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

of

802.11 a/g Super A/G Intelligent WLAN Router

Model

CRP-1

Applied by:

Wistron Neweb Corporation
No. 10-1, Li-hsin Road 1,
Science-based Industrial Park,Hsinchu 300,
Taiwan, R. O. C.

Test Performed by:

International Standards Laboratory

No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.
Lung-Tan Hsiang, Tao Yuan County 325
Taiwan, R.O.C.
Tel:(03)407-1718 Fax:(03)407-1738

Report Number: ISL-04LR019FC **Issue Date: 2004/04/29**
HC LAB:NVLAP:200234-0;VCCI: R-341,C-354;NEMKO:ELA 113a,113c;BSMI:SL2-IN-E-0037;SL2-R1-E-0037;CNLA:1178
LT LAB:NVLAP:200234-0;VCCI: R-1435,C-1440;NEMKO:ELA 113b,113d;BSMI:SL2-IN-E-0013;CNLA:0997
ISL-T10-R29-1

Contents of Report

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) CFR 47 Part 15 Subpart E (Section 15.407)
Test Procedure:	ANSI C63.4: 2001
Equipment Tested:	802.11 a/g Super A/G Intelligent WLAN Router
Model:	CRP-1
Applied by:	Wistron Neweb Corporation
Sample received Date:	2004/03/26
Final test Date :	2004/04/23
Test Site:	Chamber 02, Conduction 02
Temperature	Refer to each site test data
Humidity:	Refer to each site test data
Test Engineer:	Mailes Hsieh

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 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

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 126 pages, including 1 cover page , 3 contents page, and 122 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	SAR 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	SAR report attached
15.247 (d)	Power Spectral Density	Pass	

The 802.11a functions of EUT has been tested to the FCC regulations listed below:

Tested Standards: 47 CFR Part 15 Subpart E			
Standard Section	Test Type	Result	Remarks
15.407 (a)(1)(2)(3)	Peak Transmit Power	Pass	
15.407 (a)(1)(2)(3)	Peak Power Spectral Density	Pass	
15.407 (a)(6)	Peak Power Excursion	Pass	
15.407 (b)(5)	AC Power Line Emissions	Pass	
15.407 (b)(5)	Radiated Emissions 30MHz – 40 GHz	Pass	
15.407(f)	Radiation exposure	Pass	SAR report attached
15.407 (g)	Frequency Stability	Pass	

3. Description of Equipment Under Test (EUT)

Description:	802.11 a/g Super A/G Intelligent WLAN Router
Condition:	Pre-Production
Model:	CRP-1
Brand:	Wistron NeWeb
Frequency Range 802.11a:	5150 - 5350 MHz, 5725 - 5825 MHz
Frequency Range 802.11b/g:	2400 – 2483.5 MHz
Support Channel:	
802.11a Normal mode	12 Channels
802.11a Turbo mode	5 Channels
802.11b	11 Channels
802.11g	11 Channels
Modulation Skill:	
802.11a Normal mode	OFDM (6 Mbps – 54 Mbps)
802.11a Turbo mode	OFDM (12 Mbps – 108 MBps)
802.11b	DBPSK(1Mbps), DQPSK(2Mbps), CCK(5.5/11Mbps)
802.11g	OFDM (6M - 54Mbps)
Antennas Type:	
802.11a	PCB Printed Type (WNC Corp. Model:CRP-1)
802.11b/g	Dipole in Metal (Long-Chu Electronics Corp. Model:F1B-004321-93)
Antenna Connected:	
802.11a	Connected to the RF connector of the WLAN module
802.11b/g	Connected to the reverse SMA connector of the EUT
Antenna Peak Gain:	
802.11a	3.44dBi
802.11b/g	2dBi
WLAN Module:	Wistron NeWeb (Model: CM9)
Power Type of :	5V DC from AC Adapter
RJ-45 LAN Port:	4-Port 8-pin
RJ-45 WAN Port:	1-Port 8-pin
RJ-45 DMZ Port:	1-Port 8-pin
AC-DC Adapter:	LB (Model:M1-12S05)

The EUT is a 802.11b, 802.11g, 802.11a WLAN router, contains a WLAN module for RF communicating. The Channel and operating frequency are listed below:

(1) 11b/11g:

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		

(2) 11a Normal Mode /Turbo Mode:

(Normal Mode)		(Turbo Mode)	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
06	5280	03	5290
07	5300	04	5760
08	5320	05	5800
09	5745		
10	5765		
11	5785		
12	5805		

4. TEST RESULTS (802.11b)

4.1 Powerline Conducted Emissions [Section 15.207]

4.1.1 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.

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 6dß 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 6dß 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)

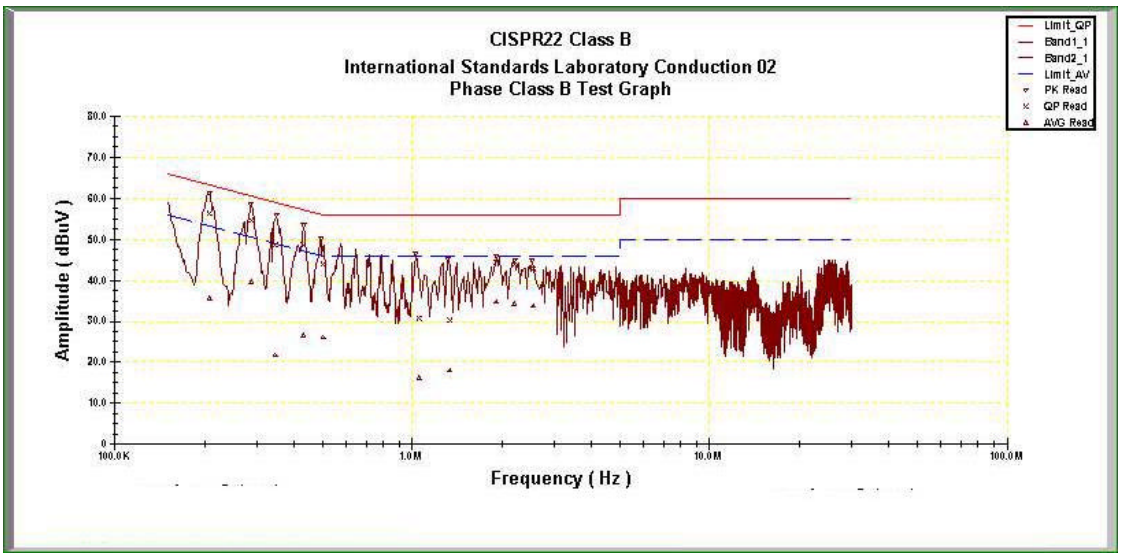
Frequency Range	150 KHz--30MHz
Detector Function	Quasi-Peak/Average
Bandwidth (RBW)	9KHz

4.1.4 Test Data:

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

Operator: Mailes Hsieh
Temperature (C): 24
03:48:59 PM, Friday, April 23, 2004 Humidity (%): 50

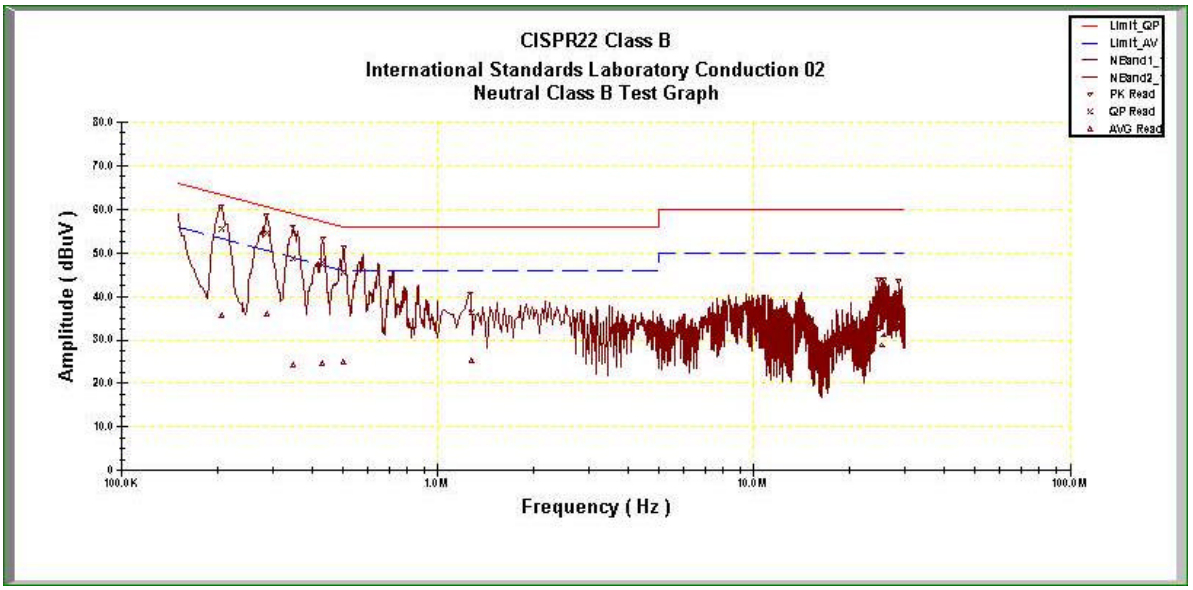
Frequency	LISN Loss	Cable Loss	QP Corrct.	QP Limit	QP Margin	AVE Corrct.	AVE Limit	AVE Margin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.20753	0.10	0.02	56.35	64.36	-8.01	35.53	54.36	-18.82
0.28638	0.10	0.02	54.58	62.10	-7.52	39.62	52.10	-12.48
0.34503	0.10	0.02	48.60	60.43	-11.83	21.79	50.43	-28.64
0.4299	0.10	0.03	48.65	58.00	-9.36	26.61	48.00	-21.39
0.50188	0.10	0.03	43.85	56.00	-12.15	26.10	46.00	-19.90
1.05252	0.38	0.07	30.68	56.00	-25.32	16.23	46.00	-29.77
1.33487	0.30	0.08	30.23	56.00	-25.77	18.09	46.00	-27.91
1.91113	0.13	0.10	44.39	56.00	-11.61	34.75	46.00	-11.25
2.19424	0.11	0.10	43.83	56.00	-12.17	34.20	46.00	-11.80
2.54973	0.13	0.11	42.70	56.00	-13.30	33.69	46.00	-12.31



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

Operator: Mailes Hsieh
Temperature (C): 24
03:39:51 PM, Friday, April 23, 2004 Humidity (%): 50

Frequency	LISN Loss	Cable Loss	QP Corrct.	QP Limit	QP Margin	AVE Corrct.	AVE Limit	AVE Margin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.20661	0.10	0.02	55.53	64.38	-8.85	35.62	54.38	-18.76
0.28676	0.10	0.02	54.41	62.09	-7.68	35.99	52.09	-16.10
0.34793	0.10	0.02	48.65	60.34	-11.69	24.24	50.34	-26.11
0.4294	0.10	0.03	48.01	58.02	-10.01	24.49	48.02	-23.53
0.5011	0.10	0.03	45.40	56.00	-10.60	24.90	46.00	-21.10
1.27656	0.24	0.08	36.22	56.00	-19.78	25.30	46.00	-20.70
24.7165	0.69	0.32	40.91	60.00	-19.09	32.50	50.00	-17.50
25.3577	0.70	0.32	39.03	60.00	-20.97	28.74	50.00	-21.26
25.6963	0.70	0.32	37.97	60.00	-22.03	31.09	50.00	-18.91
28.6863	0.70	0.34	40.66	60.00	-19.34	34.31	50.00	-15.69



* 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

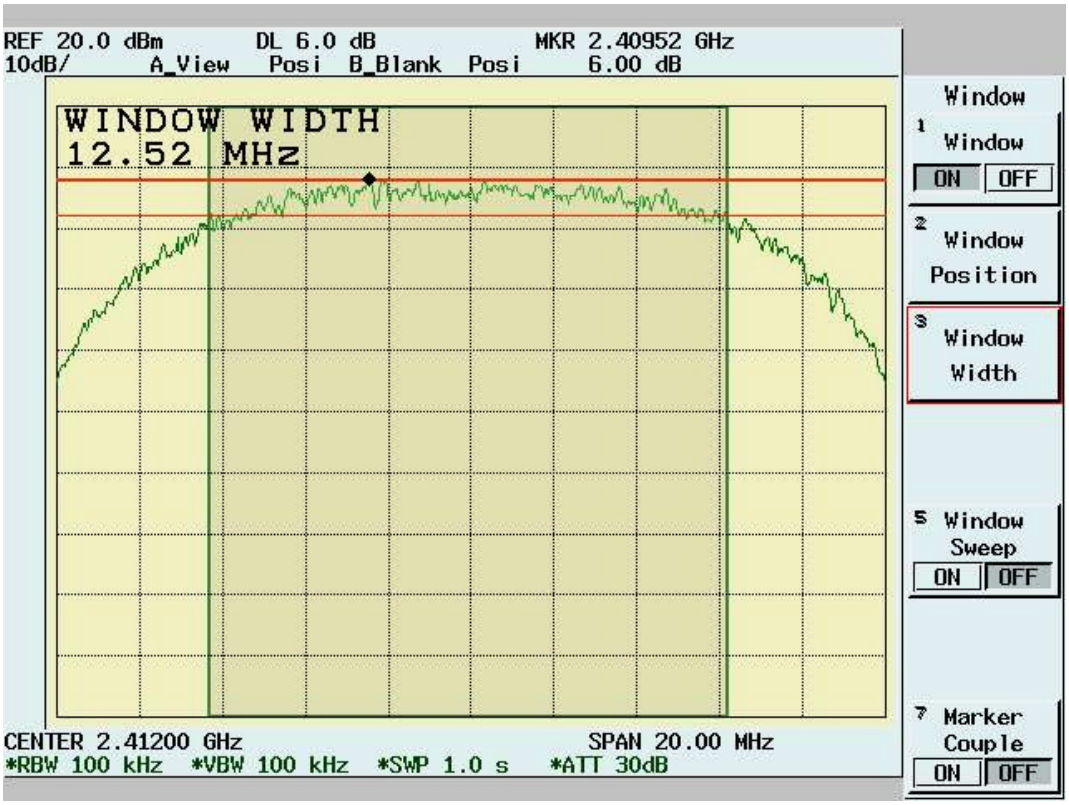
Temp. (deg. C): 25

Test Engr: Mailes Hsieh

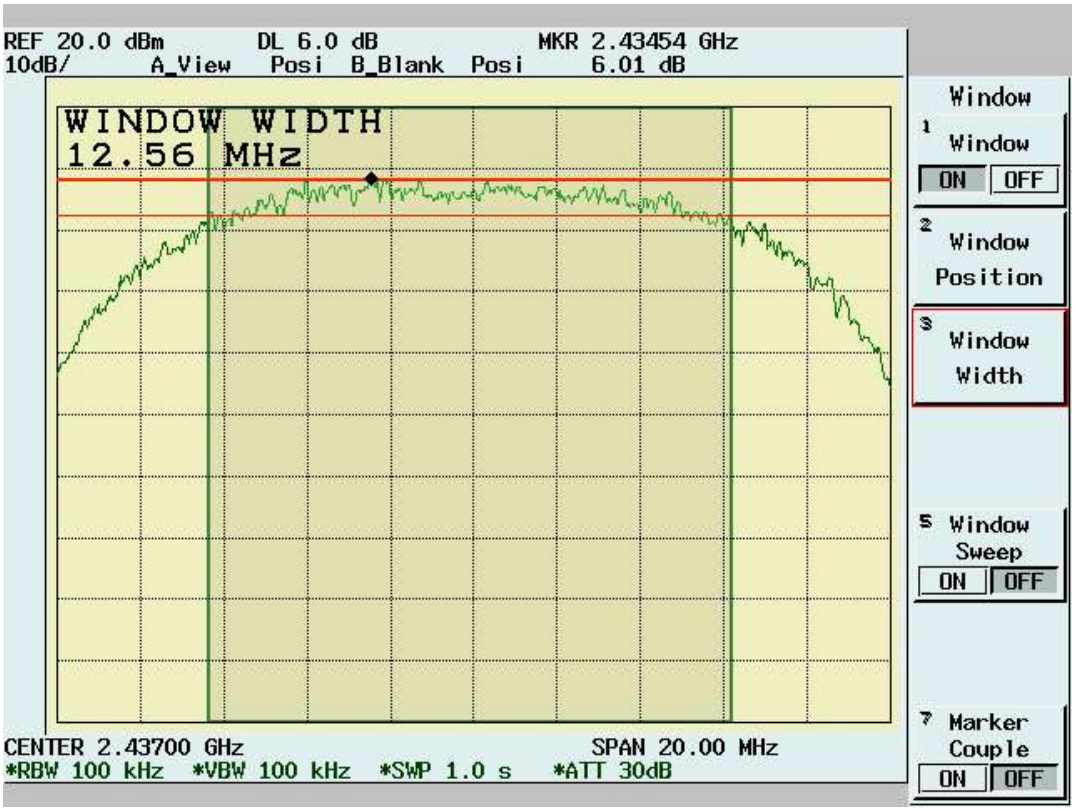
Humidity (%): 50

Chennel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	12.52	0.5	Pass
6	2437	12.56	0.5	Pass
11	2462	12.32	0.5	Pass

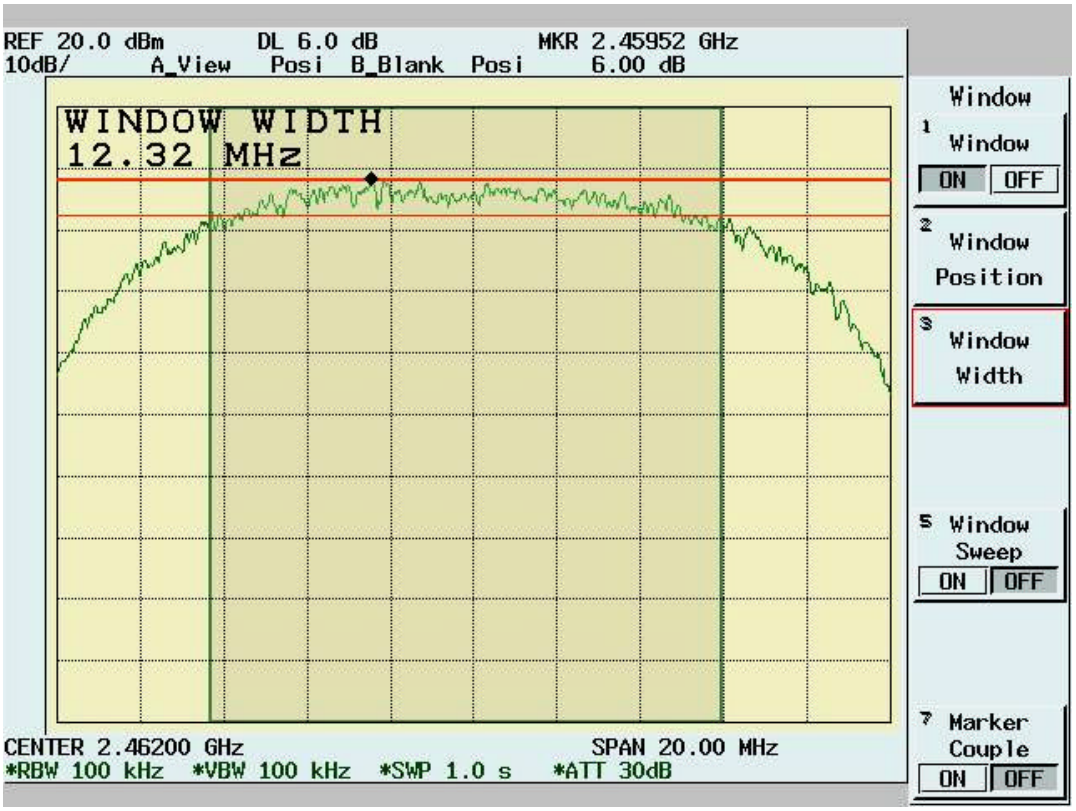
Channel 1:



Channel 6:



Channel 11:


REF 20.0 dBm
10dB/
DL 6.0 dB
A_View
Posi
B_Blank
Posi
MKR 2.45952 GHz
6.00 dB
WINDOW WIDTH
12.32 MHz
CENTER 2.46200 GHz
SPAN 20.00 MHz
*RBW 100 kHz
*VBW 100 kHz
*SWP 1.0 s
*ATT 30dB
Window
1 Window
ON OFF
2 Window Position
3 Window Width
5 Window Sweep
ON OFF
7 Marker Couple
ON OFF

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: Mailes Hsieh 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	21.156	1.1	168.11	22.256	30	Pass
6	2437	21.562	1.1	184.59	22.662	30	Pass
11	2462	21.406	1.1	178.07	22.506	30	Pass

.

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 acc*ording to EMI Receiver/Spectrum Analyzer Configuration.*

For the test of 2^{nd} to 10^{th} 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)	1MHz

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: Mailes Hsieh
Temperature (C): 23
08:14:48 PM, Friday, April 23, 2004 Humidity (%): 41

Frequency	Rx Amp.	Ant Fact	CableLoss	PreAmpGain	Corrct. Emi.	Limit	Margin	Ant. Pos.	Table Pos.
MHz	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg)
249.22	20.57	11.49	4.73	0.00	36.79	46.00	-9.21	100.00	225.00
299.66	12.16	13.59	4.65	0.00	30.40	46.00	-15.60	250.00	225.00
311.3	10.98	13.76	4.68	0.00	29.43	46.00	-16.57	300.00	62.00
350.1	10.45	14.30	4.97	0.00	29.73	46.00	-16.27	100.00	225.00
395.69	11.45	15.85	5.29	0.00	32.59	46.00	-13.41	250.00	62.00
399.57	8.01	15.99	5.32	0.00	29.31	46.00	-16.69	150.00	176.00
499.48	5.81	17.69	6.05	0.00	29.55	46.00	-16.45	150.00	13.00
791.45	5.05	20.02	7.83	0.00	32.90	46.00	-13.10	150.00	274.00
824.43	2.53	20.29	7.94	0.00	30.76	46.00	-15.24	100.00	209.00
858.38	2.85	20.57	8.19	0.00	31.61	46.00	-14.39	200.00	355.00

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

Operator: Mailes Hsieh
Temperature (C): 23
08:18:17 PM, Friday, April 23, 2004 Humidity (%): 41

Frequency	Rx Amp.	Ant Fact	CableLoss	PreAmpGain	Corrct. Emi.	Limit	Margin	Ant. Pos.	Table Pos.
MHz	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg)
36.79	13.56	14.23	1.62	0.00	29.42	40.00	-10.58	300.00	72.00
47.46	18.63	8.62	1.89	0.00	29.14	40.00	-10.86	100.00	199.00
56.19	19.25	6.36	2.20	0.00	27.81	40.00	-12.19	250.00	183.00
79.47	17.77	6.55	2.72	0.00	27.04	40.00	-12.96	150.00	105.00
98.87	19.31	10.07	3.00	0.00	32.38	43.50	-11.12	200.00	281.00
249.22	22.21	11.49	4.73	0.00	38.43	46.00	-7.57	150.00	248.00
499.48	8.44	17.69	6.05	0.00	32.17	46.00	-13.83	100.00	149.00
791.45	5.49	20.02	7.83	0.00	33.34	46.00	-12.66	200.00	149.00
890.39	3.40	20.44	8.30	0.00	32.13	46.00	-13.87	200.00	149.00
955.38	2.98	21.20	8.63	0.00	32.82	46.00	-13.18	100.00	7.00

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: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
3197.80	40.42	31.26	2.52	46.61	27.60	54.00	-26.40	102	256
3407.59	40.39	31.43	2.21	46.64	27.39	54.00	-26.61	100	73
4062.94	40.85	32.39	2.08	46.17	29.15	54.00	-24.85	102	352
4821.68	59.34	34.92	1.28	46.88	48.66	54.00	-5.34	100	254
7233.77	53.84	39.47	3.15	46.21	50.26	54.00	-3.74	102	236
9643.36	43.33	40.58	3.17	42.07	45.01	54.00	-8.99	102	256

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

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
3282.72	40.35	31.33	2.40	46.62	27.45	54.00	-26.55	100	268
3407.59	40.94	31.43	2.21	46.64	27.94	54.00	-26.06	101	112
4314.69	40.84	33.14	1.70	46.42	29.27	54.00	-24.73	100	102
4821.68	56.58	34.92	1.28	46.88	45.89	54.00	-8.11	100	268
7233.77	53.87	39.47	3.15	46.21	50.28	54.00	-3.72	100	75
9643.36	45.16	40.58	3.17	42.07	46.84	54.00	-7.16	100	268

Note:
" pk": peak reading
"av": average reading
"---": 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: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
3242.76	41.27	31.29	2.46	46.61	28.41	54.00	-25.59	99	358
3442.56	40.38	31.45	2.16	46.64	27.35	54.00	-26.65	100	102
4206.29	40.58	32.82	1.86	46.31	28.95	54.00	-25.05	100	172
4870.63	60.81	35.11	1.25	46.93	50.25	54.00	-3.75	99	358
7305.69	53.66	39.59	3.20	46.18	50.27	54.00	-3.73	100	82
9745.25	45.37	40.36	3.13	41.81	47.05	54.00	-6.95	99	358

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

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
3272.73	40.07	31.32	2.41	46.62	27.18	54.00	-26.82	100	109
3422.58	40.38	31.44	2.19	46.64	27.36	54.00	-26.64	100	248
4178.32	41.34	32.73	1.91	46.28	29.69	54.00	-24.31	100	340
4870.63	60.70	35.11	1.25	46.93	50.13	54.00	-3.87	100	170
7311.69	53.52	39.60	3.20	46.17	50.15	54.00	-3.85	100	109
9745.25	46.63	40.36	3.13	41.81	48.31	54.00	-5.69	100	127

Note:
" pk": peak reading
"av": average reading
"---": 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: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
3250.25	41.02	31.30	2.44	46.62	28.15	54.00	-25.85	100	244
3415.08	40.55	31.43	2.20	46.64	27.54	54.00	-26.46	100	112
4255.24	40.54	32.97	1.79	46.36	28.94	54.00	-25.06	100	305
4923.08	61.24	35.31	1.23	46.97	50.80	54.00	-3.20	100	8
7383.62	50.70	39.71	3.25	46.14	47.52	54.00	-6.48	100	28
9841.16	45.98	40.15	3.10	41.56	47.67	54.00	-6.33	100	8

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

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
3252.75	40.45	31.30	2.44	46.62	27.58	54.00	-26.42	102	73
3410.09	40.54	31.43	2.20	46.64	27.53	54.00	-26.47	102	236
4258.74	40.40	32.98	1.79	46.36	28.80	54.00	-25.20	102	204
4923.08	60.03	35.31	1.23	46.97	49.59	54.00	-4.41	102	73
7383.62	53.44	39.71	3.25	46.14	50.26	54.00	-3.74	102	281
9841.16	46.70	40.15	3.10	41.56	48.39	54.00	-5.61	102	73

Note:

" pk": peak reading
"av": average reading
"---": No meter reading data due to the emission level is smaller than spectrum noise level.
The Spectrum nois e 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

Test Engr: Mailes Hsieh Humidity (%): 50

Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Carrier - Outsideband Limit: >20dB (dB)	Pass/Fail
1	2413.1	116.3	---	---
Outside band	2396.6	79.37	36.93	Pass
11	2463.1	116.14	---	---
Outside band	2476.6	79.52	36.62	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: 1MHz
   Center frequency: 2.395GHz, 2.48GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed.
3. Find the next peak frequency outside the operation frequency band
4. For peak frequency emission level measurement in Restricted Band ,
   Change RBW: 1MHz
   VBW: 10Hz
   Span: 100MHz.
5. Get the spectrum reading after Maximum Hold function is completed.

4.5.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

4.5.6 Test Data

Table Band Edge measurement (Radiated)

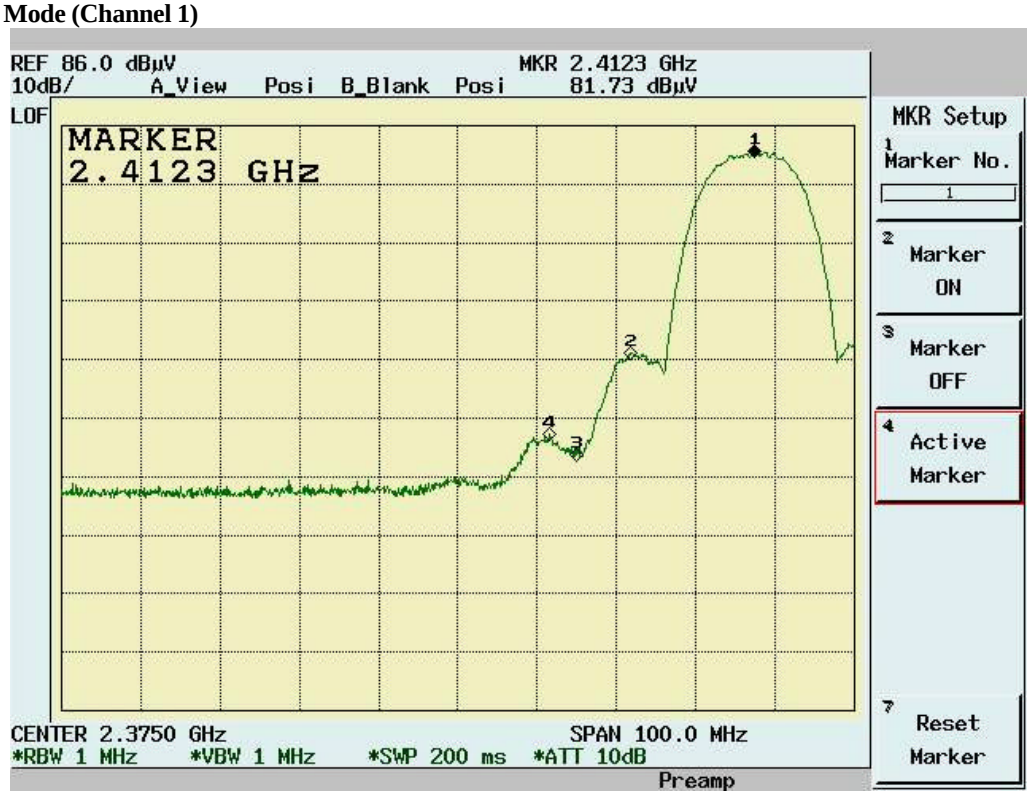
Temp. (deg. C): 25

Test Engr: Mailes Hsieh Humidity (%): 50

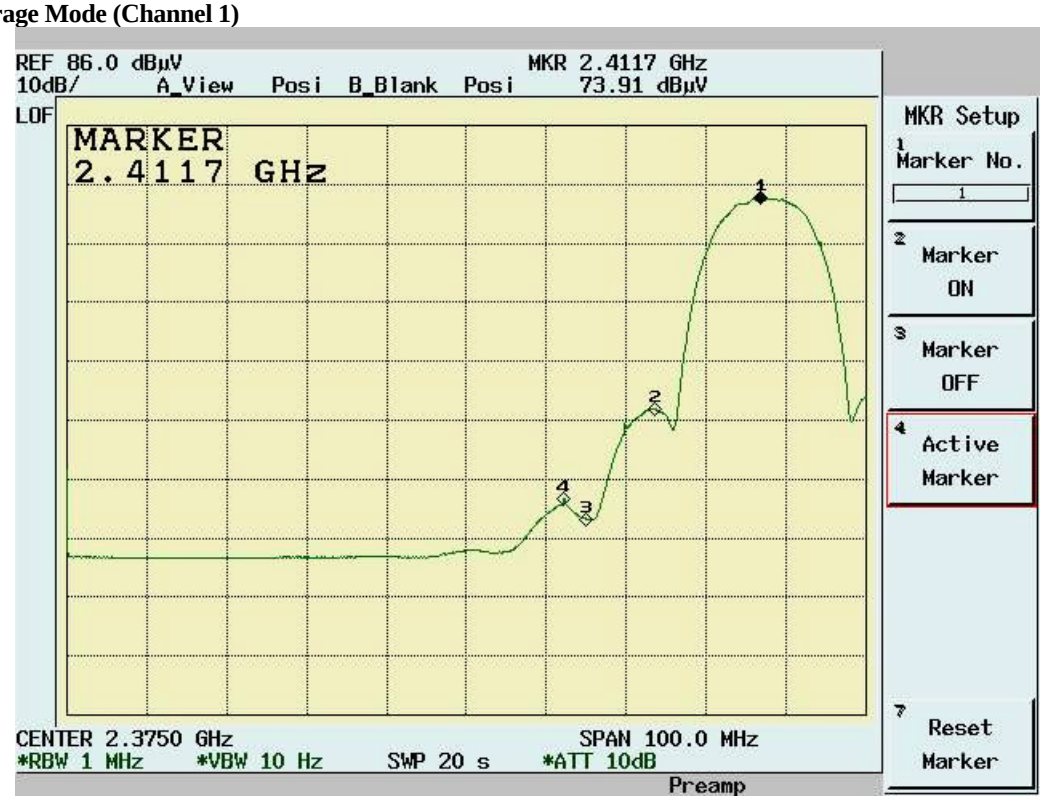
Channel	Frequency (MHz)	Spectrum Reading (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	dBc (Limit: > 20dBc)	Limit (dBuV/m)	Equip. Setup VBW	Pass or Fail
1(peak mode)	2412.3	81.73	28.67	110.4	---	---	1MHz	---
Outside band	2396.8	47.24	28.67	75.91	34.49	---	1MHz	Pass
1(average mode)	2411.7	73.91	28.67	105.58	---	---	10Hz	---
Restricted band	2387.2	22.66	28.67	51.33	---	54	10Hz	Pass
11(peak mode)	2462.3	81.84	28.64	110.48	---	---	1MHz	---
Outside band	2477.1	44.59	28.64	73.23	37.25	---	1MHz	Pass
11(average mode)	2461.2	74.27	28.64	102.91	---	---	10Hz	---
Restricted band	2486.7	22.91	28.64	51.55	---	54	10Hz	Pass

Note:
The Spectrum plot of emission level measurement in Restricted band is attached.
Emission Level=Spectrum Reading+Correction Factor
Correction Factor=Antenna Factor+cable loss–amplifier gain
Both Horizontal and Vertical polarizaion have been tested and the worst data is listed above.

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



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



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

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

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

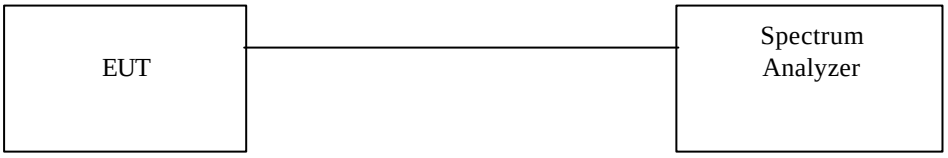
See MPE report

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

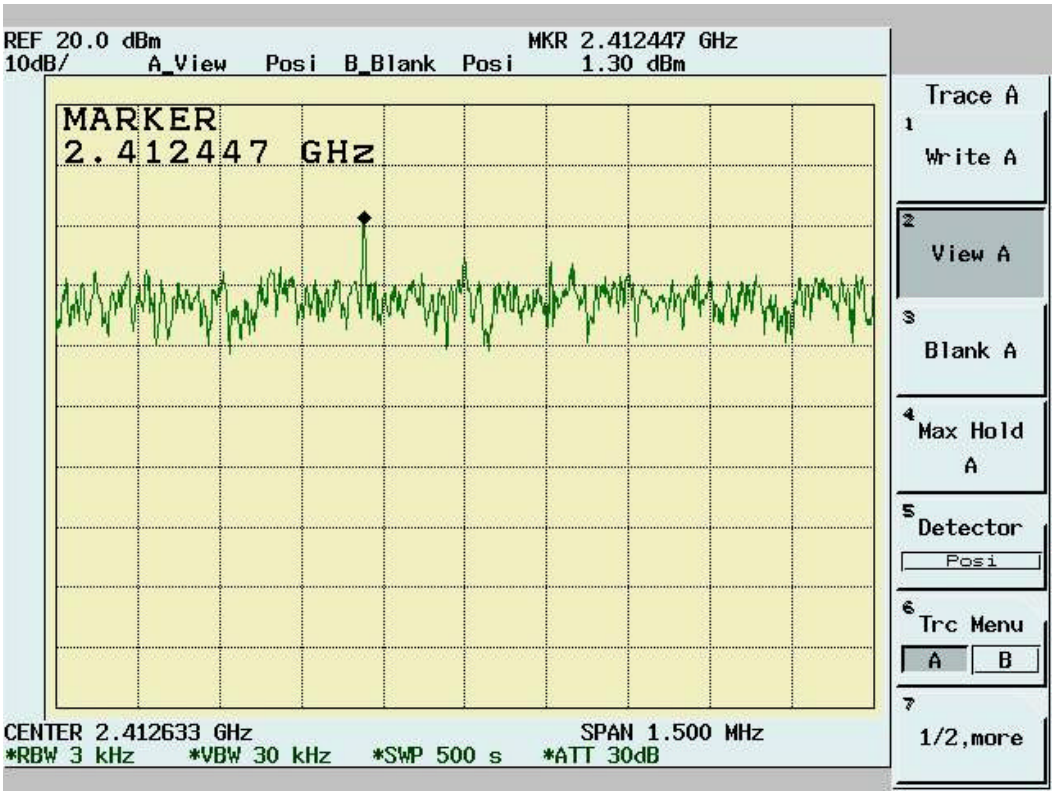
Temp. (deg. C): 25

Test Engr: Mailes Hsieh Humidity (%): 50

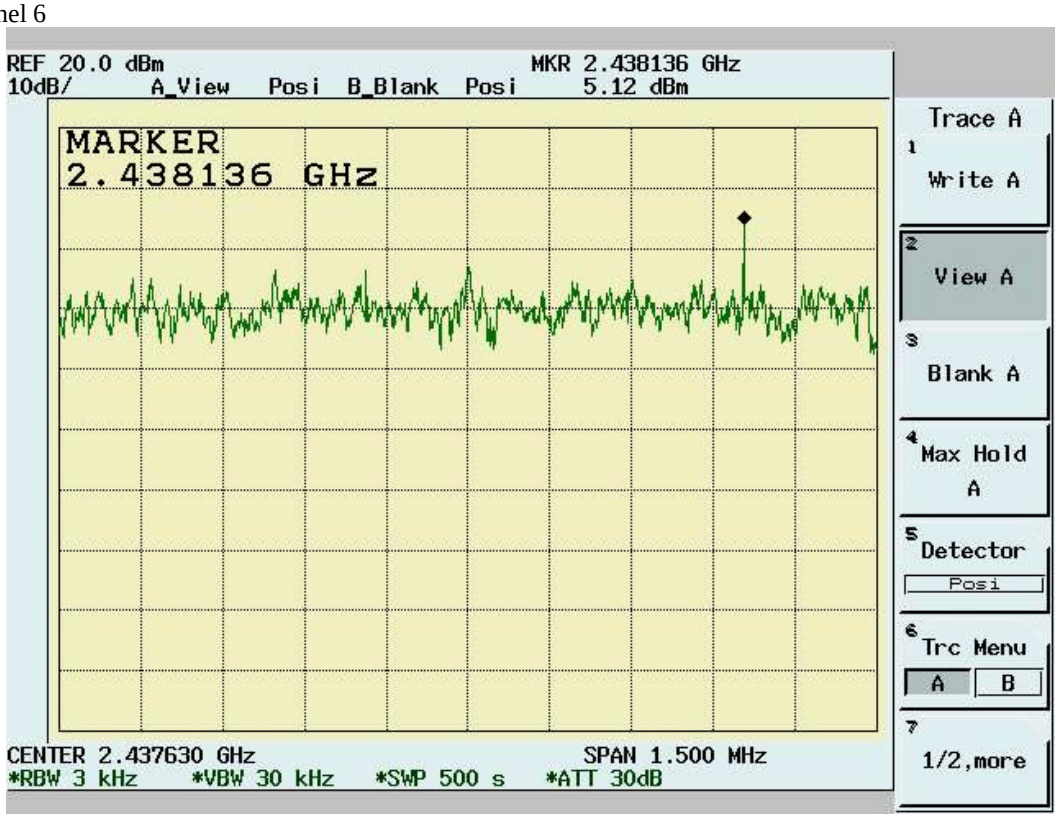
Chennel	Frequency (MHz)	Spectrum Reading (dBm/3KHz)	Cable Loss (dB)	Peak Power Output (dBm/3KHz)	Limit (dBm/3KHz)	Pass/Fail
1	2412	1.3	1.1	2.4	8	Pass
6	2437	5.12	1.1	6.22	8	Pass
11	2462	3.42	1.1	4.52	8	Pass

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

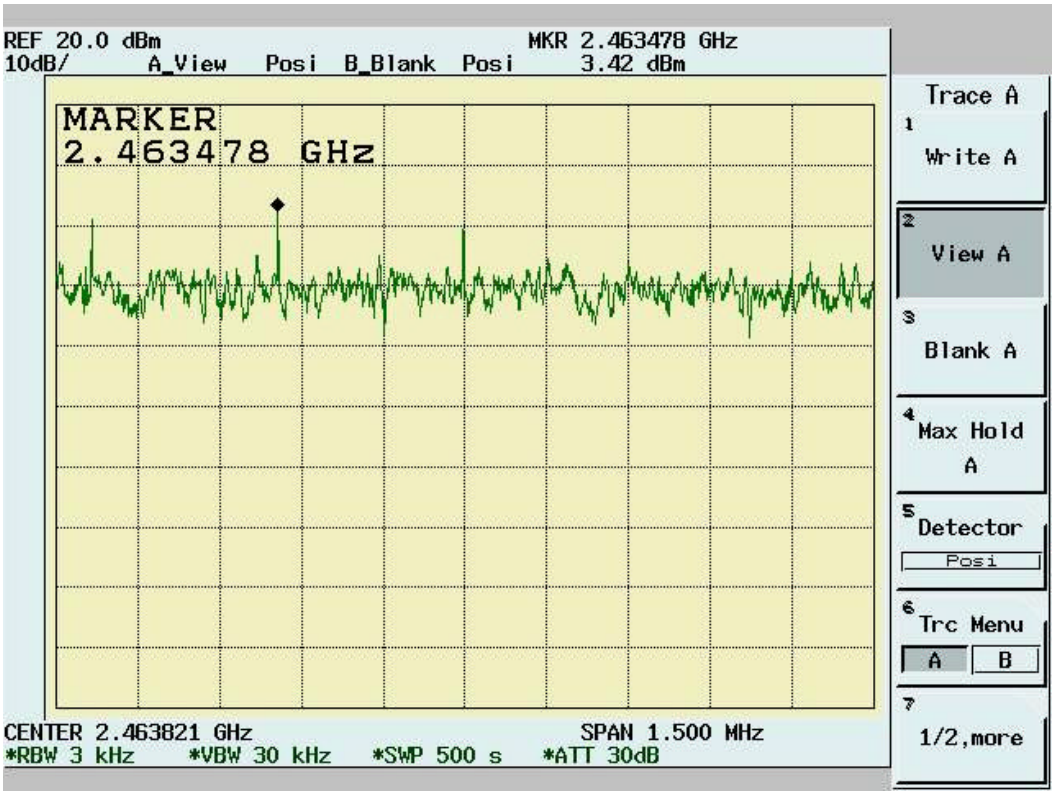
Channel 1



Channel 6



Channel 11


REF 20.0 dBm
10dB/ A_View Posi B_Blank Posi
MKR 2.463478 GHz
3.42 dBm
MARKER
2.463478 GHz
Trace A
1 Write A
2 View A
3 Blank A
4 Max Hold A
5 Detector
Posi
6 Trc Menu
A B
7 1/2,more
CENTER 2.463821 GHz
SPAN 1.500 MHz
*RBW 3 kHz *VBW 30 kHz *SWP 500 s *ATT 30dB

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 6dß 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 6dß 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)

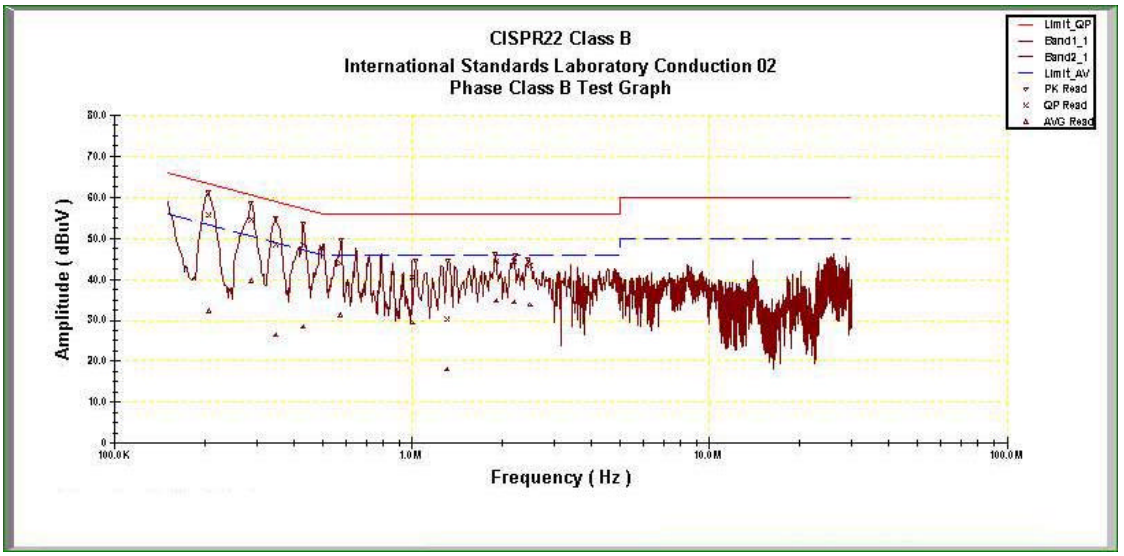
Frequency Range	150 KHz--30MHz
Detector Function	Quasi-Peak/Average
Bandwidth (RBW)	9KHz

5.1.4 Test Data:

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

Operator: Mailes Hsieh
Temperature (C): 24
03:20:34 PM, Friday, April 23, 2004 Humidity (%): 50

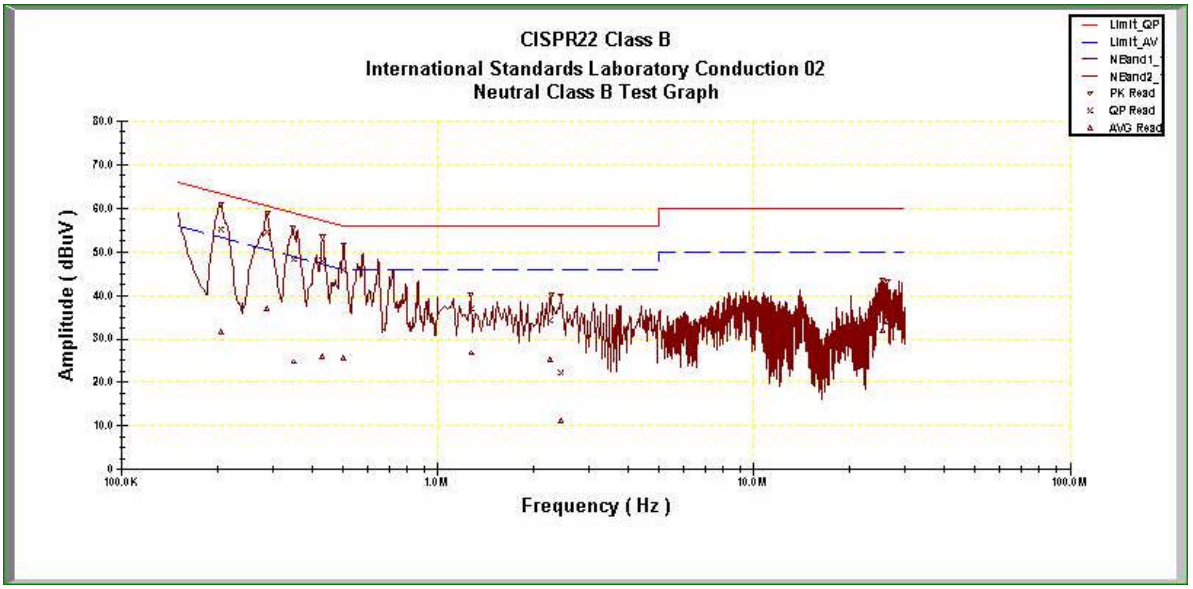
Frequency	LISN Loss	Cable Loss	QP Corrct.	QP Limit	QP Margin	AVE Corrct.	AVE Limit	AVE Margin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.20653	0.10	0.02	55.64	64.38	-8.74	32.19	54.38	-22.19
0.28653	0.10	0.02	54.38	62.10	-7.72	39.56	52.10	-12.54
0.34703	0.10	0.02	48.47	60.37	-11.90	26.36	50.37	-24.01
0.42943	0.10	0.03	48.36	58.02	-9.66	28.43	48.02	-19.59
0.5714	0.10	0.04	43.88	56.00	-12.12	31.19	46.00	-14.81
0.99514	0.10	0.07	40.42	56.00	-15.58	29.42	46.00	-16.58
1.30997	0.31	0.08	30.19	56.00	-25.81	18.11	46.00	-27.89
1.91285	0.13	0.10	44.46	56.00	-11.54	34.71	46.00	-11.29
2.19604	0.11	0.10	44.24	56.00	-11.76	34.43	46.00	-11.57
2.47836	0.12	0.10	43.43	56.00	-12.57	33.71	46.00	-12.29



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

Operator: Mailes Hsieh
Temperature (C): 24
03:28:37 PM, Friday, April 23, 2004 Humidity (%): 50

Frequency	LISN Loss	Cable Loss	QP Corrct.	QP Limit	QP Margin	AVE Corrct.	AVE Limit	AVE Margin
MHz	(dB)	(dB)	Amp.(dBuV)	(dBuV)	(dB)	Amp.(dBuV)	(dBuV)	(dB)
0.20541	0.10	0.02	55.13	64.42	-9.29	31.64	54.42	-22.78
0.28633	0.10	0.02	54.53	62.10	-7.57	36.88	52.10	-15.22
0.3483	0.10	0.02	48.20	60.33	-12.13	24.71	50.33	-25.62
0.42908	0.10	0.03	47.85	58.03	-10.18	25.95	48.03	-22.07
0.50081	0.10	0.03	45.83	56.00	-10.17	25.54	46.00	-20.46
1.27521	0.24	0.08	36.94	56.00	-19.06	26.71	46.00	-19.29
2.26343	0.11	0.10	34.24	56.00	-21.76	25.14	46.00	-20.86
2.44655	0.12	0.10	22.17	56.00	-33.83	11.16	46.00	-34.84
25.4954	0.70	0.32	39.60	60.00	-20.40	31.88	50.00	-18.12
26.489	0.70	0.33	40.67	60.00	-19.33	33.75	50.00	-16.25



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

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

5.2.1 Test Procedure

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

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

5.2.2 Test Setup

5.2.3 Test Data:

6dB Bandwidth

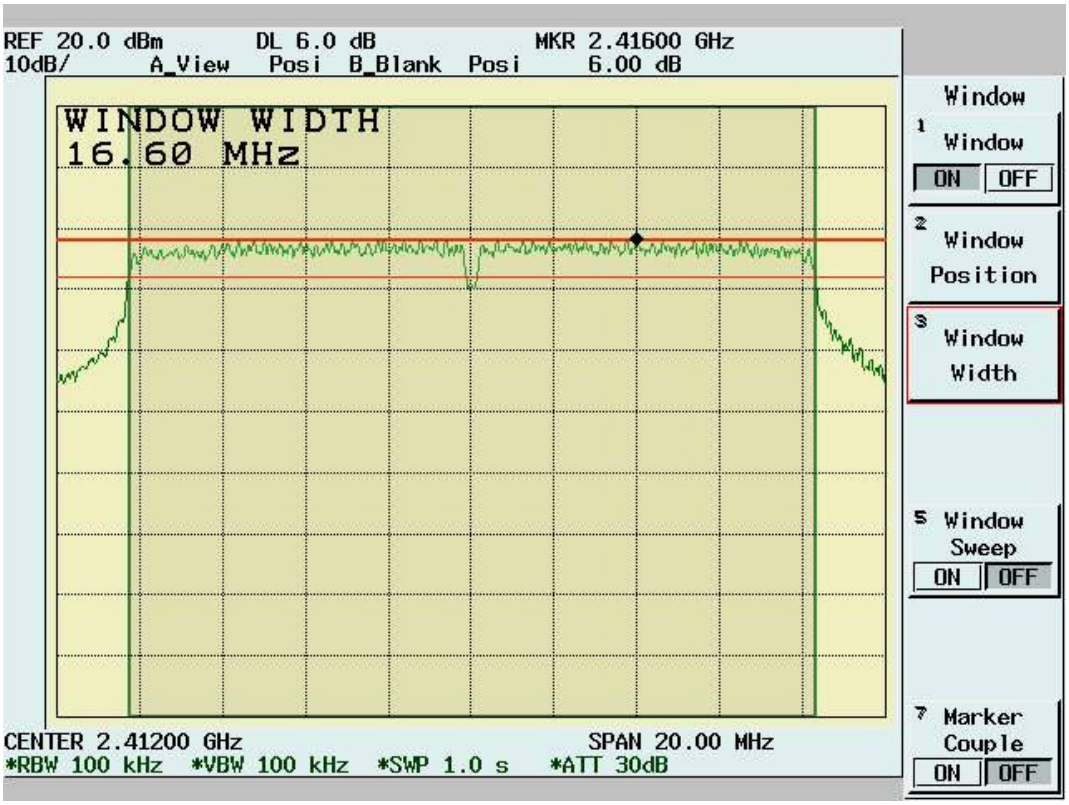
Temp. (deg. C): 25

Test Engr: Mailes Hsieh

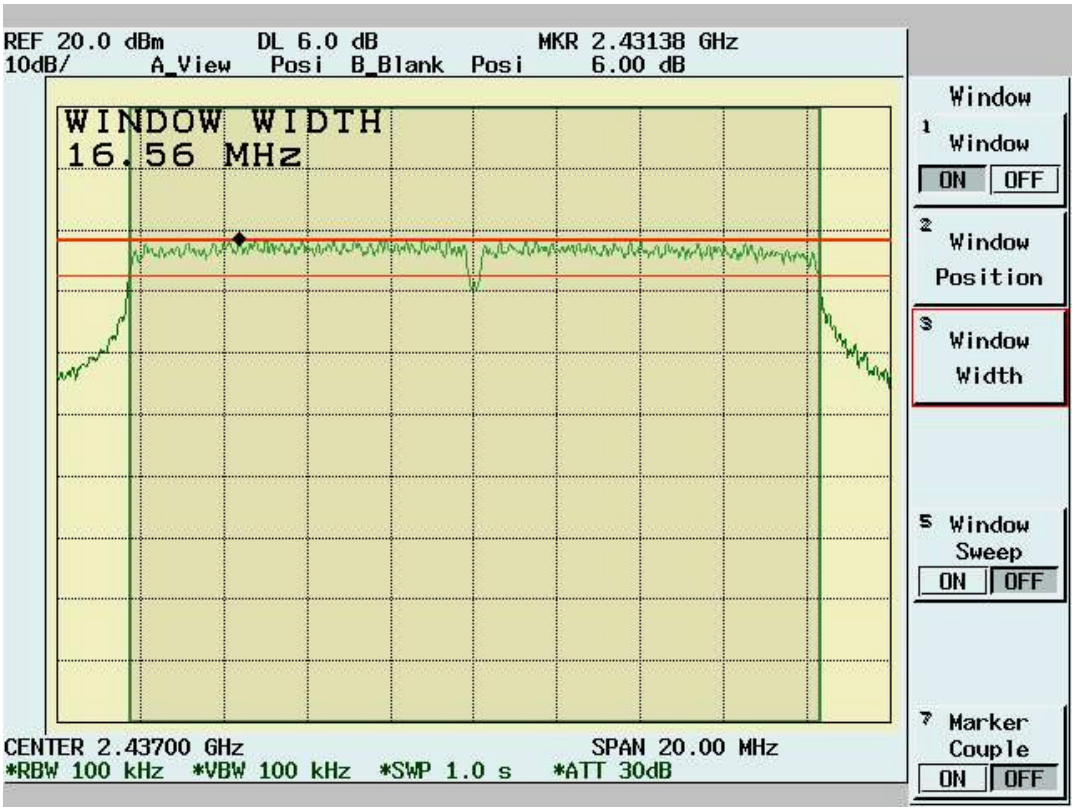
Humidity (%): 50

Chennel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Pass/Fail
1	2412	16.6	0.5	Pass
6	2437	16.56	0.5	Pass
11	2462	16.56	0.5	Pass

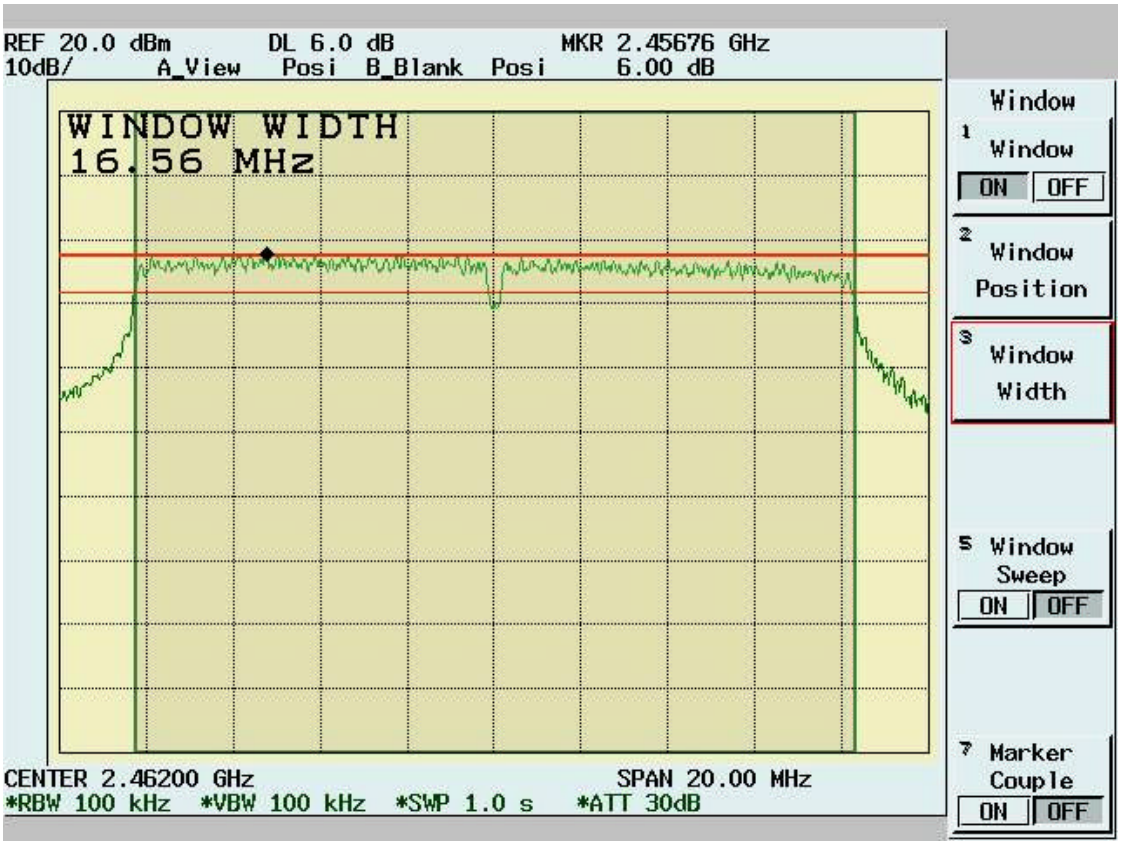
Channel 1:



Channel 6:



Channel 11:


REF 20.0 dBm
10dB/
DL 6.0 dB
A_View Posi B_Blank Posi
MKR 2.45676 GHz
6.00 dB
WINDOW WIDTH
16.56 MHz
CENTER 2.46200 GHz
SPAN 20.00 MHz
*RBW 100 kHz *VBW 100 kHz *SWP 1.0 s *ATT 30dB
Window
1 Window
ON OFF
2 Window Position
3 Window Width
5 Window Sweep
ON OFF
7 Marker Couple
ON OFF

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

5.3.1 Test Procedure

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

5.3.2 Test Setup

5.3.3 Test Data

Maximum Peak Output Power

Temp. (deg. C): 25

Test Engr: Mailes Hsieh 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	21.468	1.1	180.63	22.568	30	Pass
6	2437	21.468	1.1	180.63	22.568	30	Pass
11	2462	21.156	1.1	168.11	22.256	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 acc*ording to EMI Receiver/Spectrum Analyzer Configuration.*

For the test of 2^{nd} to 10^{th} 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

Operator: Mailes Hsieh
Temperature (C): 23
08:15:43 PM, Friday, April 23, 2004 Humidity (%): 41

Frequency	Rx Amp.	Ant Fact	CableLoss	PreAmpGain	Corrct. Emi.	Limit	Margin	Ant. Pos.	Table Pos.
MHz	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg)
249.22	20.20	11.49	4.73	0.00	36.42	46.00	-9.58	150.00	264.00
299.66	12.25	13.59	4.65	0.00	30.49	46.00	-15.51	250.00	264.00
313.24	10.91	13.79	4.69	0.00	29.39	46.00	-16.61	100.00	117.00
330.7	8.98	14.03	4.80	0.00	27.81	46.00	-18.19	100.00	264.00
350.1	10.06	14.30	4.97	0.00	29.34	46.00	-16.66	250.00	281.00
395.69	12.24	15.85	5.29	0.00	33.38	46.00	-12.62	200.00	166.00
399.57	6.67	15.99	5.32	0.00	27.97	46.00	-18.03	200.00	215.00
499.48	6.28	17.69	6.05	0.00	30.01	46.00	-15.99	150.00	313.00
791.45	5.34	20.02	7.83	0.00	33.19	46.00	-12.81	250.00	313.00
824.43	2.73	20.29	7.94	0.00	30.96	46.00	-15.04	150.00	329.00

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

Operator: Mailes Hsieh
Temperature (C): 23
08:17:22 PM, Friday, April 23, 2004 Humidity (%): 41

Frequency	Rx Amp.	Ant Fact	CableLoss	PreAmpGain	Corrct. Emi.	Limit	Margin	Ant. Pos.	Table Pos.
MHz	(dBuV)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg)
43.58	15.34	10.42	1.81	0.00	27.58	40.00	-12.42	200.00	27.00
47.46	17.23	8.62	1.89	0.00	27.74	40.00	-12.26	100.00	11.00
55.22	19.32	6.56	2.17	0.00	28.05	40.00	-11.95	200.00	190.00
58.13	19.52	5.97	2.24	0.00	27.73	40.00	-12.27	200.00	158.00
76.56	18.20	6.26	2.69	0.00	27.15	40.00	-12.85	200.00	174.00
81.41	17.56	6.84	2.75	0.00	27.15	40.00	-12.85	150.00	190.00
98.87	19.68	10.07	3.00	0.00	32.75	43.50	-10.75	250.00	223.00
249.22	22.62	11.49	4.73	0.00	38.84	46.00	-7.16	150.00	174.00
791.45	5.60	20.02	7.83	0.00	33.45	46.00	-12.55	100.00	158.00
824.43	5.66	20.29	7.94	0.00	33.90	46.00	-12.10	100.00	142.00

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: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
2918.08	38.86	31.07	2.82	46.52	26.23	54.00	-27.77	100	325
3275.22	40.38	31.32	2.41	46.62	27.48	54.00	-26.52	100	201
4825.17	45.77	34.94	1.27	46.89	35.10	54.00	-18.90	101	124
6860.14	35.70	38.34	2.74	46.38	30.40	54.00	-23.60	102	264
7239.76	46.64	39.48	3.15	46.20	43.07	54.00	-10.93	101	124
8588.41	38.03	41.56	3.34	42.54	40.40	54.00	-13.60	100	351

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

Operator: Mailes Hsieh

RBW: 1 MHz
Humidity (%): 39
Temperature (C): 22

Frequency	Rx_R.	Ant_F.	Cab_L.	PreAmpl	Emission(pk)	Limit(av)	Margin	A.Tower	T.Table
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	cm	deg
3260.24	40.91	31.31	2.43	46.62	28.03	54.00	-25.97	100	241
3400.10	40.54	31.42	2.22	46.64	27.54	54.00	-26.46	102	84
4216.78	41.39	32.85	1.85	46.32	29.77	54.00	-24.23	100	254
4821.68	47.92	34.92	1.28	46.88	37.24	54.00	-16.76	102	123
7233.77	50.27	39.47	3.15	46.21	46.68	54.00	-7.32	105	102
8582.42	38.11	41.57	3.35	42.53	40.49	54.00	-13.51	102	317

Note:
" pk": peak reading
"av": average reading
"---": 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.