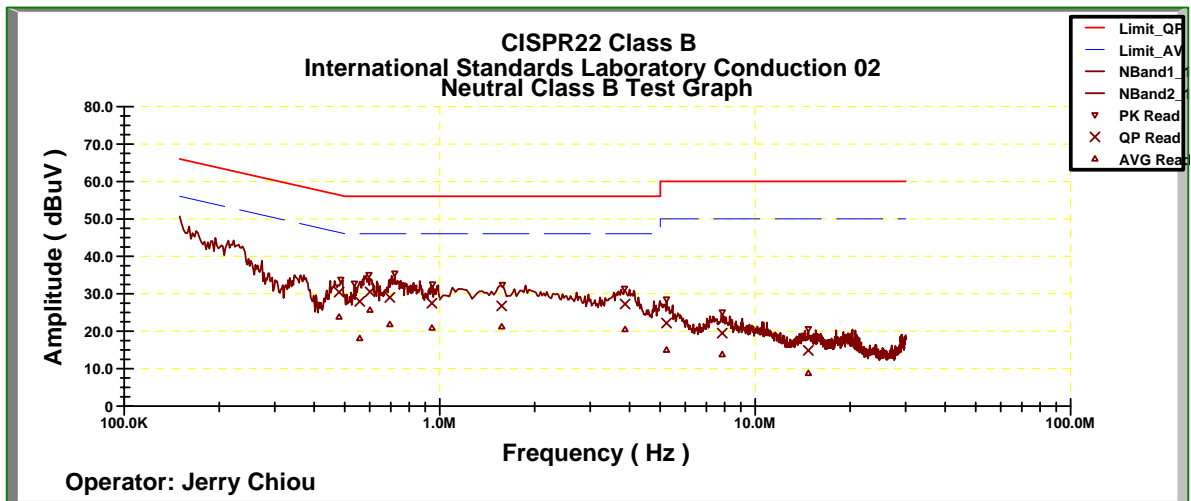
**Power Line Conducted Emissions (Neutral) Channel 1, 6, 11**

Operator: Jerry Chiou

Temperature(C):25

Humidity(%):56

Frequency	LISN Loss	Cable Loss	QPCorrct.	QPLimit	QPMargin	AVECorrct.	AVELimit	AVEMargin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.47953	0.10	0.07	30.40	56.58	-26.18	23.79	46.58	-22.79
0.55783	0.10	0.07	27.90	56.00	-28.10	18.09	46.00	-27.91
0.60076	0.10	0.07	30.50	56.00	-25.50	25.63	46.00	-20.37
0.69498	0.10	0.07	29.00	56.00	-27.00	21.81	46.00	-24.19
0.9448	0.10	0.07	27.44	56.00	-28.56	20.86	46.00	-25.14
1.57213	0.14	0.08	26.74	56.00	-29.26	21.20	46.00	-24.80
3.86712	0.10	0.14	27.24	56.00	-28.76	20.46	46.00	-25.54
5.23075	0.13	0.15	22.16	60.00	-37.84	14.98	50.00	-35.02
7.85313	0.21	0.18	19.46	60.00	-40.54	13.78	50.00	-36.22
14.7324	0.39	0.30	14.84	60.00	-45.16	8.77	50.00	-41.23



\* 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

**4.2 Bandwidth for DSSS [Section 15.247 (a)(2)]**

**4.2.1 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

**4.2.2 Test Setup**



**4.2.3 Test Data:**

**6dB Bandwidth**

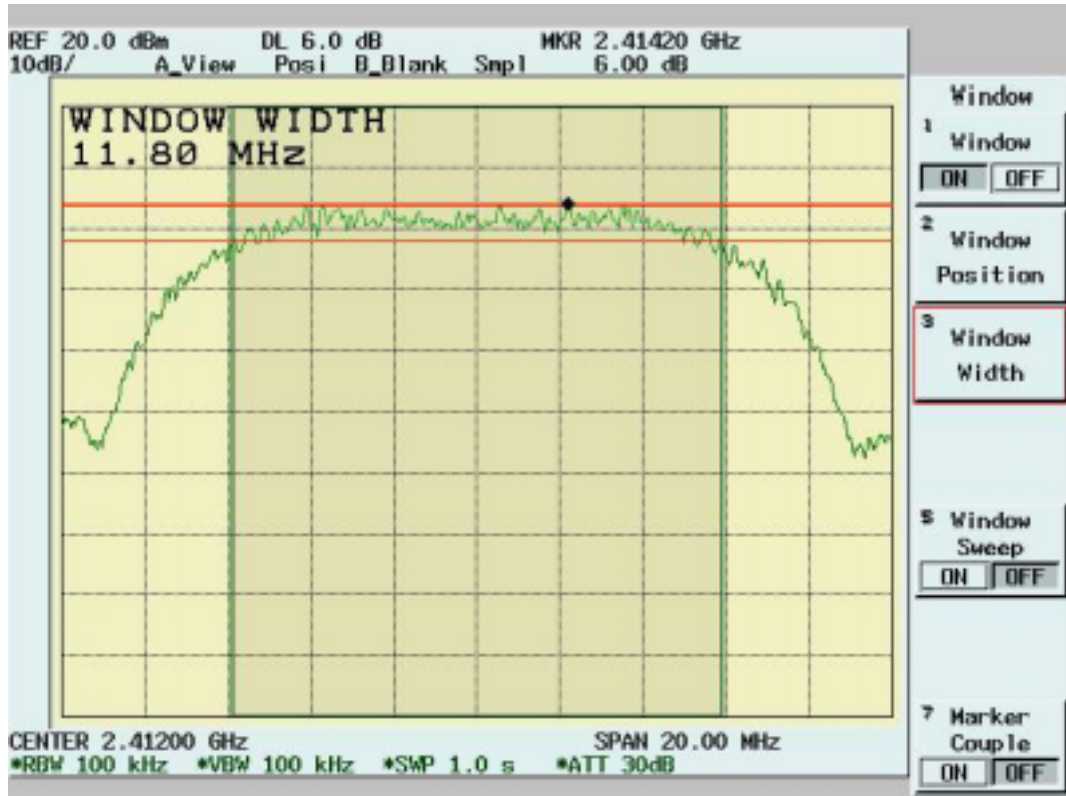
Temp. (deg. C): 25

Humidity (%): 50

Test Engr: Jerry Chiou

Chennel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	11.8	0.5	Pass
6	2437	11.8	0.5	Pass
11	2462	11.8	0.5	Pass

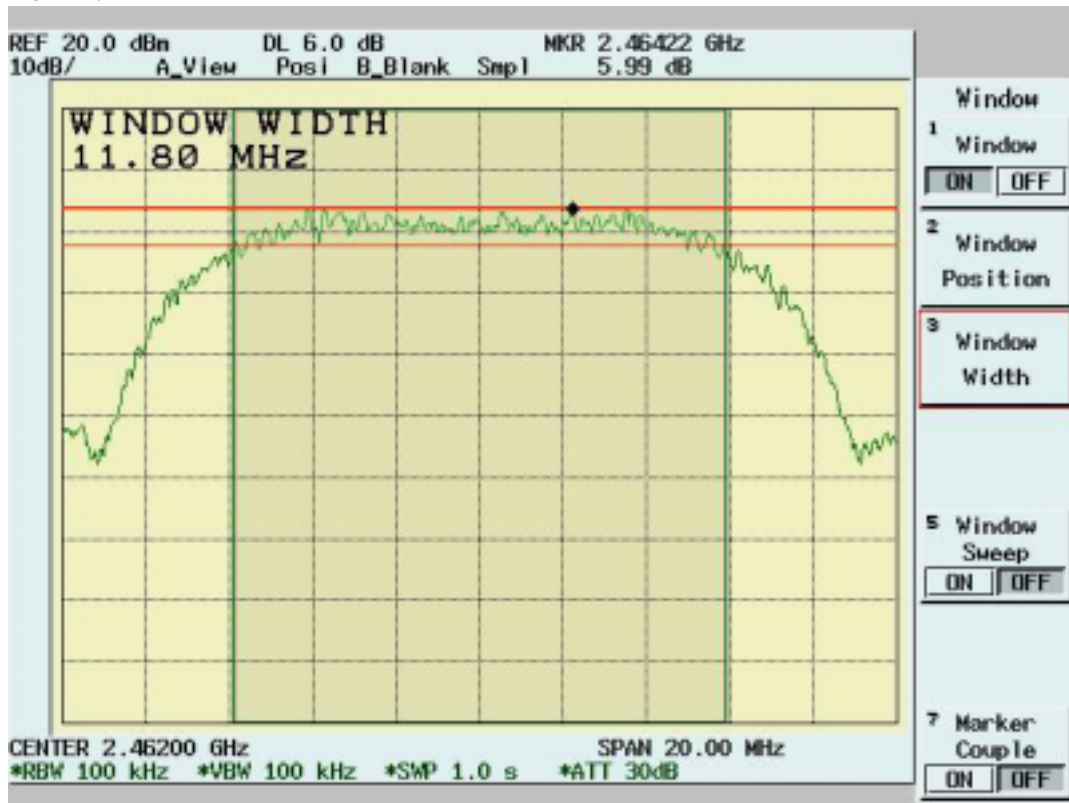
Channel 1:



Channel 6:



Channel 11:

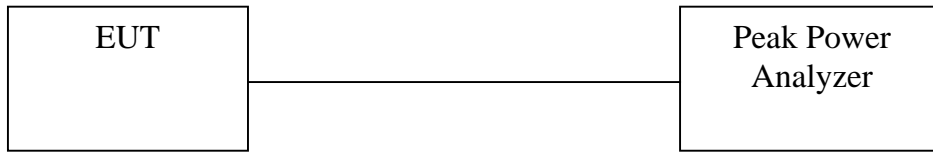


### 4.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

#### 4.3.1 Test Procedure

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

#### 4.3.2 Test Setup



#### 4.3.3 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	18.031	1.1	81.87	19.131	30	Pass
6	2437	18.124	1.1	83.64	19.224	30	Pass
11	2462	17.812	1.1	77.84	18.912	30	Pass

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

## 4.4 Radiated Emission Measurement [Section [15.247(c)(4)]

### 4.4.1 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.

### 4.4.2 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 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.

### 4.4.3 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

**4.4.4 Test Data (30MHz – 1GHz):**

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

Operator: JerryChiou  
 Temperature(C): 23  
 Humidity(%): 59

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)
279.29	10.53	13.59	3.10	0.00	27.22	46.00	-18.78	97.00	178.00
320.03	14.96	16.02	3.30	0.00	34.28	46.00	-11.72	97.00	358.00
399.57	8.73	15.90	3.70	0.00	28.33	46.00	-17.67	97.00	358.00
405.39	13.70	15.93	3.70	0.00	33.33	46.00	-12.67	97.00	31.00
443.22	8.23	16.16	3.92	0.00	28.30	46.00	-17.70	97.00	326.00
450.01	13.13	16.20	4.00	0.00	33.33	46.00	-12.67	97.00	80.00
765.26	2.96	20.17	5.00	0.00	28.13	46.00	-17.87	97.00	244.00
809.88	3.20	20.20	5.14	0.00	28.53	46.00	-17.47	97.00	146.00
832.19	3.71	20.42	5.14	0.00	29.28	46.00	-16.72	97.00	113.00

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

Operator: JerryChiou  
 Temperature(C): 23  
 Humidity(%): 59

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)
42.61	10.57	10.89	1.25	0.00	22.72	40.00	-17.28	97.00	146.00
57.16	15.89	6.00	1.30	0.00	23.19	40.00	-16.81	97.00	48.00
405.39	10.27	15.93	3.70	0.00	29.91	46.00	-16.09	97.00	31.00
450.01	10.87	16.20	4.00	0.00	31.07	46.00	-14.93	97.00	80.00
494.63	7.59	17.27	4.24	0.00	29.09	46.00	-16.91	97.00	64.00
499.48	6.21	17.39	4.29	0.00	27.89	46.00	-18.11	97.00	64.00
599.39	4.42	18.70	4.50	0.00	27.62	46.00	-18.38	97.00	358.00
829.28	2.42	20.39	5.17	0.00	27.98	46.00	-18.02	97.00	97.00

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**



**4.4.5 Test Data ( 1GHz – 25 GHz) .**

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

Operator:JerryChiou

RBW:1MHz  
Humidity(%):41  
Temperature(C):27

Frequency MHz	Rx_R. dBuV	Ant_F. dB/m	Cab_L. dB	PreAmpl dB	Emission dBuV/m	Limit dBuV/m	Margin dB	A.Tower cm	T.Table deg
2358.64	36.97pk	30.93	2.46	24.52	45.83pk	54.00av	-8.17	101	156
4818.18	33.26pk	34.11	5.14	27.49	45.01pk	54.00av	-8.99	100	18

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

Operator:JerryChiou

RBW:1MHz  
Humidity(%):41  
Temperature(C):27

Frequency MHz	Rx_R. dBuV	Ant_F. dB/m	Cab_L. dB	PreAmpl dB	Emission dBuV/m	Limit dBuV/m	Margin dB	A.Tower cm	T.Table deg
4818.18	31.08pk	34.11	5.14	27.49	42.83pk	54.00av	-11.17	100	18
9641.86	34.31pk	38.84	3.94	24.84	52.25pk	54.00av	-1.75	102	7

Note:

- According to the standards used, 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(%):41  
Temperature(C):27

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
4861.64	31.69pk	34.27	5.13	27.43	43.66pk	54.00av	-10.34	100	14

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

Operator:JerryChiou

RBW:1MHz  
Humidity(%):41  
Temperature(C):27

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
4861.64	31.95pk	34.27	5.13	27.43	43.93pk	54.00av	-10.07	100	14
9728.77	33.92pk	38.69	4.00	24.78	51.83pk	54.00av	-2.17	102	5

Note:

- According to the standards used, 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(%): 41  
Temperature(C): 27

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
4919.58	32.76pk	34.49	5.13	27.35	45.03pk	54.00av	-8.97	100	8

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

Operator: JerryChiou

RBW: 1MHz  
Humidity(%): 41  
Temperature(C): 27

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
4919.58	31.08pk	34.49	5.13	27.35	43.35pk	54.00av	-10.65	100	8
9830.17	31.45pk	38.51	4.07	24.72	49.31pk	54.00av	-4.69	101	3

Note:

- According to the standards used, 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.

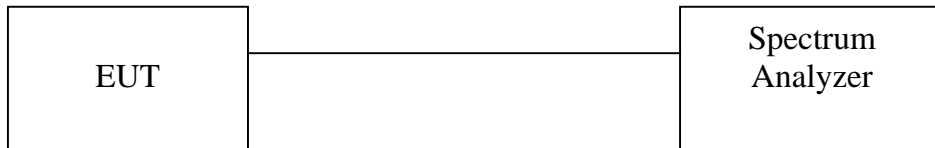
**All frequencies from 1GHz to 25 GHz have been tested.**

## 4.5 Band Edge Measurement

### 4.5.1 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

### 4.5.2 Test Setup (Conducted)



### 4.5.3 Test Data:

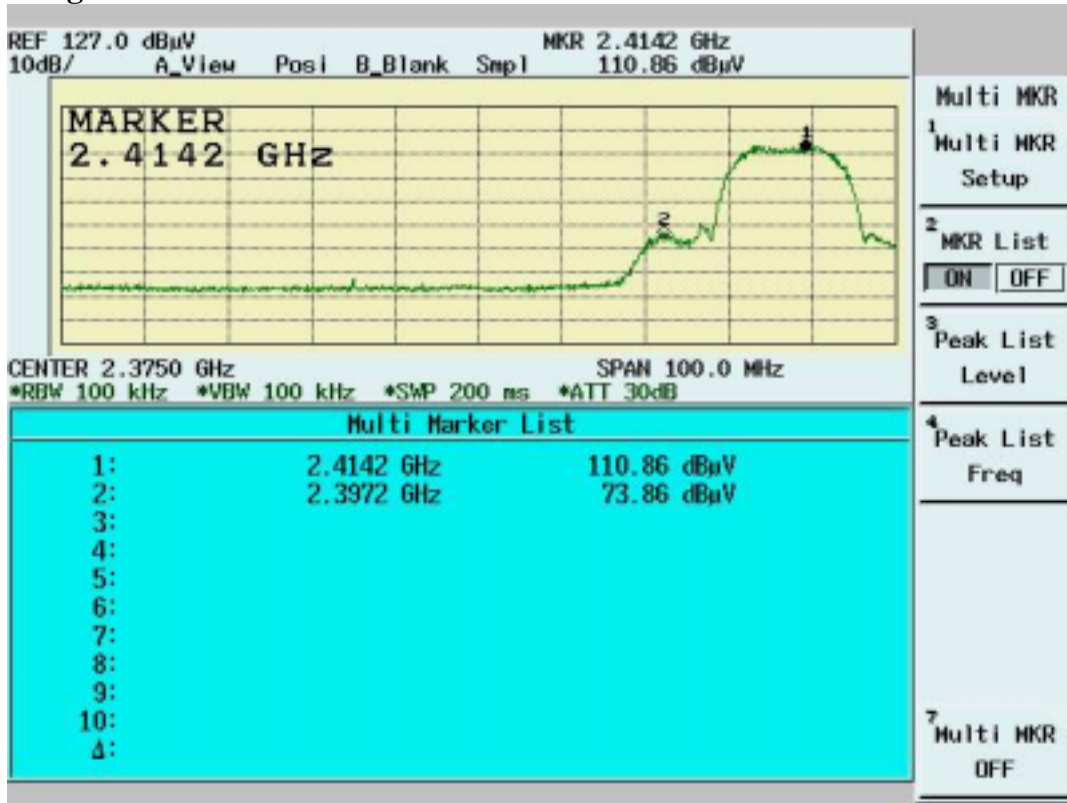
**Table: Band Edge measurement (Conducted)**

Temp. (deg. C): 25  
 Humidity (%): 50  
 Test Engr: Jerry Chiou

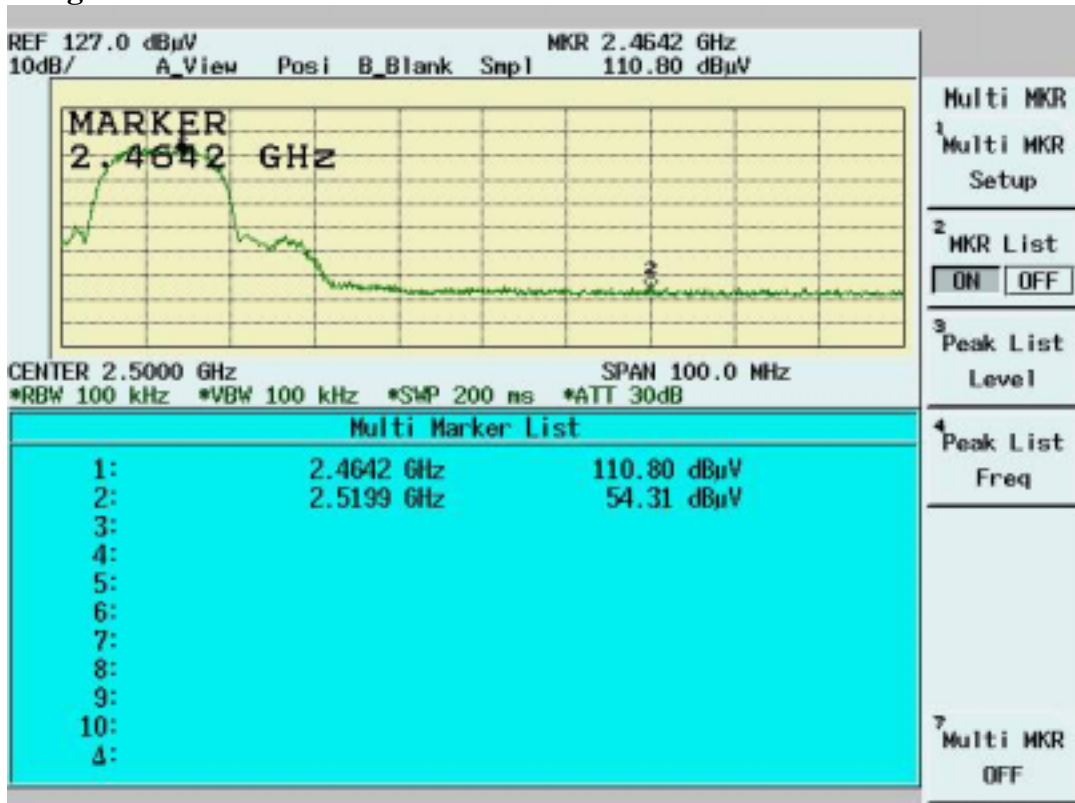
Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Carrier - Outsideband Limit: >20dB (dB)	Pass/Fail
1	2414.2	110.86	---	---
Outside band	2397.2	73.86	37	Pass
11	2464.2	110.8	---	---
Outside band	2519.9	54.31	56.49	Pass

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

**Band Edge Conducted measurement**



**Band Edge Conducted Measurement**



#### 4.5.4 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: 3MHz  
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.

#### 4.5.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

4.5.6 Test Data

Table Band Edge measurement (Radiated)

Temp. (deg. C): 25

Test Engr: Jerry Chiou

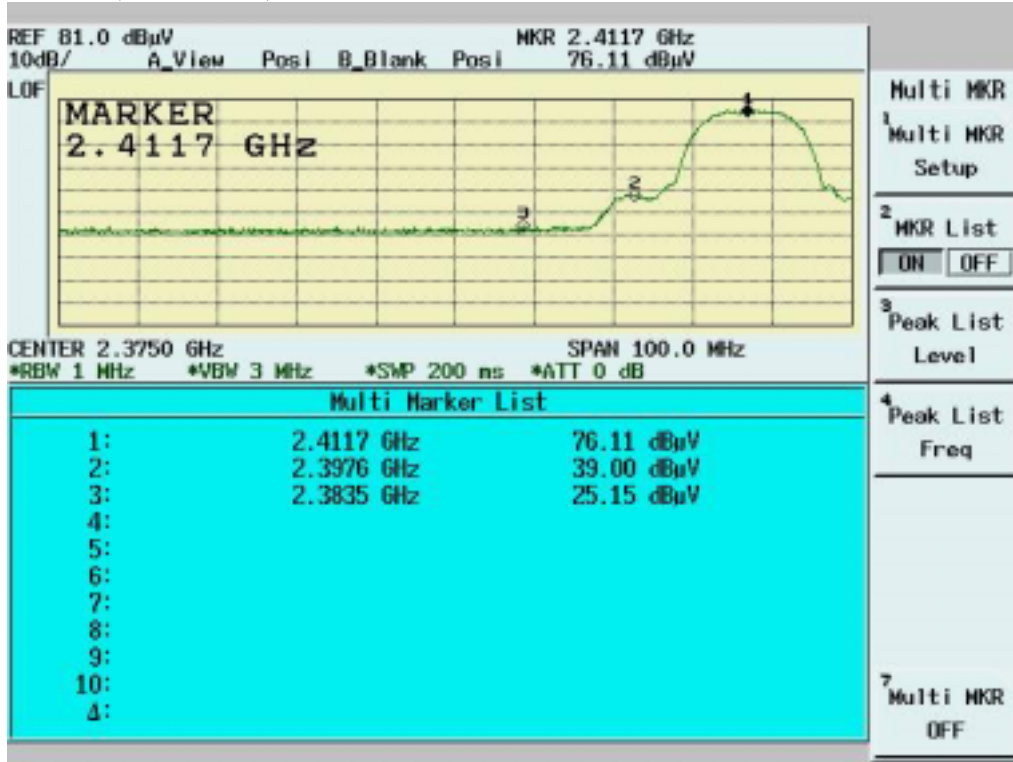
Humidity (%): 50

Description	Frequency	Spectrum	Correction	Emission	dBc	Limit	Equip.	Pass
	(MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	( Limit: > 20dBc)			
Channel_1 (average mode)	2414.4	67.91	35.48	103.39	---	---	10Hz	---
Channel_1 (peak mode)	2411.7	76.11	35.48	111.59	---	---	3MHz	---
Outside band (peak mode)	2397.6	39	35.48	74.48	37.11	---	3MHz	Pass
Channel_11 (average mode)	2464.4	66.16	35.5	101.66	---	---	10Hz	---
Channel_11 (peak mode)	2459.3	74.41	35.5	109.91	---	---	3MHz	---
Outside band (peak mode)	2501.7	24.21	35.51	59.72	50.19	---	3MHz	Pass
Channel_1 Restricted band (peak mode)	2383.5	25.15	35.47	60.62	---	74	3MHz	Pass
Restricted band (average mode)	2390	11.48	35.47	46.95	---	54	10Hz	Pass
Channel_11 Restricted band (peak mode)	2501.7	24.21	35.51	59.72	---	74	3MHz	Pass
Restricted band (average mode)	2483.5	11.23	35.51	46.74	---	54	10Hz	Pass

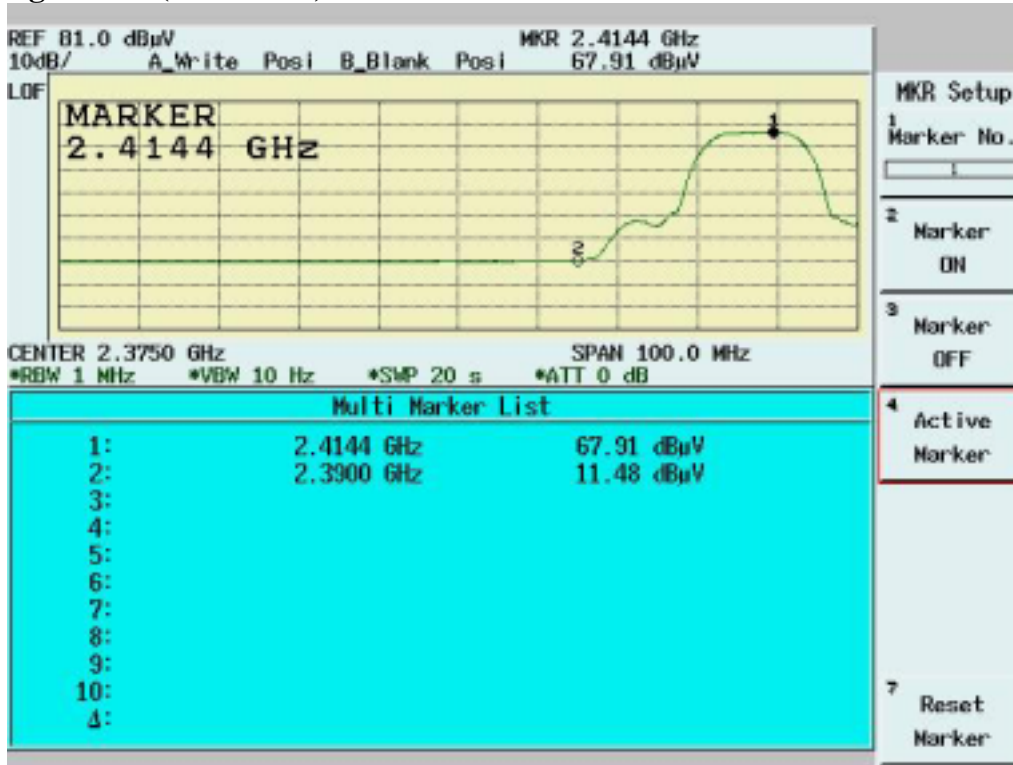
Note:

- 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)**

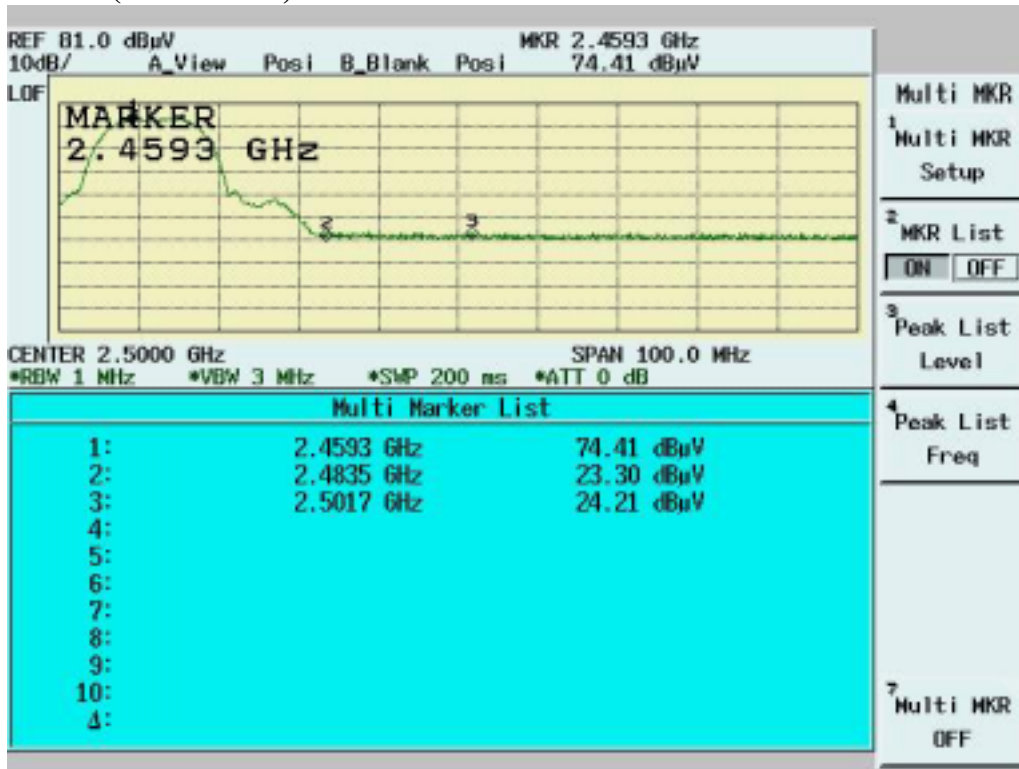


**Band Edge measurement for radiated emission in Restricted Band(Radiated) Average Mode (Channel 1)**

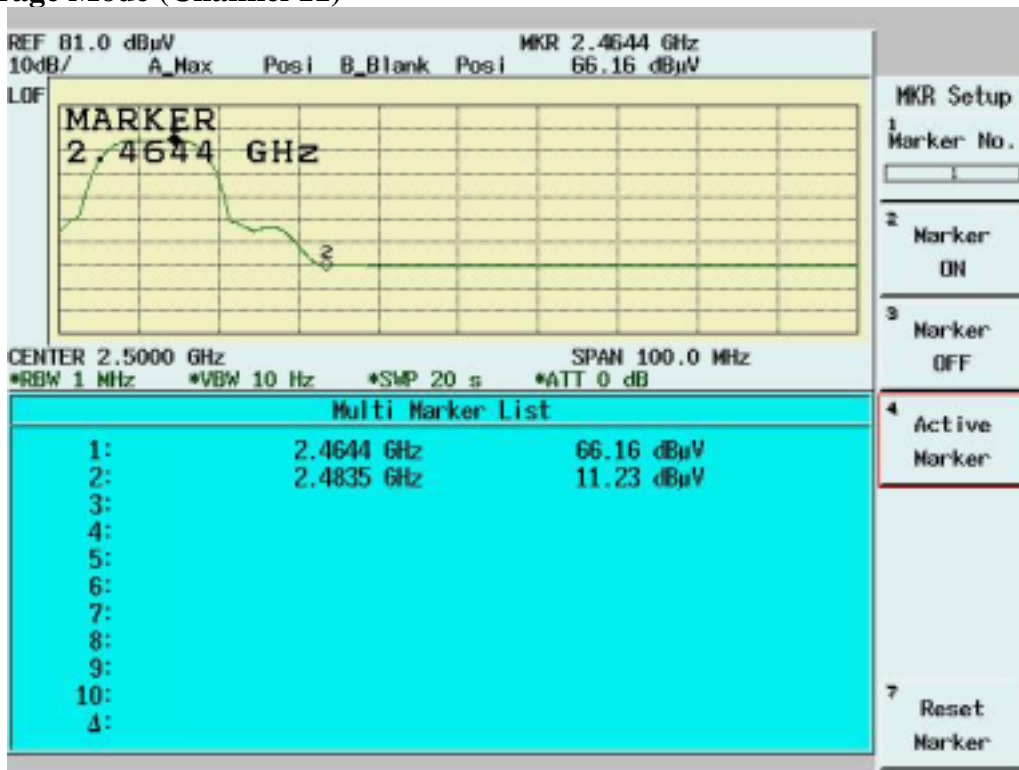




**Band Edge measurement for radiated emission in Restricted Band(Radiated) Peak Mode (Channel 11)**



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





#### **4.6 RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)]**

See MPE report

### 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.
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

##### Maximum Peak Output Power Density

Temp. (deg. C): 25

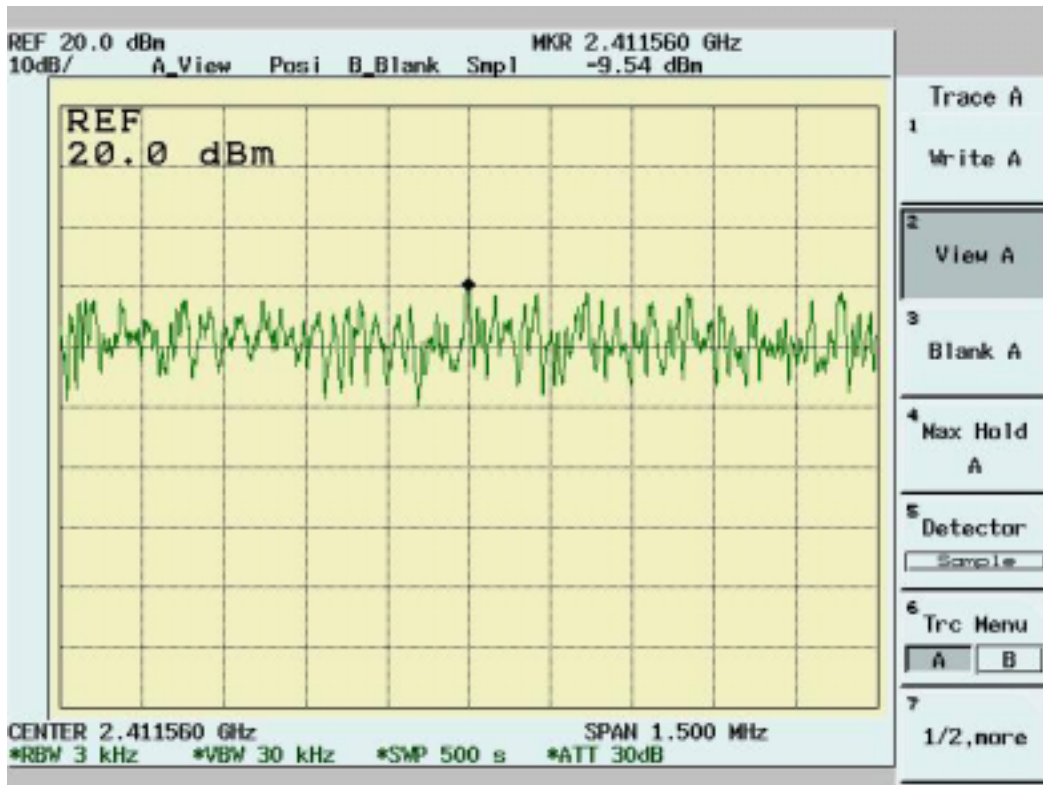
Test Engr: Jerry Chiou

Humidity (%): 50

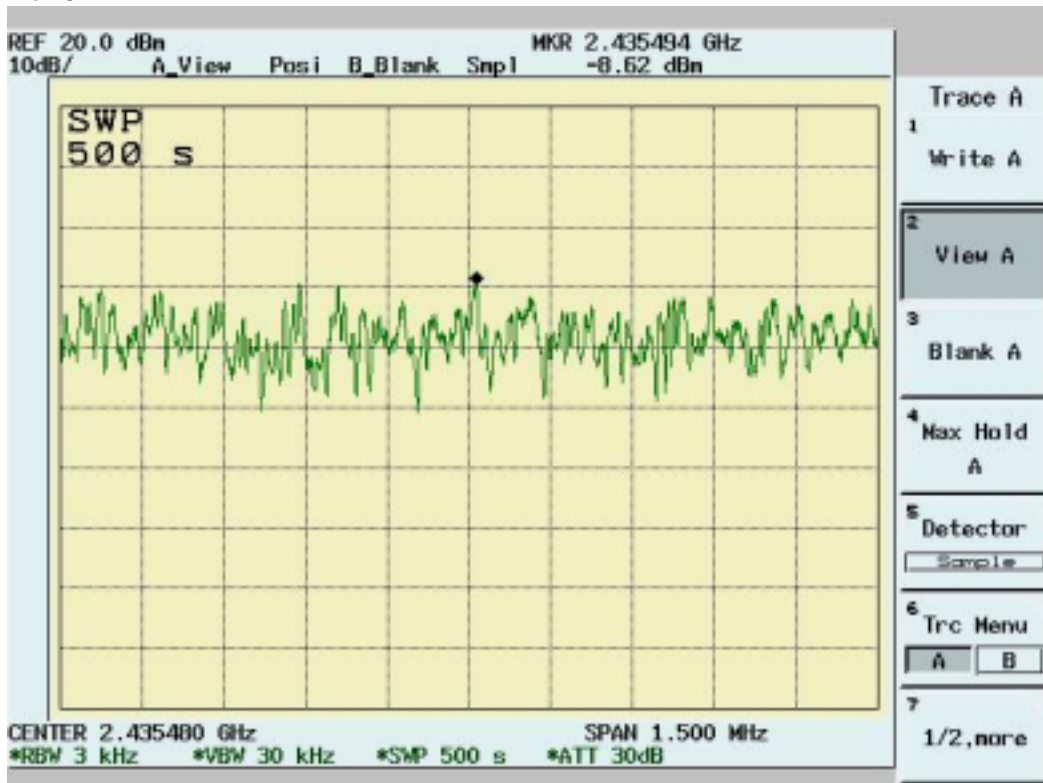
Chennel	Frequency (MHz)	Spectrum Reading (dBm/3KHz)	Cable Loss (dB)	Peak Power Output (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
1	2412	-9.54	1.1	-8.44	8	Pass
6	2437	-8.62	1.1	-7.52	8	Pass
11	2462	-8.94	1.1	-7.84	8	Pass

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

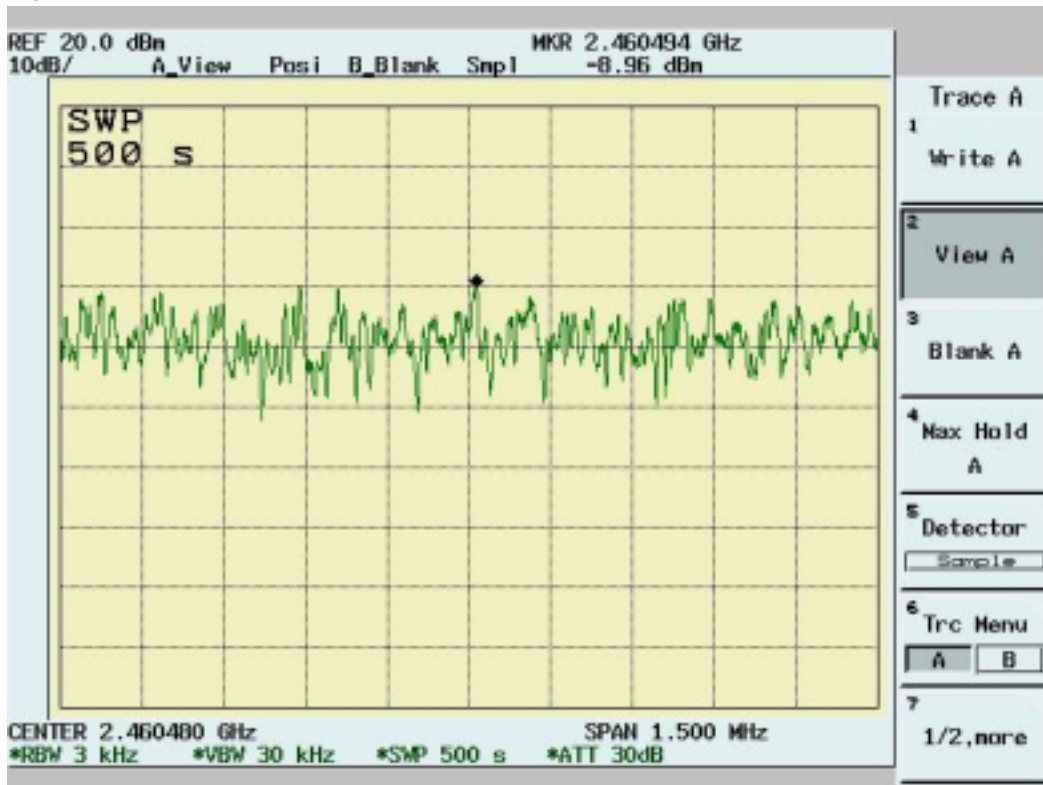
Channel 1



Channel 6



Channel 11



## 5. TEST RESULTS (802.11g)

### 5.1 Powerline Conducted Emissions [Section 15.207]

#### 5.1.1 EUT Configuration

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 used.

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)

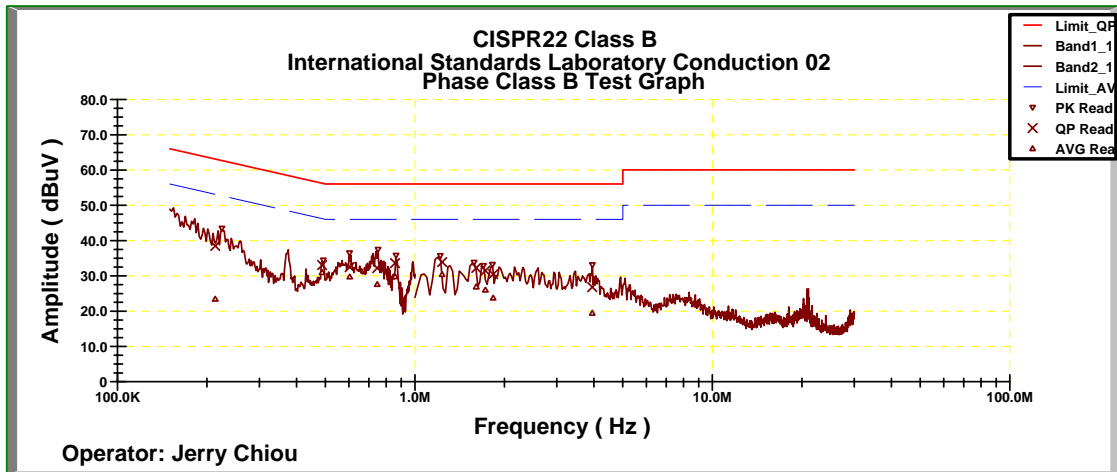
Frequency Range	150 KHz--30MHz
Detector Function	Quasi-Peak/Average
Bandwidth (RBW)	9KHz

5.1.4 Test Data:

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

Operator: Jerry Chiou  
 Temperature(C):25  
 Humidity(%):56

Frequency	LISN Loss	Cable Loss	QP Corrt.	QPLimit	QPMargin	AVE Corrt.	AVELimit	AVEMargin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.21313	0.19	0.05	38.50	64.20	-25.70	23.39	54.20	-30.80
0.48755	0.10	0.07	33.05	56.36	-23.30	30.96	46.36	-15.39
0.60376	0.10	0.07	32.46	56.00	-23.54	29.68	46.00	-16.32
0.74688	0.10	0.07	32.19	56.00	-23.81	27.56	46.00	-18.44
0.85778	0.10	0.07	33.60	56.00	-22.40	29.76	46.00	-16.24
1.23438	0.33	0.07	33.90	56.00	-22.10	30.36	46.00	-15.64
1.60805	0.22	0.08	32.23	56.00	-23.77	26.87	46.00	-19.13
1.72491	0.18	0.08	31.46	56.00	-24.54	25.97	46.00	-20.03
1.83217	0.15	0.09	30.45	56.00	-25.55	23.71	46.00	-22.29
3.94436	0.20	0.14	26.79	56.00	-29.21	19.43	46.00	-26.57



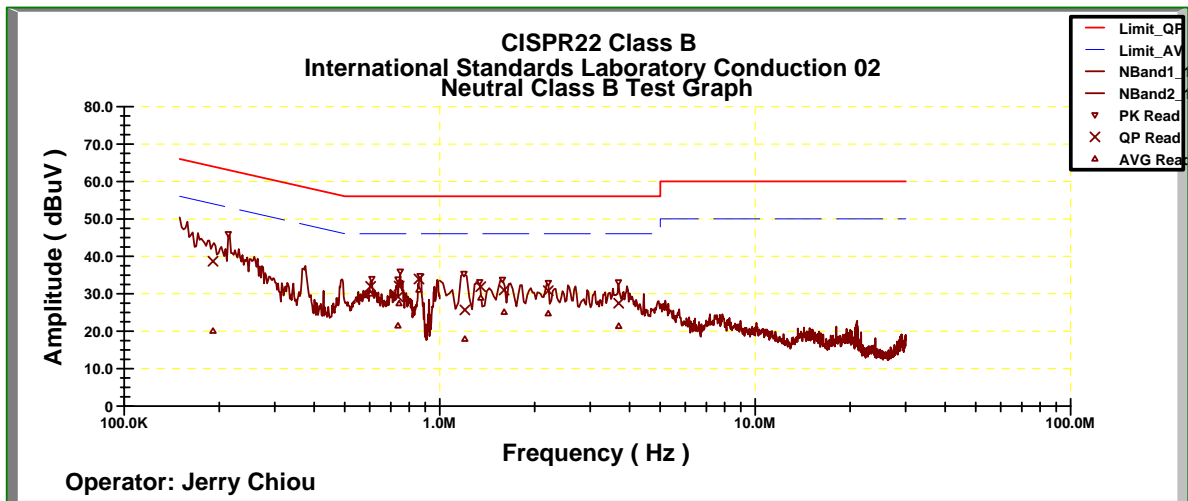
**Power Line Conducted Emissions (Neutral) Channel 1, 6, 11**

Operator: Jerry Chiou

Temperature(C):25

Humidity(%):56

Frequency	LISN Loss	Cable Loss	QPCorrct.	QPLimit	QPMargin	AVECorrct.	AVELimit	AVEMargin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.19111	0.10	0.04	38.65	64.83	-26.17	20.04	54.83	-34.79
0.60353	0.10	0.07	31.96	56.00	-24.04	30.01	46.00	-15.99
0.73718	0.10	0.07	29.15	56.00	-26.85	21.44	46.00	-24.56
0.74295	0.10	0.07	32.04	56.00	-23.96	27.40	46.00	-18.60
0.85901	0.10	0.07	33.92	56.00	-22.08	31.05	46.00	-14.95
1.20129	0.18	0.07	25.66	56.00	-30.34	17.89	46.00	-28.11
1.34929	0.17	0.08	31.84	56.00	-24.16	28.87	46.00	-17.13
1.60003	0.14	0.08	30.98	56.00	-25.02	25.09	46.00	-20.91
2.20714	0.10	0.10	30.80	56.00	-25.20	24.70	46.00	-21.30
3.69008	0.10	0.13	27.47	56.00	-28.53	21.33	46.00	-24.67



\* 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**

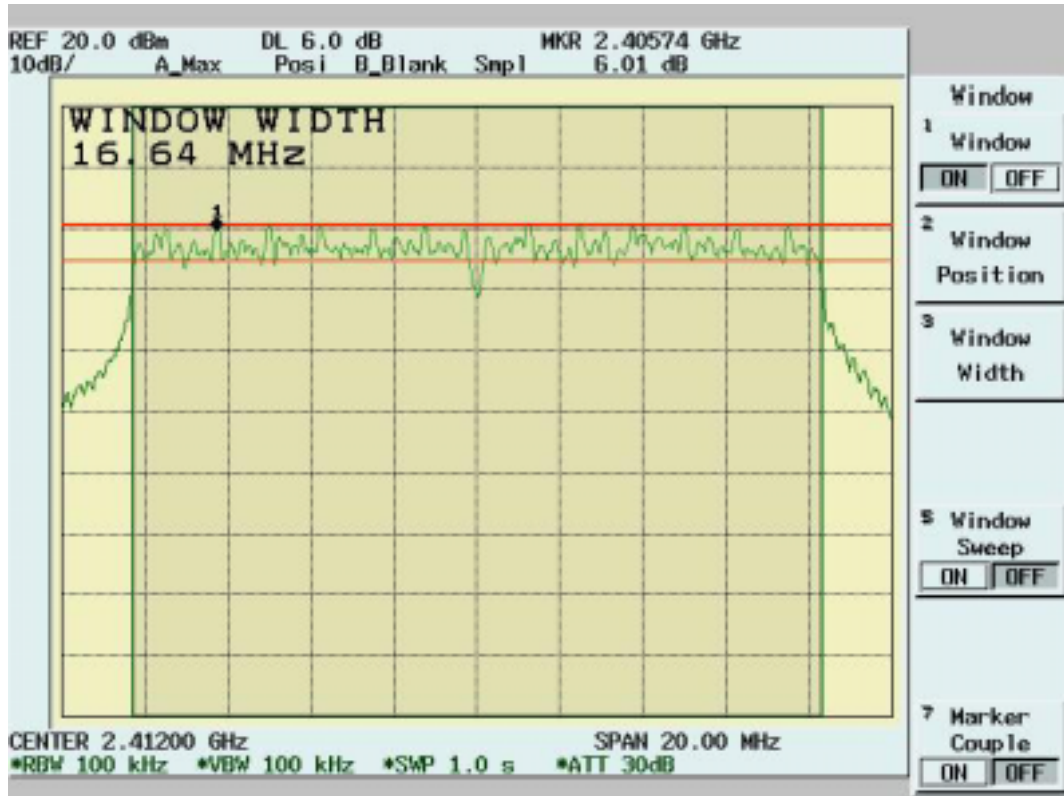
Temp. (deg. C): 25

Humidity (%): 50

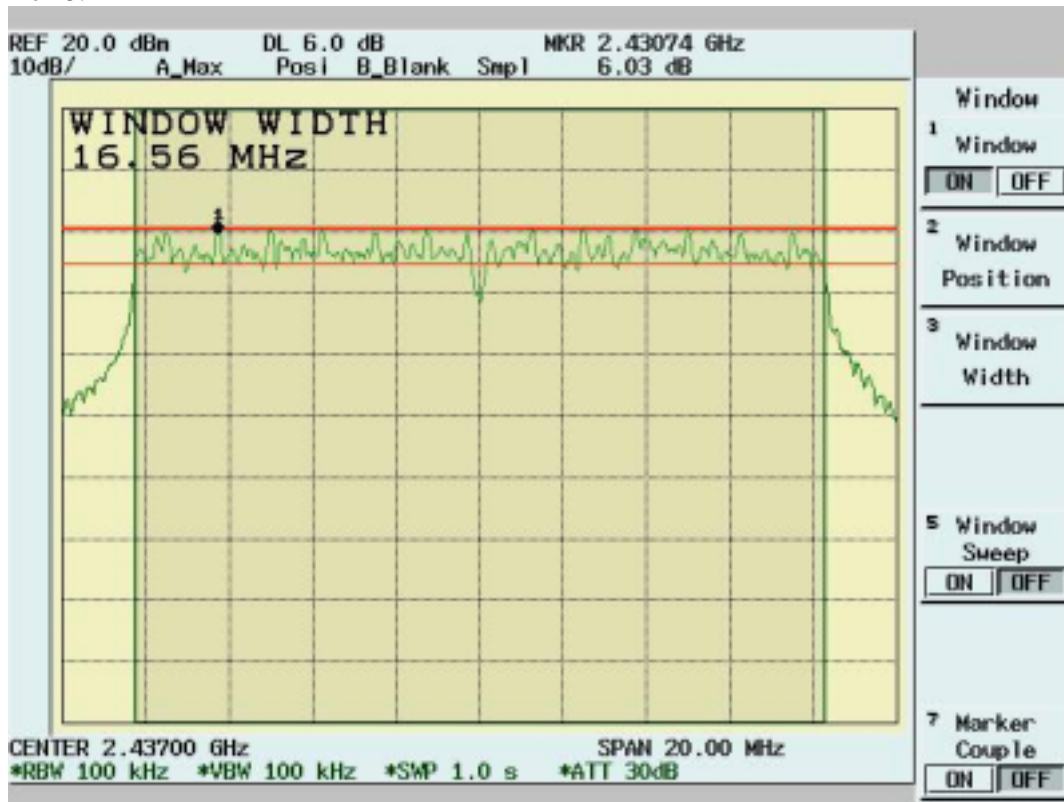
Test Engr: Jerry Chiou

Chennel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	16.64	0.5	Pass
6	2437	16.56	0.5	Pass
11	2462	16.56	0.5	Pass

Channel 1:



Channel 6:



Channel 11:

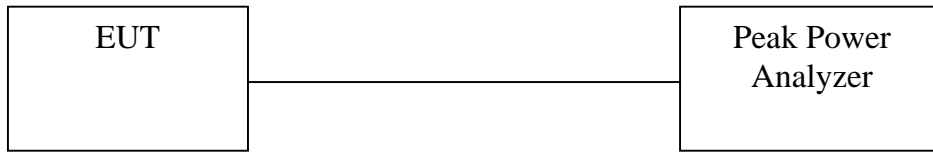


### 5.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

#### 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  
 Humidity (%): 50  
 Test Engr: Jerry Chiou

Channel	Frequency (Mhz)	Analyzer Reading (dBm)	Cable Loss (dB)	Peak Power Output (mW)	Peak Power Output (dBm)	Limit (dBm)	Pass/Fail
1	2412	21.375	1.1	176.81	22.475	30	Pass
6	2437	20.937	1.1	159.85	22.037	30	Pass
11	2462	20.781	1.1	154.21	21.881	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 according to *EMI Receiver/Spectrum Analyzer Configuration*.

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.

### 5.4.3 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: Jerry Chiou  
 Temperature(C): 23  
 Humidity(%): 59

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)
42.61	11.18	10.89	1.25	0.00	23.33	40.00	-16.67	97.00	146.00
279.29	11.62	13.59	3.10	0.00	28.31	46.00	-17.69	97.00	98.00
320.03	16.26	16.02	3.30	0.00	35.58	46.00	-10.42	97.00	114.00
399.57	9.34	15.90	3.70	0.00	28.94	46.00	-17.06	97.00	162.00
405.39	13.49	15.93	3.70	0.00	33.12	46.00	-12.88	97.00	195.00
450.01	13.71	16.20	4.00	0.00	33.91	46.00	-12.09	97.00	358.00
480.08	8.19	16.92	4.06	0.00	29.17	46.00	-16.83	97.00	130.00
809.88	3.26	20.20	5.14	0.00	28.60	46.00	-17.40	97.00	17.00
832.19	4.41	20.42	5.14	0.00	29.98	46.00	-16.02	97.00	130.00
959.26	3.62	21.30	5.64	0.00	30.56	46.00	-15.44	97.00	293.00

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

Operator: Jerry Chiou  
 Temperature(C): 23  
 Humidity(%): 59

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)
42.61	9.63	10.89	1.25	0.00	21.78	40.00	-18.22	97.00	190.00
359.8	9.13	16.14	3.44	0.00	28.71	46.00	-17.29	97.00	76.00
379.2	8.17	16.02	3.53	0.00	27.73	46.00	-18.27	97.00	92.00
405.39	12.41	15.93	3.70	0.00	32.05	46.00	-13.95	97.00	60.00
450.01	11.01	16.20	4.00	0.00	31.21	46.00	-14.79	97.00	125.00
480.08	7.09	16.92	4.06	0.00	28.08	46.00	-17.92	97.00	76.00
494.63	6.26	17.27	4.24	0.00	27.76	46.00	-18.24	97.00	125.00
599.39	4.80	18.70	4.50	0.00	28.00	46.00	-18.00	97.00	12.00
757.5	3.18	20.19	5.00	0.00	28.36	46.00	-17.64	97.00	157.00
826.37	3.40	20.36	5.19	0.00	28.95	46.00	-17.05	97.00	352.00

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(%):41  
Temperature(C):27

Frequency MHz	Rx_R. dBuV	Ant_F. dB/m	Cab_L. dB	PreAmpl dB	Emission dBuV/m	Limit dBuV/m	Margin dB	A.Tower cm	T.Table deg
9641.86	29.22pk	38.84	3.94	24.84	47.16pk	54.00av	-6.84	102	7

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

Operator:JerryChiou

RBW:1MHz  
Humidity(%):41  
Temperature(C):27

Frequency MHz	Rx_R. dBuV	Ant_F. dB/m	Cab_L. dB	PreAmpl dB	Emission dBuV/m	Limit dBuV/m	Margin dB	A.Tower cm	T.Table deg
4818.18	30.60pk	34.11	5.14	27.49	42.36pk	54.00av	-11.64	100	18
9641.86	33.20pk	38.84	3.94	24.84	51.14pk	54.00av	-2.86	102	7

Note:

- According to the standards used, 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(%):41  
Temperature(C):27

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
4861.64	31.39pk	34.27	5.13	27.43	43.37pk	54.00av	-10.63	100	14

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

Operator:JerryChiou

RBW:1MHz  
Humidity(%):41  
Temperature(C):27

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
4861.64	30.63pk	34.27	5.13	27.43	42.61pk	54.00av	-11.39	100	14
9728.77	32.16pk	38.69	4.00	24.78	50.06pk	54.00av	-3.94	102	5

Note:

- According to the standards used,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(%): 41  
Temperature(C): 27

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
4919.58	29.87pk	34.49	5.13	27.35	42.14pk	54.00av	-11.86	100	8

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

Operator: JerryChiou

RBW: 1MHz  
Humidity(%): 41  
Temperature(C): 27

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
4919.58	30.62pk	34.49	5.13	27.35	42.89pk	54.00av	-11.11	100	8
9830.17	30.08pk	38.51	4.07	24.72	47.94pk	54.00av	-6.06	101	3

Note:

- According to the standards used, 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.

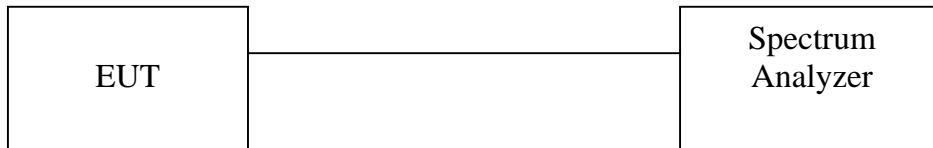
**All frequencies from 1GHz to 25 GHz have been tested.**

## 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  
 Humidity (%): 50  
 Test Engr: Jerry Chiou

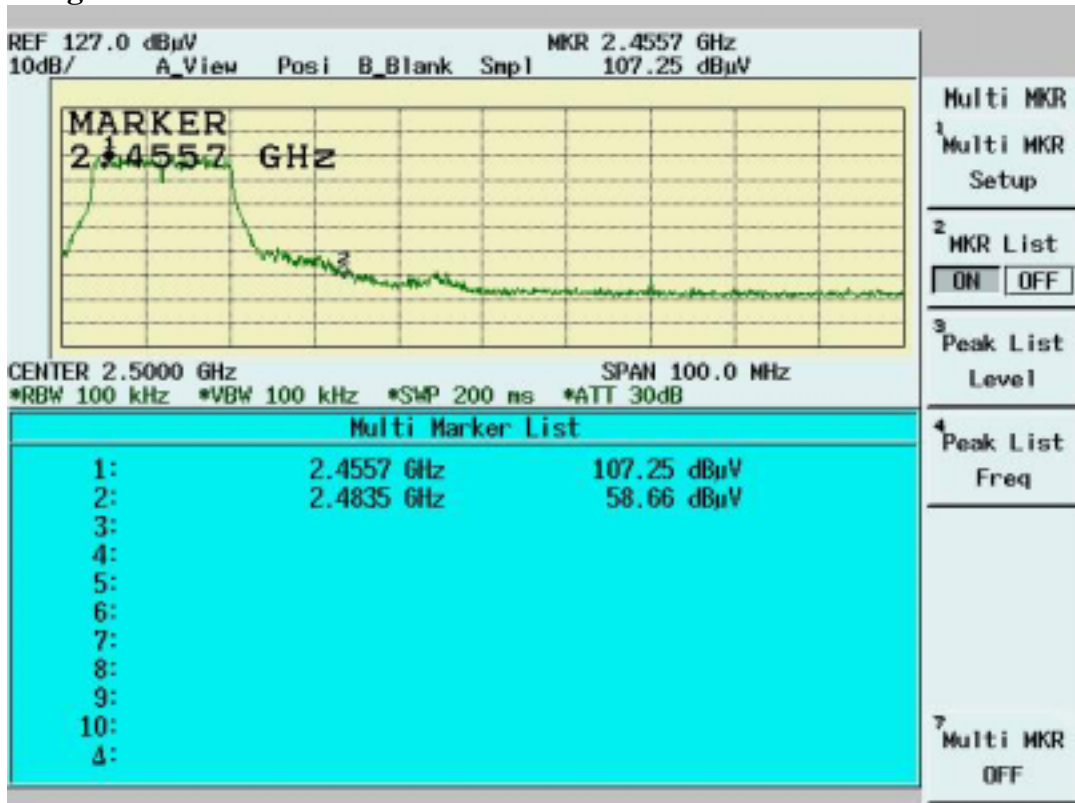
Channel	Frequency	Spectrum Reading	Carrier - Outsideband Limit: >20dB	Pass/Fail
	(MHz)		(dB)	
1	2405.7	107.73	---	---
Outside band	2398.2	72.53	35.2	Pass
11	2455.7	107.25	---	---
Outside band	2483.5	58.66	48.59	Pass

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: 3MHz  
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  
 Humidity (%): 50

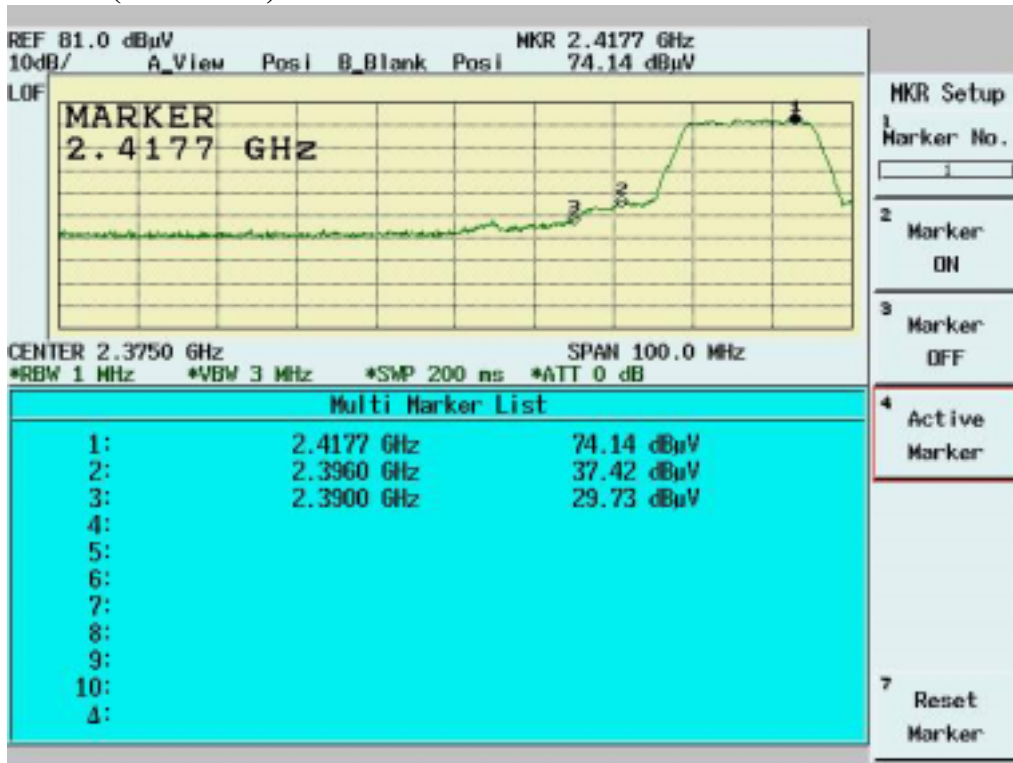
Test Engr: Jerry Chiou

Description	Frequency	Spectrum	Correction	Emission	dBc	Limit	Equip.	Pass
	(MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	( Limit: > 20dBc)	(dBuV/m)	Setup VBW	or Fail
Channel_1 (average mode)	2415.3	62.5	35.48	97.98	---	---	10Hz	---
Channel_1 (peak mode)	2417.7	74.14	35.48	109.62	---	---	3MHz	---
Outside band (peak mode)	2396	37.42	35.48	72.9	36.72	---	3MHz	Pass
Channel_11 (average mode)	2465.3	59.96	35.5	95.46	---	---	10Hz	---
Channel_11 (peak mode)	2467.7	71.91	35.5	107.41	---	---	3MHz	---
Outside band (peak mode)	2484.1	29.08	35.51	64.59	42.82	---	3MHz	Pass
Channel_1 Restricted band (peak mode)	2390	29.73	35.47	65.2	---	74	3MHz	Pass
Restricted band (average mode)	22379.7	15.51	35.47	50.98	---	54	10Hz	Pass
Channel_11 Restricted band (peak mode)	2484.1	29.08	35.51	64.59	---	74	3MHz	Pass
Restricted band (average mode)	2494.6	13.59	35.51	49.1	---	54	10Hz	Pass

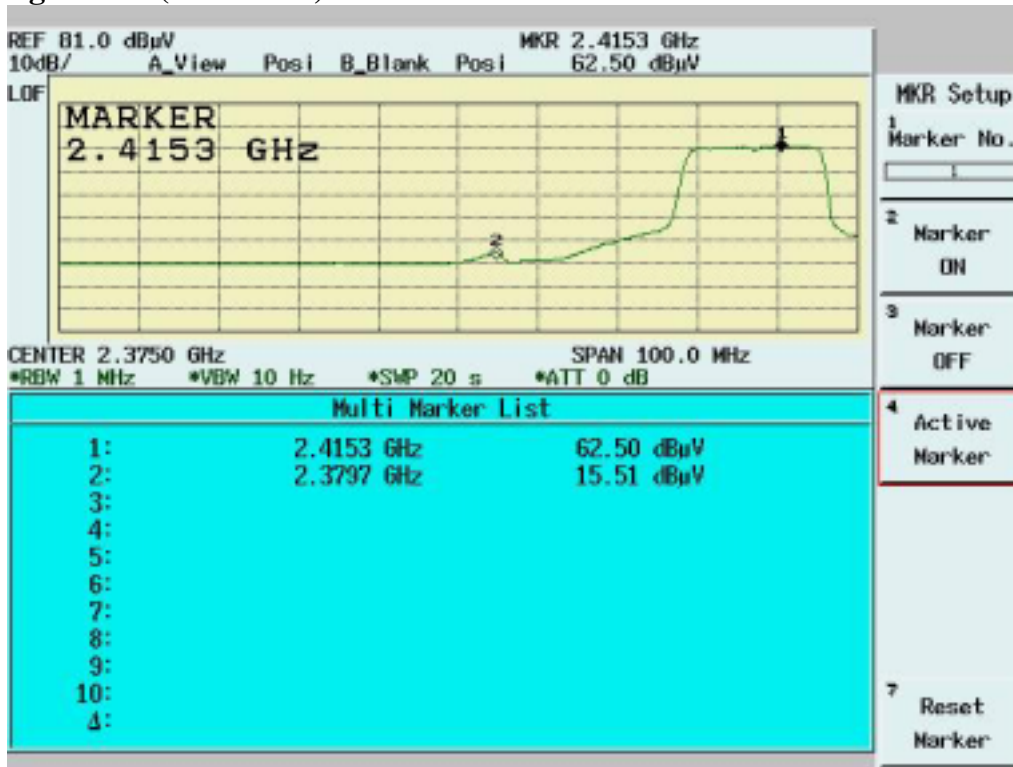
Note:

- 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.

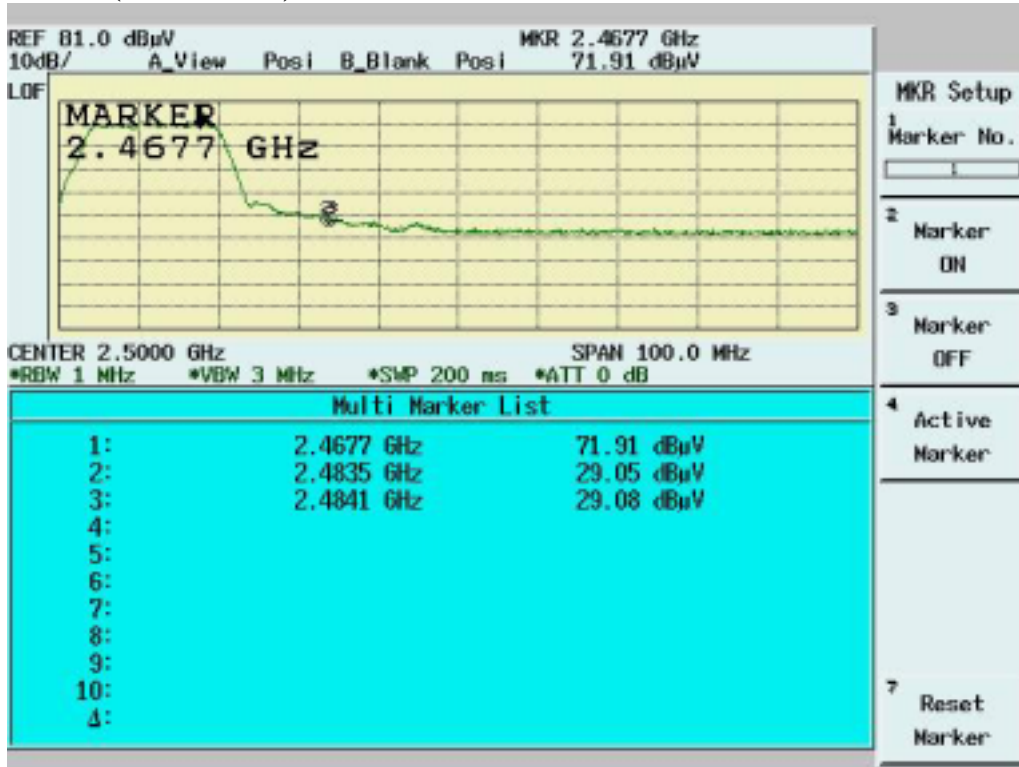
**Band Edge measurement for radiated emission in Restricted Band(Radiated) Peak Mode (Channel 1)**



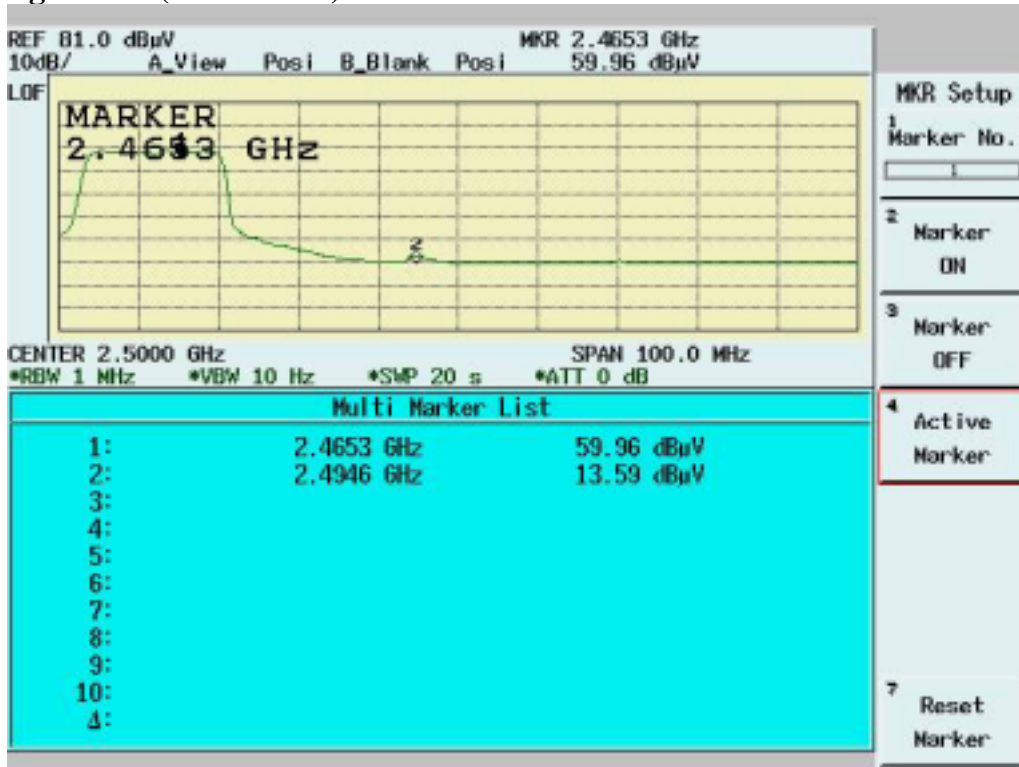
**Band Edge measurement for radiated emission in Restricted Band(Radiated) Average Mode (Channel 1)**



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



**Band Edge measurement for radiated emission in Restricted 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

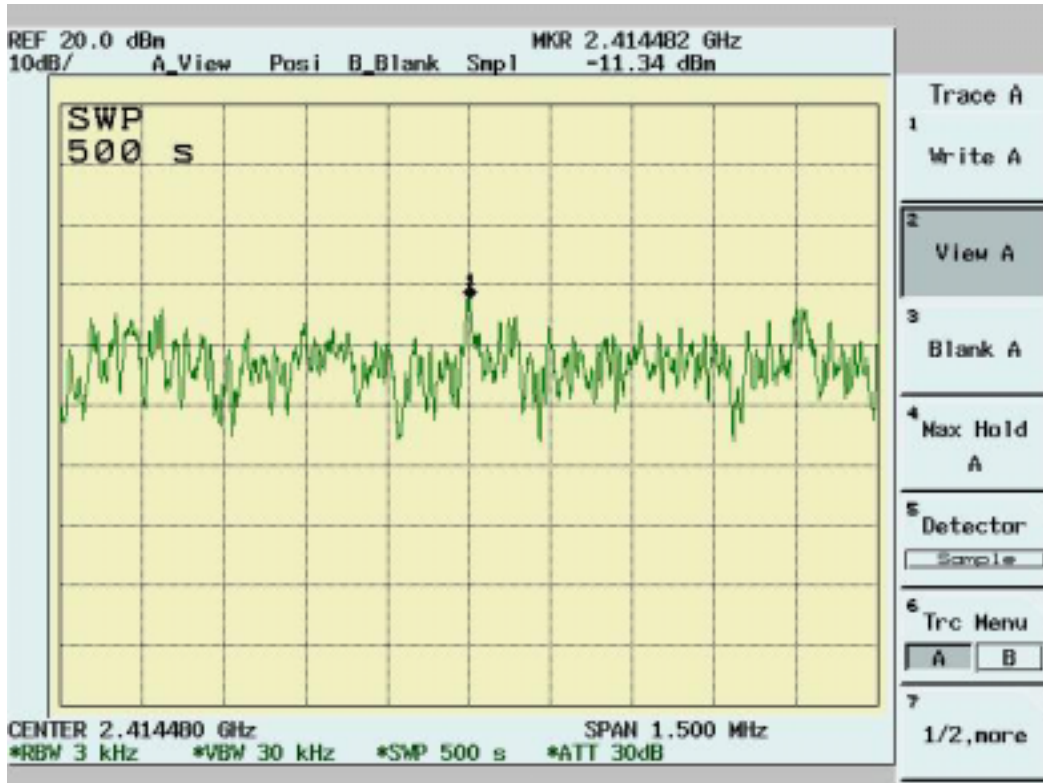
Test Engr: Jerry Chiou

Humidity (%): 50

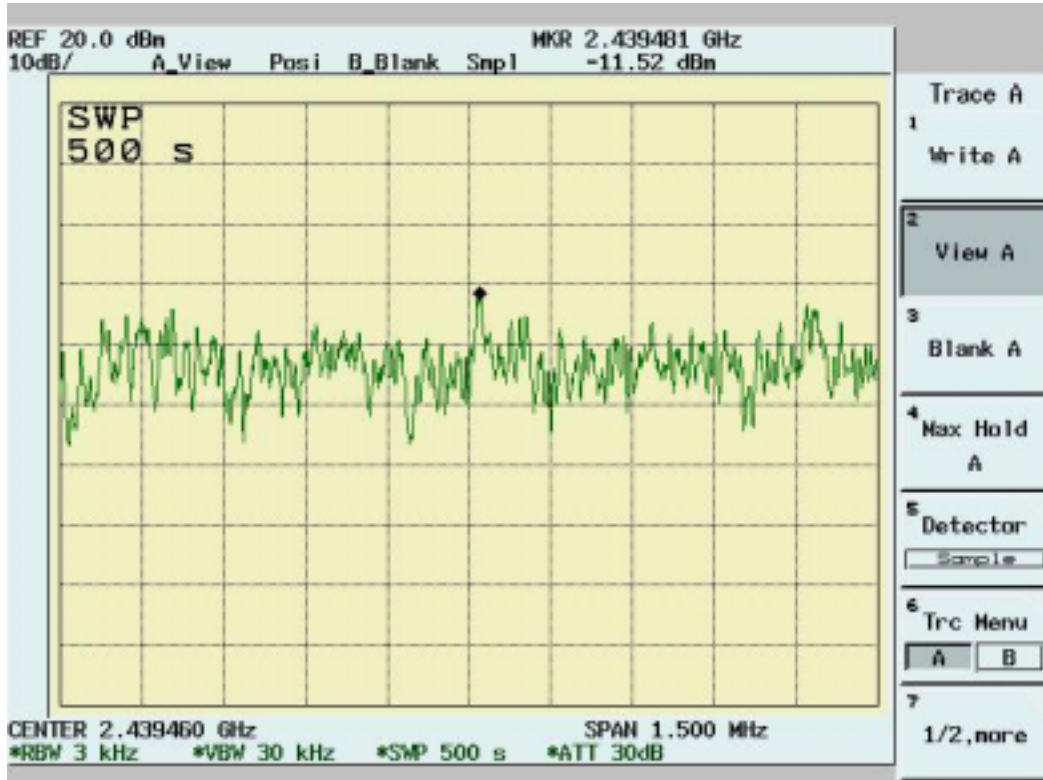
Chennel	Frequency (MHz)	Spectrum Reading (dBm/3KHz)	Cable Loss (dB)	Peak Power Output (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
1	2412	-11.34	1.1	-10.24	8	Pass
6	2437	-11.52	1.1	-10.42	8	Pass
11	2462	-11.68	1.1	-10.58	8	Pass

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

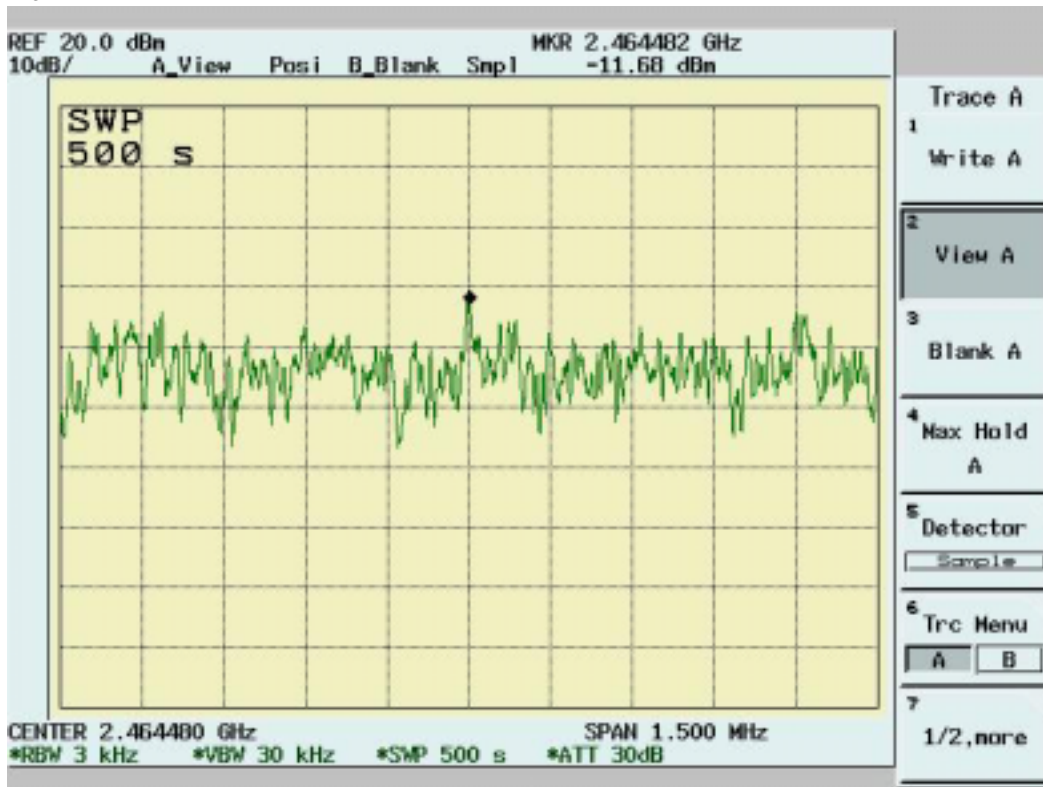
Channel 1



Channel 6



Channel 11



## 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°. 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.

### 6.3 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	05/20/2006	05/20/2007
Conduction	Digital Hygro-Thermometer Conduct	MicroLife	HT-2126G	ISL-Conduction02	11/30/2004	11/30/2006
Conduction	EMI Receiver 02	HP	85460A	3448A00183	10/01/2005	10/01/2006
Conduction	LISN 01	R&S	ESH2-Z5	890485/013	05/05/2007	05/05/2007
Conduction	LISN 06	R&S	ESH3-Z5	828874/009	12/13/2005	12/13/2006
Radiation	BILOG Antenna 08	Schaffner	CBL6112B	2756	06/07/2006	06/07/2007
Radiation	Coaxial Cable Chmb 02-10M	Belden	RG-8/U	Chmb 02-10M	12/28/2005	12/28/2006
Radiation	Digital Hygro-Thermometer Chmb 02	MicroLife	HT-2126G	Chmb 02	11/30/2004	12/30/2006
Radiation	EMI Receiver 03	HP	85460A	3448A00209	04/01/2006	04/01/2007
Radiation	Spectrum Analyzer 13	Advantest	R3132	121200411	02/17/2006	02/17/2007
Radiation	Horn Antenna 02	Com-Power	AH-118	10088	07/22/2005	07/22/2006
Radiation	Horn Antenna 04	Com-Power	AH-826	081-001	01/13/2006	01/13/2007
Radiation	Horn Antenna 05	Com-Power	AH-640	100A	09/30/2005	09/30/2006
Radiation	Microwave Cable RF SK-01	HUBER+SUHNERAG.	Sucoflex 102	22139 /2	07/07/2005	07/07/2006
Chamber 05	Peak Power Analyzer	HP	8990A	3621A01269	03/28/2006	03/28/2007
Chamber 05	Power Sensor Radar	HP	84815A	3318A01828	03/28/2006	03/28/2007
Radiation	Preamplifier 02	MITEQ	AFS44-00102 650-40-10P-44	728229	11/28/2005	11/28/2006
Radiation	Preamplifier 10	MITEQ	JS-26004000-2 7-5A	818471	11/22/2005	11/22/2006
Radiation	High Pass Filter 01	HEWLETT-PACKARD	84300-80038	001	N/A	N/A
Radiation	High Pass Filter 02	HEWLETT-PACKARD	84300-80039	005	N/A	N/A
Radiation	Spectrum Analyzer 14	Advantest	R3182	140600028	11/22/2005	11/22/2006

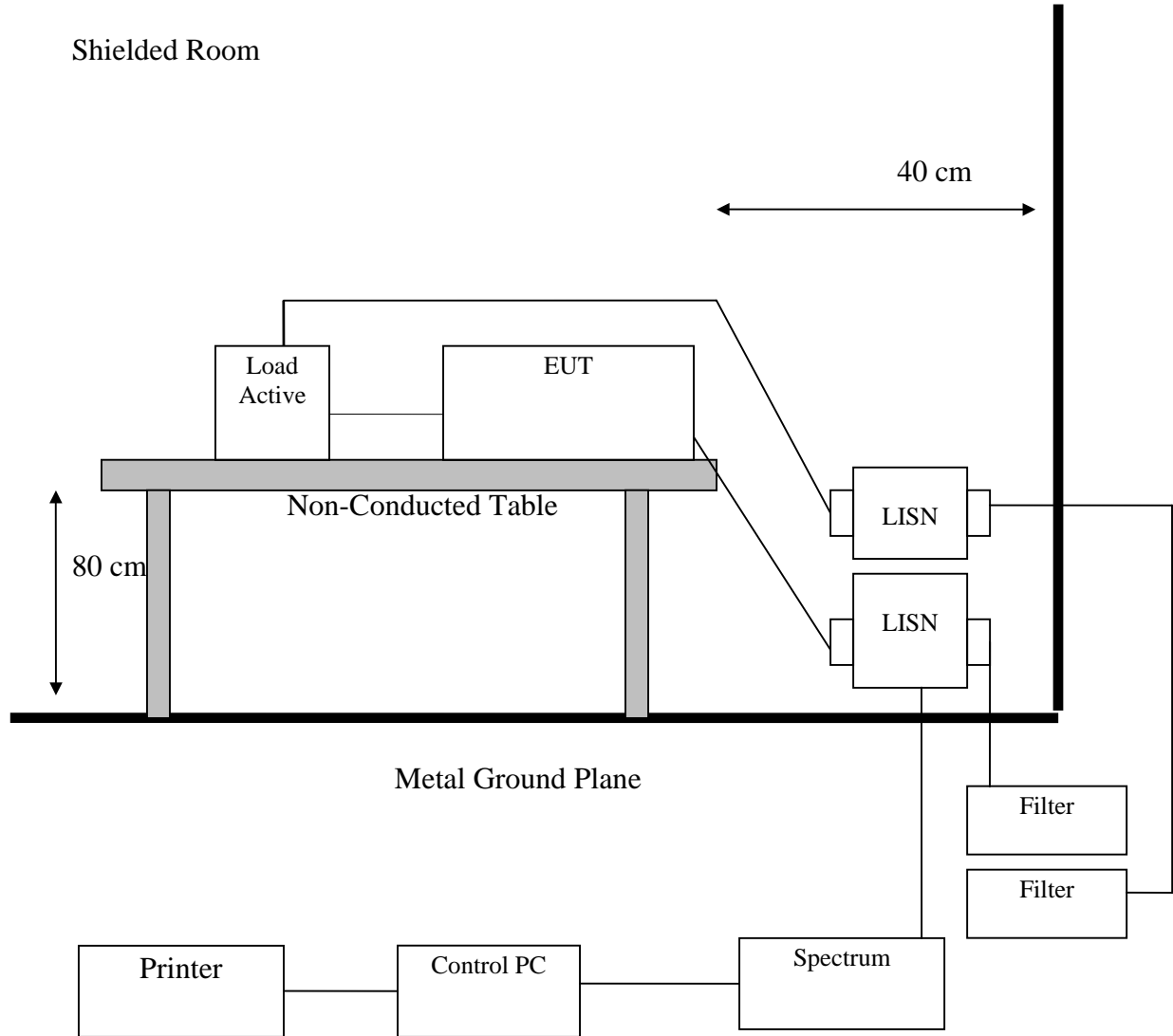
Note: Calibration is traceable to NIST or national or international standards.

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

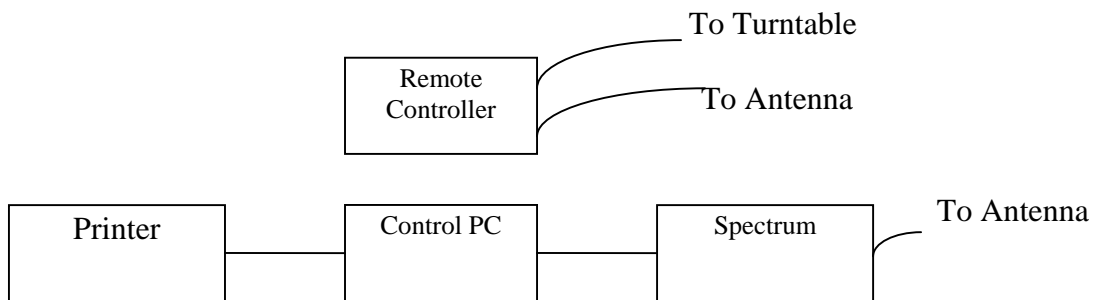
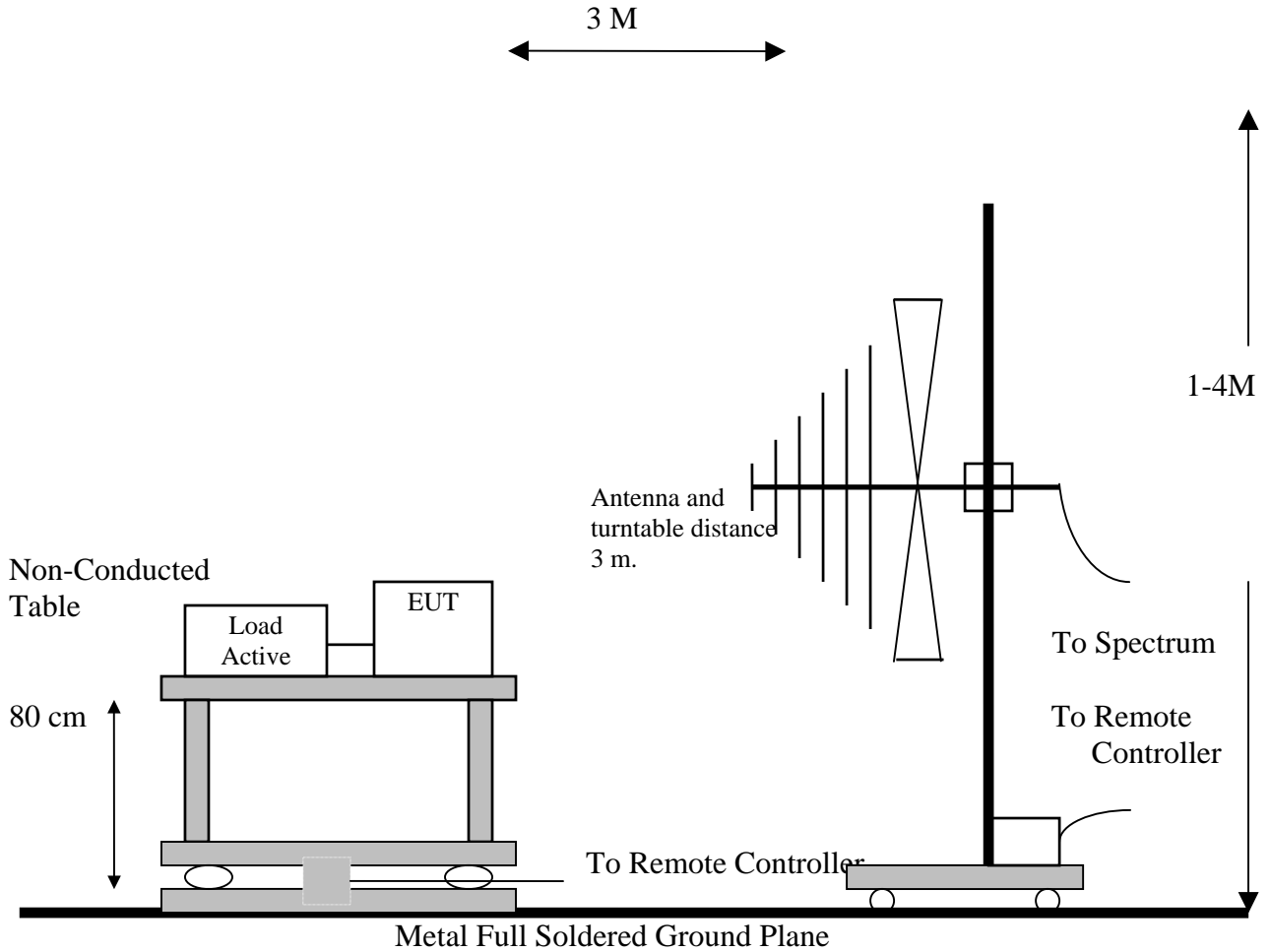
Radiation/Conduction	Filename	Version	Issued Date
Conduction	Tile.exe	1.12E	7/7/2000
Radiation	Tile.exe	1.12C	6/16/2000

## 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 USB Mouse
Model Number:	M-UR69
Serial Number:	LNA24412741
Power Supply Type:	N/A
Power Cord:	N/A
FCC ID:	(Complied with FCC DOC)

#### Support Unit 2.

Description:	DELL 19" LCD Monitor
Model:	2000FP
AC Adapter:	DELL(ADP-70EB)
Serial Number:	N/A
DSUB In:	One 15 Pins
DVI In:	One Pins
S-Video In:	One7 Pins
Power Cord:	Non-shielded, Detachable
FCC ID:	(Complied with FCC DOC)

## Support Unit 3.

Description:	IBM Notebook Personal Computer
Model:	2371
Serial Number:	N/A
Power Supply Type:	Switching AC Adapte 56W Lite-On (Model: 02K6809) 3 pins
CPU Type:	Intel Pentium-M 1.2 GHz
Hard Disk Device:	Hitachi 20GB (Model: HTC424020F7AT00)
DDR: 256MB	Infineon (Model: HYB25D256160BT-6)
BT/MODEM card:	Actiontec (Model: BMDC200)
Wireless card: 930700811107 WW)	Phillips (Model: WLAN 802.11ABG)
DC-In:	one
VGA Port:	one
USB2.0 Connector:	two
LAN Connector:	one
Modem Port:	one
PCIMCIA Connector:	one
SD Connector	one
Docking Connector:	one
Battery:	Sanyo 4 cell (Model: 92P0999)
Power Cord:	Shielded 3 PIN, 2 PIN
LCD: LTN121XA-L01)	Samsung 12.1" XGA TFT (Model:
Maximum display Resolution:	1024X768 Non-interlaced

**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. The RF software makes the transmitter continuously sending RF signals
- C. Repeat the above steps.

	Filename	Issued Date
WLAN test software (2.16.0.1)	MP Tool.exe	2006/01/06

**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
LCD Monitor D-SUB Data Cable	LCD Monitor to EUT D-SUB Port	1.6M	Shielded, Detachable	Metal Head
LCD Monitor DVI Data Cable	LCD Monitor to EUT DVI Port	1.6M	Shielded, Detachable	Metal Head
LCD Monitor S Data Cable	LCD Monitor to EUT S Port	1.6M	Shielded, 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)	
			k	Value	k	Value
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	<b>Total Uncertainty @95% mim. Confidence Level</b>	<b>Normal</b>	<b>k=2</b>	<b>1.701</b>		

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)	
			k	Value	k	Value
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	<b>Total Uncertainty @95% mim. Confidence Level</b>	<b>Normal</b>	<b>k=2</b>	<b>2.059</b>		

Measurement Uncertainty Calculations:

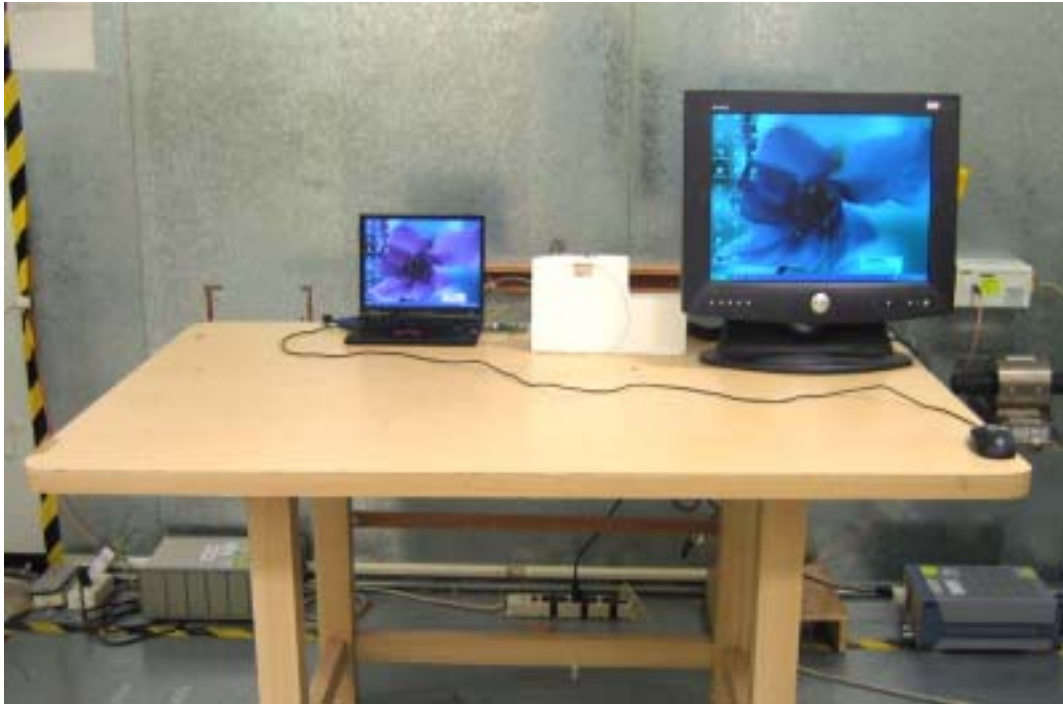
$$U_c(y) = \text{square root} ( u_1(y)^2 + u_2(y)^2 + \dots + u_n(y)^2 )$$

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

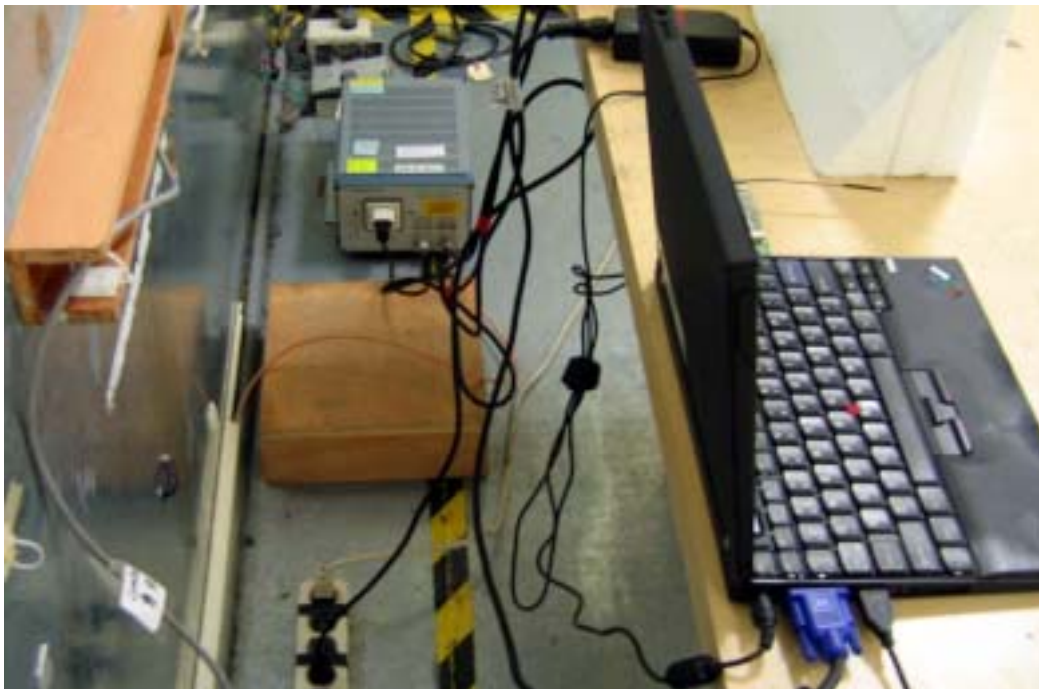
Note: The measurement Uncertainties mentioned above also refer to NIS 81-1994 of NAMAS :  
The treatment of Uncertainty in EMC Measurement.

## 6.7 Appendix G: Photographs of EUT Configuration Test Set Up

The Front View of Highest Conducted Set-up For EUT



The 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.